INFLUENCE OF LEARNING STYLE AND LEARNING FLEXIBILITY ON CLINICAL JUDGMENT OF PRELICENSURE NURSING STUDENTS WITHIN A HUMAN PATIENT COMPUTER SIMULATION ENVIRONMENT

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ABSTRACT

INFLUENCE OF LEARNING STYLE AND LEARNING FLEXIBILITY ON CLINICAL JUDGMENT OF PRELICENSURE NURSING STUDENTS WITHIN A HUMAN PATIENT COMPUTER SIMULATION ENVIRONMENT

Elizabeth Sharon Robison

Nursing education is experiencing a transition in how students are exposed to clinical situations. Technology, specifically human patient computer simulation, is replacing human exposure in clinical education (Nehring, 2010b). Kaakinen and Arwood (2009) discuss the need to apply learning theories to instructional designs involving simulation for successful learner-centered outcomes. Developing effective teaching strategies using technology to support enhancing student performance outcomes requires a paradigm shift from traditional, clinical-based models.

The purpose of this study was to begin to close research gaps and support development of evidence-based practice in implementing simulation by examining prelicensure nursing students' learning styles and flexibilities relative to clinical judgment performance. A convenience sample ($N = 51$) was obtained from students enrolled in a state college located in the Southeastern portion of the United States. The study incorporated a nonexperimental correlation design.

Experiential learning theory ascribed by D. A. Kolb (1984) provided the overarching conceptual framework for the study's research question: how do the individual and combined influences of learning style and learning flexibility (independent variables) of a prelicensure nursing student within a human patient computer simulation environment relate to clinical judgment (dependent variable)? Two instruments were used in data collection: the Kolb Learning Style Inventory-Version 4 to examine the independent variables, and the Lasater Clinical

Judgment Rubric© to examine the dependent variable. The Pearson product-moment correlation and linear regression procedures were used for statistical analyses.

The study's findings indicated learning style significantly influenced a prelicensure nursing student's clinical judgment within a human patient computer simulation environment. When the learning style variables were entered into a regression model, the variance in clinical judgment was influenced by the way an individual reflects and transforms the experience. The study's findings did not indicate a significant relationship between learning flexibility and clinical judgment. Based on the findings, a prelicensure nursing student's learning style may influence clinical judgment within a human patient computer simulation environment. Further research is recommended to examine the relationship of clinical judgment and learning style from a developmental perspective throughout the nursing program curriculum and explore the role of learner flexibility in supporting varied instructional design approaches.

CHAPTER I

INTRODUCTION

This introductory chapter provides a brief description of the background of using human patient computer simulation in nursing education, with the specific focus on prelicensure nursing student variables of learning style and learning flexibility influencing the nursing student's performance outcome. The theoretical framework, experiential learning theory, is briefly discussed in terms of applicability to an educational strategy incorporating use of human patient computer simulation in nursing education. Several areas are highlighted concerning the importance of understanding use of human patient computer simulation as an educational strategy in prelicensure nursing education and the influence on the learner, specifically on learner performance. The research question and hypotheses target a learner-centric approach, examining student variables of learning style and learning flexibility on the performance outcome of clinical judgment within a human patient computer simulation environment.

Background and Focus Area

Clinical experiences are critical in prelicensure nursing programs, providing an experiential learning approach to prepare the future nursing workforce (Ironside & McNelis, 2010). The availability of clinical space to provide structured, clinical instruction is a challenge for many nursing programs around the United States because of an increased demand to enroll additional students to meet the predicted nursing workforce shortage (Benner, Sutphen, Leonard, & Day, 2010). Patient safety concerns have led to a cautionary approach when nursing students are involved with direct clinical hands-on training (Meyer, Connors, Hou, & Gajewski, 2011). Additionally, many state boards of nursing limit faculty/student ratios within patient care settings (Meyer et al., 2011). Nurse educators in prelicensure programs are turning to technology to provide solutions to enrollment, clinical space concerns, and patient safety issues. Prelicensure nursing program administrators are beginning to invest in human patient computer simulators as an alternative to providing clinical instruction with real patients. Researchers discuss human patient simulation in terms of using a computerized mannequin which provides real-time physiological parameters, allowing an interactive component to learning within a risk-free environment (Nehring, Ellis, & Lashley, 2001; Ravert, 2002).

Nursing literature includes a variety of strategies for how human patient computer simulation is used in prelicensure nursing programs, from using simulation as a teaching strategy to use in evaluation (Hyland & Hawkins, 2009). Schiavenato (2009) mentions significant concerns related to a void in a comprehensive approach to applying simulation in nursing education, noting the importance to reexamine the concept of simulation within the teaching process. He believes the technology is driving the use of human patient computer simulation, addressing the lack of theoretical or ideological foundation supporting why simulation in nursing supports key pedagogical features to enhancing nursing student outcomes (Schiavenato, 2009). Use of clinical simulation supports a pedagogical approach focusing on student engagement during patient care scenarios and affords the opportunity for the nurse educator to assess student performance related to clinical reasoning (Benner et al., 2010).

Developing effective teaching strategies using technology to support enhancing student outcomes requires a paradigm shift for nurse educators, shifting away from traditional, clinical-based models. Much of the research related to student outcomes within a human patient computer simulation learning environment focuses on self-perceived ratings related to student satisfaction or improvement in self-confidence with a paucity of research related to the influence on student's cognitive and critical thinking performance (Bearnson & Wiker, 2005; Feingold, Calaluce, & Kallen, 2004; Fountain & Alfred, 2009; Jefferies & Rizzolo, 2006; Kardong-Edgren, Anderson, & Michaels, 2007). Ard (2009) describes the complexities of the learning process within nursing education, where learning is influenced by multiple factors to include learner and teacher characteristics, learning environment, and teaching methods. In order to promote student learning, the nurse educator should consider the impact and significance of these multiple factors in designing instructional activities within nursing education (Ard, 2009). Additionally, nurse educator competencies outlined by the National League for Nursing advocate the importance of facilitating learner development by identifying individual learning styles and unique learning aspects of a variety of learner types (Halstead, 2007).

A growing body of literature has emerged in relation to understanding learning styles in context of improving instructional design aspects in courses (McCarthy, 2010). One aspect within learning styles focuses on information processing, specifically how a learner absorbs and uses new information (McCarthy, 2010). How do learner variables influence performance and the ability to adapt to different learning situations? There is a paucity of research focusing on nursing students' learning styles and learning flexibilities, in relation to influencing student performance outcomes (Molsbee, 2011).

Theoretical Overview

A variety of theoretical learning models are used to frame nursing simulation research, including social-cognitive learning (Elfrink, Nininger, Rohig, & Lee, 2009; Rodgers, 2007), multiple intelligence learning (Fountain & Alfred, 2009), constructivism (Kriz, 2010; Parker & Myrick, 2009; Rodgers, 2007), behaviorism (Parker & Myrick, 2009), novice to expert performance development (Larew, Lessans, Spunt, Foster, & Covington, 2004), experiential learning, adult learning, and brain-based learning (Kaakinen & Arwood, 2009; Rodgers, 2007).

Human patient computer simulation brings an experiential approach to learning, applying real world applications to enhance nursing student performance outcomes. The foundation for experiential learning theory is attributed to the educational philosophy of John Dewey (Kolb, D. A., 1984). D. A. Kolb, a developmental psychologist, builds on Dewey's philosophy by providing an in-depth examination of experiential learning theory by ascribing to a four-stage cycle involving four adaptive modes to include concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). Within the structural process, four different types of knowledge are obtained depending on whether experience is grasped by apprehension or comprehension and transformed via extension or intention (Kolb, D. A., 1984). This model supports learning from an information processing perspective. Human patient computer simulation environment requires nursing students to process information using an experiential or hands-on approach to learning. Central to experiential learning theory is human adaptation to the environment (Kolb, D. A., 1984). Experiential learning theory provides a solid framework in examining student variables that may influence the learner's performance in an experiential learning environment.

Statement of the Problem

Nursing education is experiencing a transition in how students are exposed to clinical situations. Technology is replacing human exposure in clinical education (Nehring, 2010b). The program directors who have substituted technology-based human patient computer simulation for clinical rotations, cited decreased availability of clinical sites and shortage of qualified nursing faculty as primary reasons for the substitution, noting human patient computer simulation provides a suitable alternative clinical experience (Decker, 2009; Hyland & Hawkins, 2009; Landeen & Jefferies, 2008; Nehring, 2010b; Nehring et al., 2001; Peteani, 2004). Nehring (2008) found 16 states allowed simulation as part of prelicensure programs' clinical hour requirement, with 17 states considering changes in the future. Most state boards of nursing have some oversight over nurse education within the state, prompting many to begin to explore changing the percentage of clinical time with simulation to meet student and faculty demands (Nehring, 2008). The leadership of the National Council of State Boards of Nursing (NCSBN; 2009) is encouraging changes in nursing education to include simulation. Additionally, national nurse educators are beginning to explore use of simulation for performance-based assessment as an additional component for licensure (Benner et al., 2010).

Developing effective teaching strategies using technology to support enhancing student performance outcomes requires a paradigm shift from traditional, clinical-based models. Kaakinen and Arwood (2009) found very few studies viewed simulation from a learning perspective, concluding most executed simulation from a teaching paradigm. Different models are emerging to structure human patient computer simulation incorporating different learning theories such as experiential learning, social learning, problem-based learning, adult learning, social construct learning, situated cognition, and transformative learning (Kaakinen & Arwood, 2009; Lisko & O'Dell, 2010; Paige & Daley, 2009). Within the 16 studies with a learner-centric focus, Kaakinen and Arwood found two studies examined nursing simulation relative to learner outcomes, with one of the studies focused on the influence of learner variables on the diagnostic reasoning process within different learning environments. Learning with technology requires educators to explore other learner variables that have potential for influencing student performance outcomes.

The members of the National League for Nursing have begun a 3-year project to explore the use of simulation for high-stakes evaluation (Klestzick, 2010). The goal of the project is to develop simulation scenarios and tools clinical instructors across the country can use for evaluation purposes to support graduate nurse readiness in terms of competency-based performance (Klestzick, 2010). Nursing leaders in the field of nursing simulation conclude the use of simulation for high-stakes testing experience is not appropriate at this time for prelicensure nursing graduates, citing multiple concerns with varying levels of understanding about simulation and lack of standardization and expectation levels between the two levels of prelicensure programs (Kardong-Edgren, Hanberg, Keenan, Ackerman, & Chambers, 2011). Lasater (2011a) echoes a similar concern on the readiness of nursing leadership to use human patient computer simulation for high-stakes testing. As a panel member of the 2010 National League of Nursing Think Tank for Simulation for High-Stakes Evaluation in Nursing Education, Lasater (2011a) comments on the importance of standardization and uniformity across multiple sites as well as recognizing the need to impart clear expectations on use of simulation for evaluation versus learning. Human patient computer simulation used for learning focuses on different performance outcomes, addressing the student in a development role rather than an evaluative perspective.

Nursing students using human patient computer simulation may have varying performance outcomes related to clinical judgment. Clinical judgment is defined as "an interpretation or conclusion about a patient's needs, concerns, or health problems and/or decisions to take action (or not), use or modify standard approaches, or improvise new ones as deemed appropriate by the patient's response" (Tanner, 2006b, p. 204). If human patient computer simulation replaces clinical time spent with the patient, using technology and a simulated scenario may impact students' clinical judgment because of their preferred learning style or ability to adapt their learning style to different learning situations. No studies were identified in nursing literature focusing on student variables related to learning style preference and adaptability to different learning situations in relationship to influencing performance outcomes, specifically clinical judgment when involved with human patient computer simulation.

Significance of the Study

Human patient computer simulation continues to gain popularity as an evolving technology to provide authentic experiences to students in a low-risk environment. As nursing programs struggle with limited clinical sites and faculty shortages, simulation centers are seen as one solution to maintaining and potentially increasing enrollment. Although state boards of nursing have various policies on whether simulation can count towards actual clinical hours, many state nursing officials are beginning to explore changing their policy to meet educational demands (Nehring, 2008).

Early research efforts focused on justifying the use of human patient computer simulation as a teaching methodology since the resource investment was costly (Nehring, 2010b). Within the last ten years researchers have begun to focus on the use of human patient computer simulation technology as new emerging technology within an educational context: how nursing program directors incorporate and implement simulation to enhance student outcomes (Nehring, 2010a). Kaakinen and Arwood (2009) discuss the need to apply learning theory to instructional design involving nursing simulation for successful learner-centered outcomes. By understanding prelicensure nursing student's learning style and learning flexibility on clinical judgment during human patient computer simulation, nurse educators can understand individual variables as potential influences on clinical judgment in a learning environment incorporating technology. Additionally, study findings provide an opportunity to fill the gap in nursing literature, especially important as national nurse leadership considers performance-based evaluation using simulation as a prerequisite for licensure.

Research Question

To begin to close research gaps and support development of best practices in implementing human patient computer simulation in prelicensure nursing programs, the study will examine learning in terms of individuals' learning styles and flexibilities relative to clinical judgment performance. Clinical judgment performance is discussed in relation to the prelicensure nursing student. The overarching research question aligns with exploring whether any relationship exists between learning style, learning flexibility, and clinical judgment: How do the individual and combined influences of learning style and learning flexibility of prelicensure nursing students within a human patient computer simulation environment relate to clinical judgment?

Hypotheses

The following research hypotheses were formulated to address the research question and align with theoretical constructs of experiential learning theory.

H_1. There is a relationship between learning style and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

$H0_1$. There is no relationship between learning style and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

H_2. There is a relationship between learning flexibility and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

$H0_2$. There is no relationship between learning flexibility and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

H_3. The individual and combined influences of learning style and learning flexibility on clinical judgment of prelicensure nursing students within a human patient computer simulation environment will demonstrate multiple significant relationships.

$H0_3$. The individual and combined influences of learning style and learning flexibility on clinical judgment of prelicensure nursing students within a human patient computer simulation environment will demonstrate no multiple significant relationships.

Chapter Summary

The basis for the study is to investigate prelicensure nursing student variables of learning style and learning flexibility on the performance outcome of clinical judgment within a human patient computer simulation environment. The overarching theoretical framework is based on the conceptual model of experiential learning theory. The background and focus of the study, problem statement, and significance of the study were highlighted. Additionally, the research question with supporting hypotheses was introduced. A detailed literature review is provided in Chapter 2.

Definition of Key Terms

Clinical judgment. Tanner (2006b) defines *clinical judgment* as "an interpretation or conclusion about a patient's needs, concerns, or health problems, and/or the decision to take action (or not), use or modify standard approaches, or improvise new ones as deemed appropriate by the patient's response" (p. 204).

Experiential learning. *Experiential learning* is a holistic perspective of learning which integrates experience, perception, cognition, and behavior (Kolb, D. A., 1984). The process is described using "a four-stage cycle involving four adaptive learning modes—concrete experience, reflective observation, abstract conceptualization, and active experimentation"

(Kolb, D. A., 1984, p. 40). Additionally, the process involves development of new knowledge in which tension is created among the four adaptive learning modes in response to the demands of the situation (Kolb, A. Y. & Kolb, 2005a).

Human patient computer simulation. *Human patient computer simulation* is the use of a computerized mannequin which provides a simulated patient with real-time physiological parameters, allowing for an interactive component to learning within a low-risk, controlled environment (Nehring et al., 2001; Ravert, 2002).

Learning. D. A. Kolb (1984) defines *learning* as the "creation of knowledge and meaning" which "occurs through the active extension and grounding of ideas and experiences in the external world and through internal reflection about the attributes of these experiences and ideas" (p. 52). Learning is viewed as a holistic process in which conflict resolution and adaptation occurs between the opposing modes concerning how an individual feels or thinks and reflects or acts (Kolb, A. Y. & Kolb, 2005a).

Learning flexibility. Sharma and D. A. Kolb (2011) define *learning flexibility* as indicating "the development of a more holistic and sophisticated learning process," where development occurs when the individual moves from a specialized learning style approach to an integrated, holistic approach to the learning process. The integrated approach involves creative tension among the learning modes based on the context of the situation (Sharma & Kolb, D. A., 2011).

Learning style. *Learning style* involves a specialized mode of adaptation consisting of a dynamic possibility-processing structure. The structure is a unique way an individual grasps an experience with varying degrees of emphasis on one of two different modes of consciousness, apprehension or comprehension and transforms the experience through intention or extension (Kolb, D. A., 1984; Sharma & Kolb, D. A., 2011).

Prelicensure nursing students. *Prelicensure nursing students* are individuals involved in a nursing education program of study designed to prepare the student "for entry into practice as generalists" (NCSBN, 2005, p. 2).

CHAPTER II

REVIEW OF RELATED LITERATURE

The literature review includes the history of simulation and its use in nursing education, focusing on the use of human patient computer simulation as an educational strategy. The chapter includes applicable learning theories to address important considerations for pedagogical approaches incorporating human patient computer simulation and follows with a discussion on experiential learning theory including applicability to a human patient computer simulation environment in nursing education. The overview encompasses a discussion of learning style within higher education, describing two predominant learning style measurement instruments used within higher education. The next section includes information on clinical judgment from a nursing perspective. The chapter concludes with a description of the theoretical framework used to address the research question.

History and Use of Human Patient Computer Simulation

The use of simulation dates back to medieval times, but use with a technological component in health care education began with a resuscitation manikin, Resusci-Anne, in the late 1950s (Harder, 2009). As technology evolved, health care educators were introduced to the next phase of development, a torso mannequin with chest movement, audible breath sounds, audible heart sounds, and ability to introduce drugs and gases into simulated scenarios (Harder, 2009). The introduction of a human patient computer simulator in the late 1960s was attributed to Denson and Abrahamson who developed a simulator called Sim One for anesthesiology programs (Harder, 2009; Nehring, 2008; Peteani, 2004). The expense and bulky size of this simulator limited its use (Harder, 2009). With improved technology enhancements, the human patient simulator took on a life-like appearance and nurse educators in prelicensure programs began noting the value of introducing this modality of instruction to provide a realistic, interactive patient encounter in a safe environment (Harder, 2009; Hyland & Hawkins, 2009; Peteani, 2004). The national focus on patient safety contributed to the appeal of using human patient computer simulation as a low-risk learning environment for clinical instruction.

In a landmark report sponsored by the Institute of Medicine, *To Err is Human: Building a Safer Health Care System*, Kohn, Corrigan, and Donaldson (2000) address significant concerns related to medical errors occurring each year that resulted in as many as 98,000 deaths. Kohn et al. recommend improving patient safety by establishing interdisciplinary team training incorporating simulation. Although the focus of the report is not on nursing education, Nehring (2008) emphasizes patient safety issues and quality healthcare begin with the healthcare education system. Durham and Alden (2008) discuss the benefits of incorporating several multidimensional patient safety concepts into clinical education through the use of patient simulators. Several authors discuss and highlight the unique aspects of using human patient computer simulation in nursing educational programs to support the safety agenda by allowing students to make mistakes without harming a patient, thus creating a low-risk environment to practice and master critical clinical skills (Bambini, Washburn, & Perkins, 2009; Decker, 2009; Durham & Alden, 2008; Fort, 2009; Haskvitz & Koop, 2004; Hyland & Hawkins, 2009; Jefferies, Kost, & Sweitzer, 2009; Nehring, 2008; Nehring et al., 2001; Peteani, 2004).

There are several national trends in nursing education leading nursing program directors to explore use of human patient computer simulation within nursing curricula. Nursing programs are experiencing staff shortages, lack of suitable clinical venues, and increasing pressure to enroll more students (Florida Center for Nursing [FCN], 2011a; Southern Regional Education Board [SREB], 2007). A survey of prelicensure nursing programs conducted in 2006 in the southern region of the United States found 26,101 qualified applicants denied admission primarily because of faculty and facility shortages (SREB, 2007). Rosseter (2011) elaborates on the findings of a 2010 survey by the American Association of Colleges of Nursing, which identified 67,563 qualified applicants were turned away because of "insufficient number of faculty, clinical sites, classroom space, clinical preceptors, and budget constraints" (para. 3), with faculty shortages cited as a primary reason. Human patient computer simulation is considered a viable alternative to address these concerns (Decker, 2009; Hyland & Hawkins, 2009; Landeen & Jefferies, 2008; Peteani, 2004).

The complexity of the healthcare system and the risks associated with certain conditions are providing an impetus for use of human patient computer simulation (Decker, 2009; Nehring, 2010b). A human patient computer simulation environment provides students an opportunity to apply newly acquired knowledge and gain confidence with clinical skills in a low-risk, supportive environment (Decker, 2009; Nehring, 2010b). Several faculty members at one community college minimized student anxiety prior to the psychiatric rotation by using human patient computer simulation as a preparation activity (Sleeper & Thompson, 2008). The students and faculty described the simulated encounter as realistic, allowing students to practice therapeutic communication with a high-risk client in a safe environment (Sleeper & Thompson, 2008). In another program, faculty members had senior nursing students prepare for a postpartum rotation by requiring them to implement discharge teaching to first-time mothers using human patient computer simulation as a practice session and proficiency validation (Wagner, Bear, & Sander, 2009). Wagner et al. found students had positive perceptions about the experience in preparing them to implement discharge teaching for postpartum patients. Additionally, the nursing staff on the postpartum unit highlighted how independently the nursing students performed when providing discharge instructions to a high-risk population (Wagner et al., 2009). Jefferies and Rizzolo (2006) conducted a national, multisite study with prelicensure nursing students comparing use of human patient computer simulation with paper and pencil case study. The nursing students in the human patient computer simulation group reported a significantly greater confidence level (Jeffries & Rizzolo, 2006).

Smith (2009) discussed program changes for last-semester senior nursing students includes replacing 24 hours of their clinical rotation in acute care with human patient computer simulation. The fast-paced atmosphere in the acute care setting affords little time for nursing students to think carefully about appropriate nursing interventions for their patients and to reflect on day-of-care events (Smith, 2009). Smith notes positive evaluation from both nursing students and faculty members after using human patient computer simulation, with faculty members noting greater student confidence and preparation for their other acute care clinical rotations. Schiavenato (2009) provides cautionary advice to consider pedagogical applications from theoretical underpinnings to support use of the process of simulation to define the role and place of human patient computer simulation within nursing education.

Human Patient Computer Simulation and Instruction

Research in human patient computer simulation in prelicensure programs continues to garner attention as more nursing program directors begin to integrate human patient computer simulation within nursing curriculum (Nehring, 2010a). Ravert (2002) reviewed empirical research addressing the effectiveness of simulation in education using quantitative data during the period 1980 to 2000. Of the nine studies meeting her criteria on using quantitative statistics, only two incorporated nurses in their sample, and neither of these studies focused on prelicensure nursing education (Ravert, 2002). Ravert and Hoffman (2011) are in the process of conducting a similar analysis of empirical-based literature and have narrowed their search years to 2008 to 2010. Within this time frame, human patient computer simulation research has proliferated scholarly literature, with one journal, *Clinical Simulation in Nursing Education,* established for the sole purpose of addressing simulation in nursing education and promoting simulation as a specialty within nursing (Tarnow, 2006).

The body of knowledge on use of human patient computer simulation in prelicensure nursing programs is primarily from a bachelor of science in nursing perspective as the bulk of research has focused on undergraduate education (Nehring, 2010a). There are fewer empirical studies on use of human patient computer simulation in associate's degree nursing programs, but the findings imparted by researchers from undergraduate programs are transferable to the extent the information discusses application to prelicensure nursing program students and faculty. The body of research beginning to develop related to prelicensure nursing program use of human patient computer simulation can be viewed within three areas of focus: students, educators, and processes (Nehring, 2010a). The following discussion will synthesize the research within these three areas focusing on outcomes of the research.

Laschinger et al. (2008) reviewed literature on health profession students related to knowledge, skills, confidence, and satisfaction with simulation. The inclusion criteria for the studies analyzed were experimental and observational studies from 1995 through 2006. Only six studies were conducted using nursing students, with three of the six occurring in United States nursing programs (Laschinger et al., 2008). The researchers examined individual variables: knowledge acquisition, skill performance, learner satisfaction, self-confidence, and pace of simulation (Laschinger et al., 2008). The one study which addressed student performance of a technical skill, electrocardiogram, did not demonstrate significant improvement on skill performance as a result of nursing students using human patient computer simulation (Laschinger et al., 2008). Laschinger et al. concluded the results showed variable outcomes in all the studies examining self-confidence. The results from the study incorporating nursing students indicated an increase in student's confidence level after the simulation experience (Laschinger et al., 2008). A review conducted by Leigh (2008) of 12 nursing studies published between 2001 and 2008 found an increase in student self-efficacy after participating in human patient computer simulation. Nehring and Lashley (2009) analyzed 26 published empirical-based nursing studies conducted after 2001. Results from studies examining student and faculty outcomes on using human patient computer simulation as an adjunct to traditional clinical education indicate positive perceptions by faculty and an increase in student confidence levels (Nehring & Lashley, 2009). Lapkin, Levett-Jones, Bellchambers, and Fernandez (2010) examined studies published from 1999 to 2009 focusing on the impact of human patient computer simulation on clinical reasoning skills of undergraduate nursing students. Their findings were inconclusive because of the lack of evidence on effectiveness of simulation influencing clinical reasoning skills and overall small sample size in many of the studies (Lapkin et al., 2010). Additionally, meta-analysis was not possible because of the lack of replication studies (Lapkin et al., 2010). Cant and Cooper (2010) reviewed quantitative studies incorporating medium- to high-fidelity simulators between 1999 and 2009. Of the 12 studies used in the review, improvement in knowledge, critical thinking ability, satisfaction, or confidence when compared to a control group was observed in six studies (Cant & Cooper, 2010).

There exists a paucity of research providing conclusive evidence that human patient computer simulation in prelicensure nursing programs positively impacts student learning outcomes. The findings noted by Rourke, Schmitdt, and Garga (2010) on lack of research efforts grounded in theory are important to consider as human patient computer simulation continues to garner national attention for inclusion in nursing education. Many state boards of nursing are beginning to explore options on allowing classroom time dedicated to simulation to count as clinical hours as many envision the use of simulation as increasing enrollment and ultimately meeting the demand for registered nurses (Nehring, 2008). In 2007, the FCN (2011b) launched a 2-year project to promote use of simulation in nursing education and highlight the importance of understanding issues, barriers, and effective strategies for using simulation. One of the major barriers noted in the project report was the lack of evidence-based research related to guidelines and requirements on ensuring the sustainability and success of using human patient computer simulation within nursing education curricula (FCN, 2011b). The leadership of the NCSBN (n.d.) has begun a national, multi-site initiative on examining simulation technology as a substitution for clinical experiences, focusing on knowledge and clinical competency outcomes of students. The results of a pilot study examining knowledge acquisition, clinical performance, and self-confidence of senior-level undergraduate prelicensure nursing students revealed inconclusive results related to improvement in clinical performance being influenced by exposure to human patient computer simulation (NCSBN, 2009). Evidence-based research is necessary to promote positive growth and use of simulation as well as provide justification for funding initiatives to support improvements in nursing education (Jefferies, 2006).

Learning Theories for Simulation Environments

Learning theories are important to consider as nurse educators search literature for evidence-based practice to frame instructional design incorporating technology (Thompson & Crutchlow, 1993). Rourke et al. (2010) reviewed empirical-based literature in which human patient computer simulation was incorporated to examine the use of theory. Rourke et al.

classified the articles as “adequate use of theory, minimal use of theory, or no use of theory” (pp. 4-5). Rourke et al. identified adequate use of theory as an article with an in-depth discussion of the theory, along with constructs and interrelationships of the theory providing “the foundation for a study’s purpose, research questions, data collection, interpretation of findings, and discussion” (p. 4). Of the 47 articles Rourke et al. reviewed, only 10% were identified as representing adequate use of theory. Garrett, MacPhee, and Jackson (2010) provide a case example of how faculty members at a school of nursing incorporated evidence-based approaches in a nursing education simulation center, yet the article provided no theoretical reference of learning theories within the framework design. Tanner (2006a) discusses the need for nursing programs to transform clinical education by designing learning activities based on evidence-based models with simulation used as a complement to existing clinical experiences.

Nurse educators use several adult learning themes. *Andragogy*, a term coined by Malcolm Knowles, is commonly discussed as a primary adult learning theory, but there are other theories nurse educators may consider when incorporating human patient computer simulation technology (Clapper, 2010). Researchers explore the following theories in relationship to use in a human patient computer simulation environment to include (a) transformative learning theory (Clapper, 2010), (b) triune brain theory (Clapper, 2010), (c) theory of margin (Clapper, 2010; Kamerer, Brophy, & Corvino 2011), (d) social learning theory (Kaakinen & Arwood, 2009), and (e) experiential learning theory (Clapper, 2010; Kaakinen & Arwood, 2009; Lisko & O’Dell, 2010; Paige & Daley, 2009).

Transformative learning theory. Mezirow (2003) discusses transformative learning theory as metacognitive reasoning unique to adult learners. Mezirow defines transformative learning as “learning that transforms problematic frames of reference—sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets)—to make them more inclusive, discriminating, open, reflective, and emotionally able to change" (p. 2). Based on a transformative learning theory framework, a human patient computer simulation environment might incorporate the process of using the learner's prior interpretation to construct new or revised interpretation. Mezirow comments on the importance of critical reflection within a transformative learning environment. Brookfield (1995) notes the processes of critical reflection and autobiography to assist adult learners with reflecting on learning experiences. This reflection process can be accomplished through a debriefing component. With debriefing, the nurse educator facilitates the processes of critical reflection and autobiography, as well as supports a transformative learning environment by allowing the learner to make connections in building new or revised constructs (Clapper, 2010).

Triune brain theory. MacLean (1990) explains the emotional effect of learning with triune brain theory. In a situation in which the learner may fear or feel intimidated within a learning environment, the limbic system could shift to a protective and survival mode (MacLean, 1990). Fear and intimidation can lead a nursing student to feel the environment is threatening. Higher order learning may not occur if nursing students do not view the environment as positive for learning. Environmental factors are important to consider with adult learners when using human patient computer simulation (Jefferies, 2011). Nurse educators should focus on use of positive reinforcement and communication which is constructive to facilitate a trusting environment (Clapper, 2010).

Theory of margin. McClusky (1974) introduces the theory of margin, discussing a balance between the power and load. Internal and external factors within an adult's life might impact the balance of power and load as a learner (McClusky, 1974). A key aspect of the theory is factors which may overload the adult, leading to a situation in which learning is not taking place (McClusky, 1974). Incorporating theory of margin into the instructional design would ensure human patient computer simulation activities are structured to provide essential and meaningful learning opportunities (Clapper, 2010). Nurse educators can structure activities to achieve balance, thus providing more information initially during patient scenarios as nursing students are introduced to human patient computer simulation.

Kamerer et al. (2011) found significant improvement in student performance related to skill completion when they incorporated a simulation learning interactive module for students to complete prior to exposure to the human patient computer simulation environment. Introduction of targeted skills for these modules allowed faculty members to focus on critical thinking and application of the scenario to clinical practice rather than on skill deficiencies (Kamerer et al., 2011). Kamerer et al. structured the simulation learning interactive module approach to allow practice of skills already introduced to the students but recognized as challenging procedures, thus incorporating concepts of scaffolding and balance to improve learning outcomes (Kamerer et al., 2011).

Social learning theory. Bandura (1977) discusses social learning theory in terms of self-efficacy or social change through modeling and reinforcement learning. Through observations and opportunities for constructive feedback, individuals will begin to form concepts of expected behavior. In a simulation environment incorporating social learning theory, the nurse educator might teach a skill or behavior, role play to model behavior, or target specific behavior through positive reinforcement (Kaakinen & Arwood, 2009).

A problem-based learning model developed in 1970 by the medical education community focuses on an environment meant to develop metacognitive thinking and support concepts of social learning (Savery & Duffy, 2001). The model is based on a constructivist framework in which interaction with the environment through some stimulus and social interaction is occurring (Savery & Duffy, 2001). In a human patient computer simulation environment, clinical instructors might incorporate a graded-approach to introduce performance activity, focusing on a development of expected performance level of the student developing from a novice to an expert (Kaakinen & Arwood, 2009). Additionally, the interaction within the social environment can occur with a group approach to learning and incorporate debriefing activities to allow sharing with other group members in a collaborative forum.

Experiential learning theory. D. A. Kolb (1984) notes important educational implications for learning grounded in experience in experiential learning theory, which touts the importance of transforming the experience to create knowledge. Experiential learning theory is identified as one of the learning theories used in nursing literature when discussing human patient computer simulation since key to this environment is providing nursing students with an opportunity to experience risk-free clinical situations (Jefferies, 2011). When incorporating D. A. Kolb's experiential learning theory approach, nursing educators should consider the nursing student's learning style preference when designing the simulation (Clapper, 2010; Kaakinen & Arwood, 2009).

An expanded approach incorporating concepts of experiential learning theory and social learning is to examine simulation from a social or situational orientation to learning. Lave and Wenger (1991) discuss learning in terms of authentic experiences with collaboration and social interaction as critical components. Simulation based on this model would address whether student outcomes of learning occurred in terms of the social structures to include interaction among people, activity, and ingredients (Kaakinen & Arwood, 2009; Paige & Daley, 2009). The emphasis with social learning is not in terms of cognitive change but social outcomes.

Theoretical Underpinnings of Experiential Learning

John Dewey, Paulo Freire, William James, Carl Jung, Kurt Lewin, Carl Rogers, Jean Piaget, and Lev Vygotsky influenced the foundation for experiential learning theory (Kolb, D. A., 1984; Kolb, A. Y. & Kolb, 2011). D. A. Kolb, a developmental psychologist, incorporates aspects of the foundational philosophies related to experiential learning and provides a holistic model for experiential learning theory which ascribes to a four-stage cycle involving four adaptive modes. Central to experiential learning is human adaptation to the environment, where learning occurs through the dialectic opposing forces of grasping an experience and transforming the experience (Kolb, D. A., 1984). Through the process of human adaptation, there is tension and conflict in which D. A. Kolb outlines four abilities or modes required for effective learning: concrete experience (CE) or experiencing, reflective observation (RO) or reflecting, abstract conceptualization (AC) or thinking, and active experimentation (AE) or acting (Figure 1).

Within the learning process there are two continuums, perception and processing, which interface with the four modes (Kolb, D. A., 1984). On the perception continuum, learning occurs by grasping the experience with the dimension consisting of abstract conceptualization (AC) on one end and concrete experience (CE) on the other end (Figure 1; Kolb, D. A., 1984, Kolb, A. Y. & Kolb, 2009). The processing continuum, where learning occurs by transforming the experience and intersects the perception continuum, the dimension consists of active experimentation (AE) and reflective observation (RO) on the two poles (Figure 1; Kolb, D. A., 1984: Kolb, A. Y. & Kolb, 2009; Kolb, A. Y. & Kolb, 2011). Movement occurs within these continuums based on the learner's preference and ability to adapt within the contextual situation

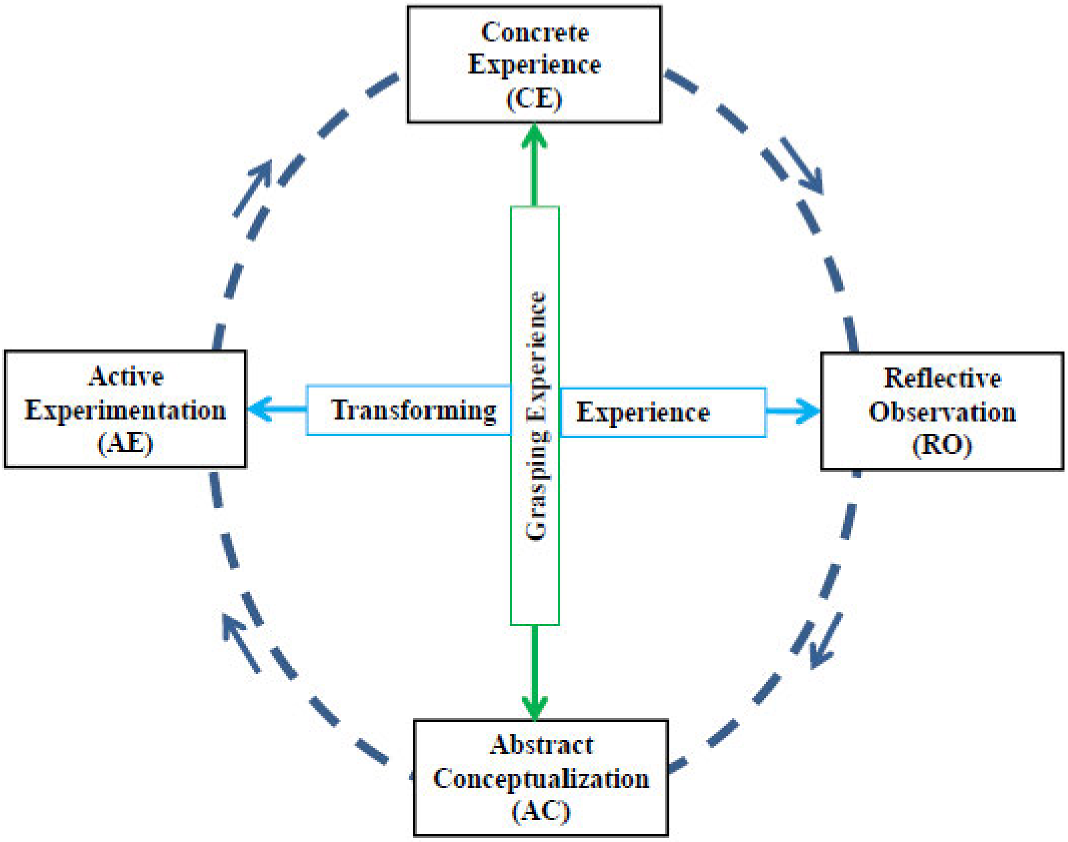

Figure 1. Experiential learning cycle. Adapted from "Your Learning Edge: The Art of Learning from Experience," by A. Y. Kolb and D. A. Kolb, 2011, Workshop conducted by Weatherhead School of Management, Case Western Reserve University, Cleveland, OH. Copyright 2011 by Experience Based Learning Systems. Reprinted with permission (Appendix A).

(Kolb, D. A., 1984). Conflict resolution occurs among the learner's dialectic opposing forces which determine the individual's level of learning (Kolb, D. A., 1984). D. A. Kolb provides a holistic view of learning incorporating an adaptation process in which an individual can achieve the highest stages of the developmental process of learning through integration of the four adaptive modes. The cyclic approach is important in experiential learning, as well as the spiral of the learning process which occurs when the learner is responsive to the situation and knowledge develops through integration of the four adaptive modes in a recursive process (Kolb, A. Y. &

Kolb, 2009). The holistic viewpoint is similar to Jungian theory of psychological types which discusses the integration of thinking, feeling, perceiving, and behaving for learning to occur (Kolb, D. A., 1984).

Within the structural process of experiential learning theory, D. A. Kolb (1984) originally identifies four different types of knowledge or individual learning styles as accommodating (accommodator), diverging (diverger), converging (converger), and assimilating (assimilator; Figure 2). An accommodator accentuates roles within active experimentation (AE) and concrete experience (CE; Kolb, D. A., 1984). The accommodator is viewed as a doer and one who gets involved but is adaptable to changing situations (Kolb, D. A., 1984). A diverger emphasizes roles within concrete experience (CE) and reflective observation (RO; Kolb, D. A., 1984). This individual is viewed as providing meaning to the situation with imaginative skills and the ability to be observant (Kolb, D. A., 1984). A converger focuses roles within abstract conceptualization (AC) and active experimentation (AE). This individual is viewed as a problem-solver and decision-maker, using reasoning to organize knowledge (Kolb, D. A., 1984). The assimilator's abilities encompass abstract conceptualization (AC) and reflective observation (RO) roles (Kolb, D. A., 1984). This individual uses inductive reasoning to focus on ideas, recognizing the importance of theoretical soundness (Kolb, D. A., 1984).

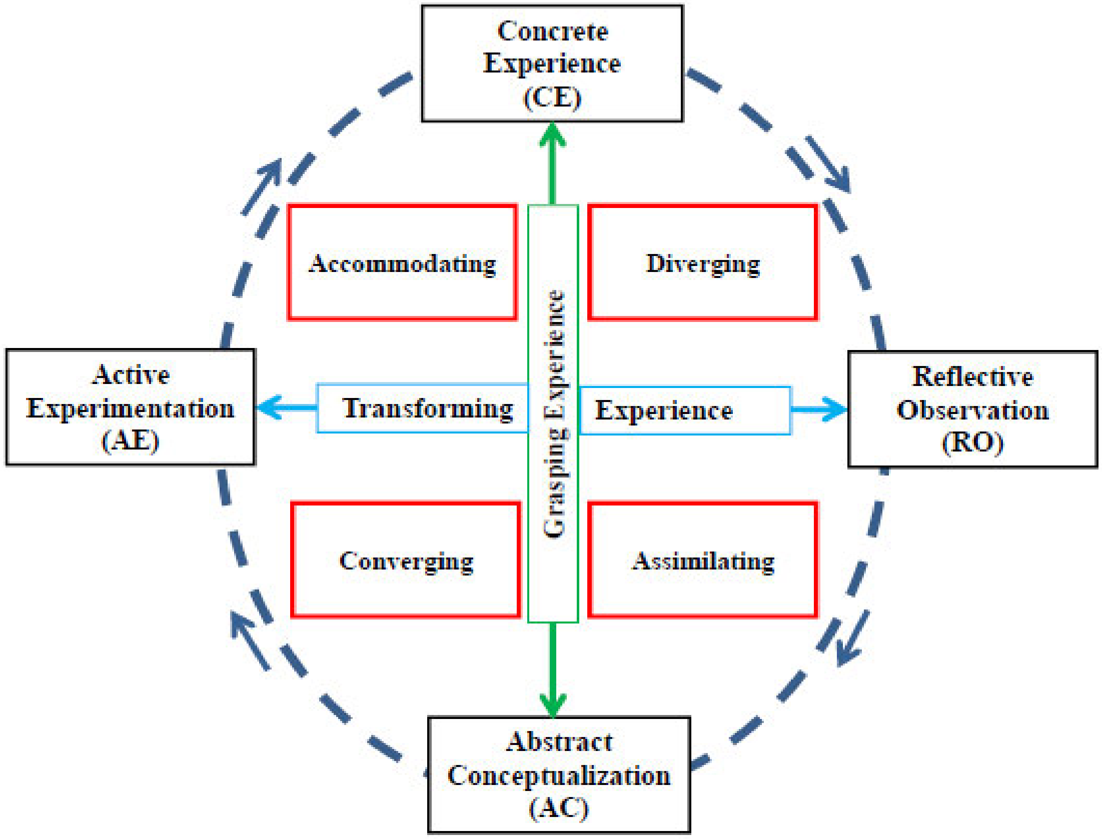

Figure 2. Experiential learning cycle identifying four learning styles. Adapted from "Kolb Learning Style Inventory LSI Workbook Version 3.1," by D. A. Kolb, 2007, HayGroup®, Boston, MA. Copyright 2007 by HayGroup®. Reprinted with permission (Appendix B).

Through extensive research using experiential learning theory, researchers (Kolb, A. Y. & Kolb, 2005a; Kolb, A. Y. & Kolb, 2011) expanded the learning styles to nine distinctive styles with a regional perspective (Figure 3). Each style has specific characteristics identified through years of research (Kolb, A. Y. & Kolb, 2005a). The nine learning styles are placed in a grid format stemming from a division of the two normative distributions, abstract conceptualization over concrete experience (ACCE) dimension and active experimentation over reflective observation (AERO) dimension, split into thirds (Kolb, A. Y. & Kolb, 2005a). D. A. Kolb and

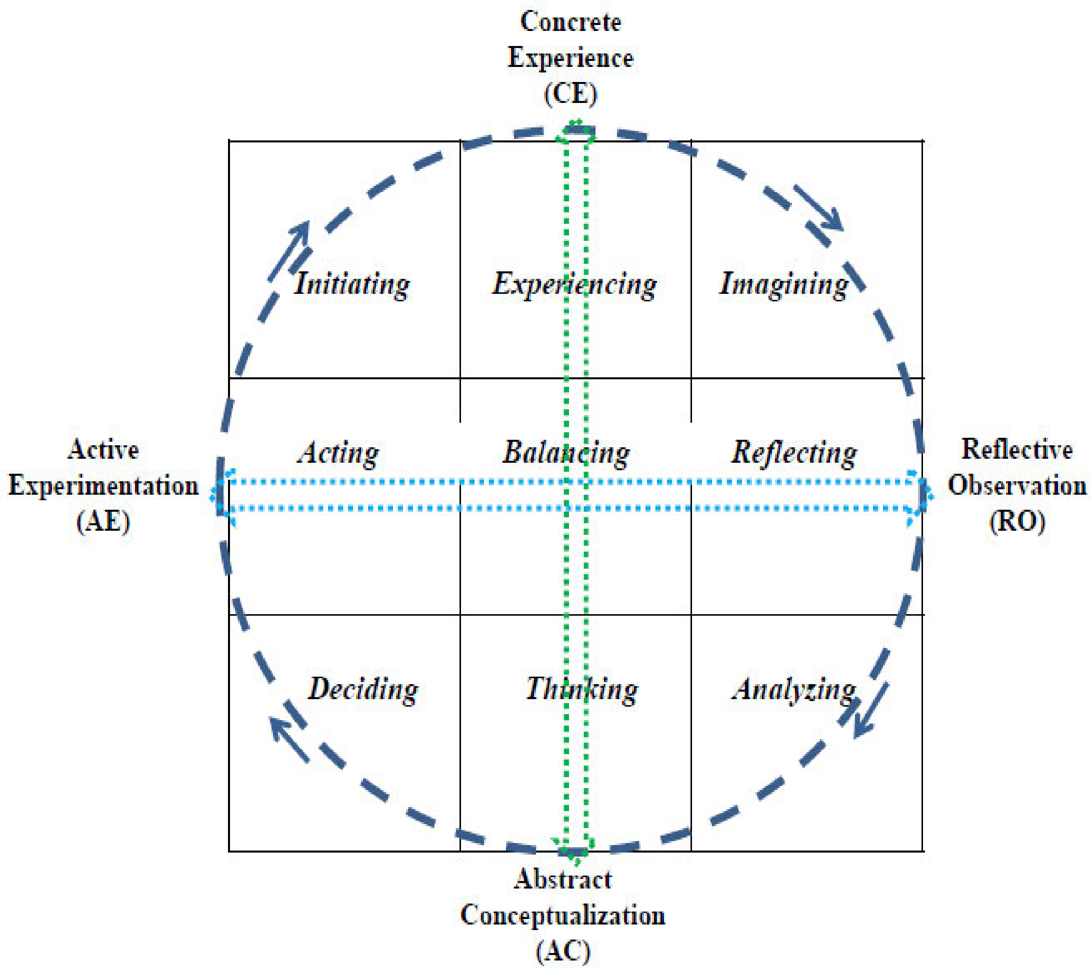

Figure 3. Experiential learning cycle in regional grid with nine learning styles. Adapted from "Your Learning Edge: The Art of Learning from Experience," by A. Y. Kolb and D. A. Kolb, 2011, Workshop conducted by Weatherhead School of Management, Case Western Reserve University, Cleveland, OH. Copyright 2011 by Experience Based Learning Systems. Reprinted with permission (Appendix A).

Kolb (2011) outline the abilities concerning how an individual approaches learning using the following brief descriptions:

Initiating – initiating action to deal with experiences and situations.

Experiencing – finding meaning from deep involvement in experience.

Imagining – imagining possibilities by observing and reflecting on experiences.

Reflecting – connecting experience and ideas through sustained reflection.

Analyzing – integrating ideas into concise models and systems through reflection.

Thinking – disciplined involvement in abstract and logical reasoning.

Deciding – using theories and models to decide on problem solutions and courses of action.

Acting – a strong motivation for goal directed action that integrates people and tasks.

Balancing – adapting by weighing the pros and cons of acting versus reflecting and experiencing versus thinking. (p. 7)

The general ability descriptions D. A. Kolb and Kolb provide aligns with an individual's learning style preference within the experiential learning cycle. The processing continuum and perception continuum remain the focus within experiential learning cycle, with the four modes representing how an individual learns through moving back and forth between dialectic opposed adaptive learning modes of reflecting or acting and experiencing or thinking (Kolb, D. A. & Kolb, 2011).

A. Y. Kolb and Kolb (2005a) frame experiential learning theory by identifying six propositions: (a) learning is not an outcome but a process in which engagement is crucial; (b) examining, testing, and integrating ideas and beliefs with the new ideas form a relearning process; (c) conflict and conflict resolution between the dialectic modes are important for adaptation to the environment and learning; (d) learning is holistic, integrating the person's thoughts, feelings, perceptions and behaviors; (e) an equilibrium state occurs between the person and environment, where the individual assimilates new experiences with existing ideas and accommodates the existing ideas within the new experiences; and (f) new knowledge is created in a constructivist approach in which social knowledge is built and refined to develop the individual's personal knowledge. Additionally, an individual using constructs within experiential learning theory can address human development and lifelong learning from an integrative perspective (Kolb, D. A., 1984).

D. A. Kolb (1984) discusses knowledge acquisition being dependent on whether the experience is grasped via apprehension or comprehension and transformed by extension or intention. As individuals continue to mature through the learning spiral, A. Y. Kolb and Kolb (2009) address the iterative process of learning in which an individual's ability to reflect and think about a specific experience enriches learning, allowing the individual to transform new experiences into a richer and deeper learning process. The maturation process of learning is continual and lifelong (Kolb, A. Y. & Kolb, 2009).

In terms of experiential learning theory, a higher level of synthesis occurs when the adult develops the ability to adapt to world experiences through the developmental growth of integration and recognition of needing to use nondominant modes within the dialectic process (Kolb, D. A., 1984). Adaptation allows an individual to embrace components of his or her non-dominant modes to reach higher-level functioning (Kolb, D. A., 1984). A. Y. Kolb and Kolb (2005a) discuss movement through the developmental process as the individual adapts to the increased complexities and relativism in the world, explaining the process of increased integration between the dialectic opposed dimensions of how an individual grasps the experience and how an individual transforms the experience. D. A. Kolb refers to this behavior as an individual's adaptive flexibility. D. A. Kolb views adaptive flexibility from a contextual aspect by understanding an individual's flexibility along the two dimensions. An individual's learning flexibility represents a developmental process where the learner moves freely using all four adaptive modes of learning to include experiencing, reflecting, thinking, and acting (Sharma & Kolb, D. A., 2011).

Experiential Learning Theory in Nursing Education

Experiential learning theory provides a framework for nursing education research examining a variety of instructional design strategies. Laschinger (1990) conducted a literature review of nursing education research incorporating Kolb's theory of experiential learning and recommended further research to support developing instructional activities within nursing education programs, but highlighted the usefulness of the theory in nursing education. Experiential learning theory application within nursing education research has included prelicensure and postlicensure educational programs (Ard, 2009).

Laschinger (1986) uses experiential learning theory in examining the predominant learning style of third-year undergraduate nursing students. Her data indicated the predominant learning style was in the area of concrete operations, with 62.5% of the students in the quadrant of diverger or accommodator (Laschinger, 1986). Rassool and Rawaf (2007) relate similar findings when reviewing research conducted in the United Kingdom; two-thirds of the nursing students' preferred learning style was in the concrete dimension. The data from a 3-year longitudinal study of prelicensure nursing students in a diploma program showed the predominant learning style preference was the assimilator, aligning with the dimension focusing on thinking (Rakoczy & Money, 1995). In a study involving scenario simulation in an undergraduate nursing program, Wagner, Lisko, O'Dell, and Serroka (2010) discuss 60% of nursing students' learning style preference fell within the dimension aligned with feeling. Baker, Pesut, McDaniel and Fisher (2007) identify approximately 36% of the students in the master of science in nursing program had learning style preference within the doing phase of the cycle, with the other phases almost equally distributed. Laschinger and Boss (1989) examine whether different levels of educational preparation influenced preference for a particular learning style within undergraduate and postlicensure nursing students. The results indicated no statistical significant finding identifying a preferred learning style based on educational preparation (Laschinger & Boss, 1989).

Hartley (2010) describes an innovative teaching strategy integrating experiential learning theory by having postlicensure nursing students explore in-depth areas within the four phases of the cycle in relation to an experience in the practice setting. Prior to the activity, Hartley had the students complete the Kolb Learning Style Inventory. The information from the student's preferred learning style guided feedback given by the instructor. Lisko and O'Dell (2010) discuss an integration of medical-surgical theoretical concepts into a practical learning and skills performance activity relying on experiential learning theory to transform the change process within the nursing program. Student and faculty member comments reflected positively on the change to the curriculum (Lisko & O'Dell, 2010).

Learning Style and Higher Education

Core competencies published by the National League for Nursing list one of the core competencies for nurse educators is to "facilitate learner development and socialization" through identifying "individual learning styles" (Halstead, 2007, p. 52). Keefe (1982) discusses the importance of understanding a student's learning styles and tailoring instructional design in response to the learner's needs. Several authors present learning styles as comprising different traits in terms of physiological, cognitive, or personality (affective) components (Jonassen & Grabowski, 1993; Keefe, 1982). Curry (1987) in a review of the psychometric standards of reliability and validity of 16 learning style instruments used in the United States identified a three-tiered thematic focus of the most widely used instruments. Learning behavior within the tiered framework is characterized by individual personality dimension, information processing dimension, or instructional preferences as related to interaction with the teaching environment (Curry, 1987). Cassidy (2004) mentions the general perception within the academic community on how an individual approaches a learning situation can impact performance and outcomes. There are a variety of theories and measurement instruments used in empirical-based work regarding learning styles (Cassidy, 2004). Hawk and Shah (2007) discuss the importance of making an informed choice when integrating learning style within an educational program.

Learning Style Measurements in Higher Education

Two widely used learning style inventories within higher education in the United States are the Kolb Learning Style Inventory, incorporating information processing modes, and the Myers-Briggs Type Indicator, incorporating cognitive personality style (Hickcox, 2006). The Kolb Learning Style Inventory examines processes within the cycle of learning with the individual's learning style viewed within the context of learning; the Myers-Briggs Type Indicator provides categorical personality type descriptions (Hickcox, 2006; Kolb, D. A. & Kolb, 2011). Desmedt and Valcke (2004) identify D. A. Kolb as the most cited author regarding learning style, whereas Myer was influential in her contribution to cognitive and learning style research in personality theory.

Kolb Learning Style Inventory. The 40 years of research with experiential learning theory and the multiple refinements of Kolb Learning Style Inventory have led to identification of nine distinctive learning styles (Kolb, A. Y. & Kolb, 2005a). The Kolb Learning Style Inventory-Version 4 released in July 2011 integrates the Kolb Learning Style Inventory-Version 3.1 with minor revisions and adds eight questions to determine an individual's learning flexibility. The minor revisions have not changed the psychometric property of the instrument (D. A. Kolb, personal communication, July 19, 2011). The scores generated from the Kolb

Learning Style Inventory-Version 4 have shown high correlation with the scores generated on Kolb Learning Style Inventory-Version 3.1, maintaining the instrument's external validity (Experience Based Learning Systems, 2012). The Adaptive Style Inventory was created as a modified version of the original Learning Style Inventory (Kolb, D. A., 1984) and is the precursor to the portion of the Kolb Learning Style Inventory-Version 4 that examines an individual's learning flexibility. Additionally, the Kolb Learning Style Inventory-Version 4 provides a nine style typology versus the previous four style types of accommodator, diverger, assimilator, and converger (Kolb, D. A. & Kolb, 2011). A. Y. Kolb and Kolb (2005a) comment on the clarity of the learning style types when divided into nine types and viewing the positioning of an individual's learning style type within a dimensional placement within abstract conceptualization (AC) and concrete experience (CE) dimension and active experimentation (AE) and reflective observation (RO) dimension rather than a categorical type. The nine learning styles are placed in a grid format stemming from a division of the two normative distributions for abstract conceptualization over concrete experience (ACCE) dimension and active experimentation over reflective observation (AERO) dimension into thirds (Kolb, A. Y. & Kolb, 2005a). A. Y. Kolb and Kolb describe the nine learning styles as initiating, experiencing, imagining, reflecting, analyzing, thinking, deciding, acting, and balancing (Figure 3).

The learning styles are arranged in a grid format around the learning cycle and show preference for learning based on the learner's comfort zone (Kolb, D. A. & Kolb, 2011). The Kolb Learning Style Inventory Version-4 generates scores based on a forced-choice questioning format providing information to indicate the individual's learning style preference and how an individual varies their learning style from situation to situation (Kolb, D. A. & Kolb, 2011). The scores generated measure variables within learning style and a score related to learning flexibility (Kolb, D. A. & Kolb, 2011). The six variable scores related to learning style include four scores measuring an individual's relative emphasis on abstract conceptualization (AC), active experimentation (AE), concrete experience (CE), and reflective observation (RO) which are considered interdependent learning modes (Kolb, A. Y. & Kolb, 2005b). The other two scores which are considered independent measure how the individual grasps the experience in terms of abstract over concrete preference and transforms the experience in terms of action over reflection preference (Kolb, A. Y. & Kolb, 2005b). The dimension value on how an individual grasps the experience is derived from subtracting the score for concrete experience (CE) from the score from abstract conceptualization (AC; Kolb, A. Y. & Kolb, 2005b). The dimension value on how an individual transforms the experience is derived from subtracting the score for reflective observation (RO) from the score for active experimentation (AE; Kolb, A. Y. & Kolb, 2005b). Reliability of the Kolb Learning Style Inventory-Version 3.1, which provides the basis of the learning style questions in the Kolb Learning Style Inventory-Version 4, as measured by Cronbach's alpha ranges from .77 to .84 (Kolb, A. Y. & Kolb, 2005b). Kolb Learning Style Inventory-Version 3.1's internal validity evidence has been examined empirically through first order correlation matrix of the six Learning Style Inventory scales and through factor analysis of the four primary scales (Kolb, A. Y. & Kolb, 2005b).

The Learning Flexibility Index (LFI) is determined based on how an individual's learning style varies with different situations (Kolb, D. A. & Kolb, 2011). A learner's flexibility is based on the construct of adaptation, related to the adaptability of the individual within the context of the learning situation, as learning style is not considered a fixed entity but a dynamic state (Kolb, D. A. & Kolb, 2011). The development of learning flexibility is intrinsically connected to the constructs of experiential learning theory, representing the individual's ability to integrate the dialectically opposed dimensions of abstract conceptualization (AC) and concrete experience (CE), as well as active experimentation (AE) and reflective observation (RO) and move freely around the learning cycle (Sharma & Kolb, D. A., 2011). The Learning Flexibility Index (LFI) construct validity was shown to be strongly correlated with experiential learning theory (Sharma & Kolb, D. A., 2011).

Experiential learning theory posits learning as a lifelong process and supports the exploration of constructs outside formal education to allow for continual development of higher-level integration (Kolb, D. A., 1984). D. A. Kolb and Kolb (2011) discuss a dramatic increase in citations in the literature related to experiential learning theory, increasing from approximately 100 in 2005 to over 400 in 2010. Exploring experiential learning theory literature related to learning styles within prelicensure nursing student populations provides mixed discussions. Molsbee (2011) identifies difficulty in examining a dominant learning style from published literature because of the inconsistencies in instrument use and how learning style was defined. Ard's (2009) summary of a review of higher education and nursing literature related to empirical-based studies on learning styles includes limitations related to instrument inconsistencies, convenience sampling, lack of replication, and limited theoretical framework. An extensive literature review conducted by Laschinger (1990) includes experiential learning theory within the nursing profession, not just within higher education and concludes the theory offers a "valid and useful model for instructional design in nursing education" (p. 991).

There were no published studies found in nursing education literature which addressed the use of Kolb Learning Style Inventory-Version 4, but studies were identified which incorporated earlier versions of the Kolb Learning Style Inventory, without the component of adaptive flexibility (Joyce-Nagata, 1996; Laschinger, 1986; Linares, 1999; Molsbee, 2011;

Rakoczy & Money, 1995). Linares examined learning styles of 301 prelicensure and 188 postlicensure nursing students using a Learning Style Questionnaire, which incorporated Kolb's experiential learning theory constructs. The Learning Style Questionnaire was used by Linares because of concerns cited in literature related to the ipsative or forced-choice format of the Learning Style Inventory (initial version), as well as construct validity and measurement difficulties. Additionally, Linares postulates that findings in nursing literature on nursing students' learning style preference as being concrete or abstract may have varied due to use of the different versions of the Learning Style Inventory instrument. Joyce-Nagata administered the Learning Style Inventory (initial version) to 229 prelicensure undergraduate nursing students and found the preferred learning styles were in the abstract dimension. Rakoczy and Money conducted a 3-year longitudinal study of over 130 prelicensure nursing students in a diploma program using the initial version of the Learning Style Inventory and found the predominate style type in the abstract dimension of learning and plotted within the assimilator learning style quadrant. The combined 3-year mean scores for the four learning modes were concrete experience (CE) $M_{score} = 25.4$, abstract conceptualization (AC) $M_{score} = 29.9$, active experimentation (AE) $M_{score} = 33.2$, and reflective observation (RO) $M_{score} = 32.5$ (Rakocsy & Money, 1995). Molsbee (2011) reviewed data from 226 associate's degree prelicensure nursing students collected using the Kolb Learning Style Inventory-Version 3.1. Molsbee's findings noted the following mean scores within the four modes within the learning cycle as concrete experience (CE) $M_{score} = 24$, abstract conceptualization (AC) $M_{score} = 30$, active experimentation (AE) $M_{score} = 34$, and reflective observation (RO) $M_{score} = 31$. Learning style preference types were represented within the sample population with the following percentages: (a) 26.2% as assimilator, (b) 26.5% as accommodator, (c) 18.6% as converger, and (d) 28.8% as diverger

(Molsbee, 2011). These different studies show support for earlier findings of variability of a predominant learning style preference within prelicensure nursing students.

There were no published studies found in nursing literature related to the use of the Adaptive Style Inventory, the precursor to the Learning Flexibility Index (LFI). Mainemelis, Boyatzis, and D. A. Kolb (2002) used the Adaptive Style Inventory in a longitudinal study with master in business administration students, along with an earlier version of the Learning Style Inventory. Their findings indicated individuals demonstrated more adaptive flexibility if they were balanced on the dialectic opposed dimensions of abstract conceptualization (AC) and concrete experience (CE) as well as active experimentation (AE) and reflective observation (RO; Mainemelis et al., 2002).

Myers-Briggs Type Indicator. A mother and daughter team, Katherine Briggs and Isabel Myer, developed a personality inventory based on the psychological foundations of Swiss psychologist Carl Jung (Lawrence, 1982). Within Jung's theory are four mental processes which form the basis for the personality types outlined in the Myers-Briggs Type Indicator (Lawrence, 1982). Dichotomous dimensions are incorporated into sixteen personality types represented by four scales, which include extraversion (E) and introversion (I), sensing (S) and intuition (I), thinking (T) and feeling (F), and judgment (J) and perception (P; Lawrence, 1982). Personality types are reflected by identifying the component in each scale which applies to the individual's personality (Lawrence, 1982). Lawrence argues personality type theory provides more insight into learning styles, with the type viewed as a dynamic descriptor. The latest iteration of Myers-Briggs Type Indicator is Myers-Briggs Type Indicator-Step II (Form Q) , which describes five different opposite facets within the four scales (Myer, P. B. & Myer, 2003). The intent of the four letter type descriptors, determined through responses to force-choice question format is not to measure individual traits, but to group individuals based on Jung's theory of psychological types (Ring, 2008).

Several studies completed with prelicensure and postlicensure nursing students have identified fairly consistent results related to the dominant personality facets (Allchin, Dzurec, & Engler, 2009; Anderson, 1998; Fladeland, 1995; Malloy, 2007; Puyleart, 2006). Fladeland found upper division undergraduate nursing students primary preference was identified as ESFJ. Undergraduate prelicensure nursing students in Malloy and Puyleart studies showed the same predominant top two preference types of ESFJ and ISFJ, with Puryleart noting a third top preference of ISTJ. Allchin et al. (2009) studied nursing students from 2- and 4-year programs and found the predominant psychological type as ESFJ. Additionally, they found nursing faculty's predominant personality type was ISTJ (Allchin et al., 2009). Anderson found nurse preceptors and nurses in orientation were more satisfied with orientation if the teaching style of the preceptor matched the learning style of the nurse as indicated by the Myers-Briggs Type Indicator.

Clinical Judgment in Nursing

Several terms in nursing literature are used interchangeably to define constructs within clinical judgment to include critical thinking, decision making, and clinical reasoning (Caputi & Engelmann, 2004; Jackson, Ignatavicius, & Case, 2006; Pesut & Herman, 1999; Simmons, 2010). Kuiper and Pesut (2004) comment on the ongoing confusion related to the definition and process of critical thinking in nursing. Nurse educators (Kuiper & Pesut, 2004) perceive critical thinking as a rational-linear process, yet the panel members of the American National League for Nursing's Planning for Ongoing Systematic Evaluation and Assessment of Outcomes describe critical thinking as a nonlinear process (as cited in Kuiper & Pesut, 2004). Lasater (2011b) discusses how nursing literature does not provide an agreed upon definition of critical thinking or components to consistently measure the process of critical thinking. Simpson and Courtney (2002) identify terms used in nursing literature interchangeable with critical thinking including problem-solving, clinical decision-making, and creative thinking. Jackson et al. define the differences between critical thinking, clinical reasoning, and clinical judgment using the following descriptions:

> Critical thinking is a disciplined process that requires validation of data, including any assumptions that may influence your thoughts, and then careful reflection of the entire process while evaluating the effectiveness of what you have determined is the necessary action. Clinical judgment is the development of opinions in the clinical practice setting, based on experience and knowledge, to guide the decisions you will make regarding the care of the patient. To achieve clinical judgment, you will use clinical reasoning in the process, taking clinically specific data regarding specific populations or disease processes and making evaluations regarding their meaning. (p. 14)

Pesut and Herman (1999) describe clinical reasoning as requiring knowledge. Additionally, clinical reasoning is influenced by certain attitudes to include "intent, reflection, curiosity, tolerance for ambiguity, self-confidence, and professional motivation" (Pesut & Herman, 1999, p. 11). The reasoning structure is complex and varies based on an individual's knowledge, skill, and experience (Pesut & Herman, 1999). There are tools and tasks which support the clinical reasoning process (Pesut & Herman, 1999). Simmons (2010) mentions the ambiguity and inconsistency in healthcare literature related to the term clinical reasoning, recognizing other terms are used to convey the same meaning to include clinical judgment and decision making. Based on a concept analysis of clinical reasoning, Simmons defines clinical reasoning as “a complex cognitive process that uses formal and informal thinking strategies to gather and analyse patient information, evaluate the significance of this information and weigh alternative actions” (p. 1155). The end product of clinical reasoning is clinical judgment (Pesut, 2001; Simmons, 2010).

Tanner (2006b) outlines a model of clinical judgment to conceptualize the complex interconnected processes influencing clinical judgment, to include context, background and relationship components that nurses bring to the situation (Figure 4). Clinical judgment is defined as “an interpretation or conclusion about a patient’s needs, concerns, or health problems, and/or the decision to take action (or not), use or modify standard approaches, or improvise new ones as deemed appropriate by the patient’s response” (Tanner, 2006b, p. 204). Clinical reasoning is identified as a process which incorporates clinical judgment (Tanner, 2006b). Tanner’s model of clinical judgment includes the actions of noticing, interpreting, responding and reflecting (Figure 4). Lasater (2007a) incorporates Tanner’s clinical judgment model components in developing a rubric to use in describing levels of performance in clinical judgment of students experiencing simulated scenarios (Appendix C). Faculty reported the observational tool was “valuable in communicating with students about the concept of clinical judgment” (Lasater, 2007a, p. 502). The Lasater Clinical Judgment Rubric© provides an objective, observable process related to clinical judgment performance, with an opportunity to provide feedback to students on improvements and further development (Lasater, 2007a). Several nurse researchers have applied the Lasater Clinical Judgment Rubric© for evaluating student performance outcome relative to clinical judgment (Blum, Borglund, & Parcells, 2010; Dillard et al., 2009; Lasater, 2007b).

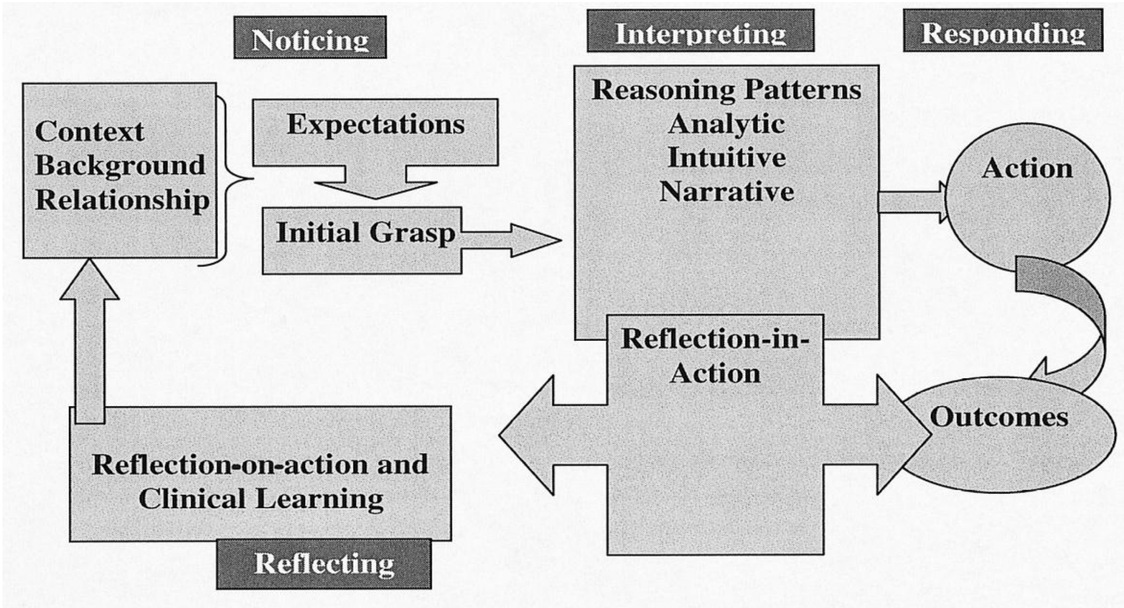

Figure 4. Tanner's clinical judgment model. Adapted from "Thinking like a Nurse: A Researched Based Model of Clinical Judgment in Nursing," by C. A. Tanner, 2006, *Journal of Nursing Education*, *45*(6), p. 208. Copyright 2006 by SLACK. Reprinted with permission (Appendix D).

Theoretical Framework

The theoretical framework used to support the research question incorporates experiential learning theory as ascribed by D. A. Kolb (1984) to examine the independent variables of learning style and learning flexibility and Tanner's (2006b) clinical judgment model to examine the dependent outcome performance variable of clinical judgment within a specific environmental context (Figure 5). Learning style is made up of six different variables representing the four learning modes of adaption and the unique way an individual grasps the experience by apprehension or comprehension and transforms the experience by extension or intention (Kolb, A. Y. & Kolb, 2005b; Kolb, D. A., 1984). Knowledge is obtained depending on whether the experience is grasped or transformed (Kolb, D. A., 1984). The four adaptive learning modes include concrete experience (CE), abstract conceptualization (AC), active experimentation (AE), and reflective observation (RO; Kolb, D. A., 1984). D. A. Kolb discusses the process of higher level synthesis occurring as an adult develops the ability to adapt to world experiences through the developmental growth of integration and recognition of needing to use nondominant learning modes within a dialectic process. Human adaptation to the environment is central to experiential learning theory (Kolb, D. A., 1984). The environmental context is important in examining the performance outcome of clinical judgment. Clinical judgment is viewed as a complex interconnected process involving components of noticing, interpreting, responding, and reflecting within a clinical situation (Tanner, 2006b).

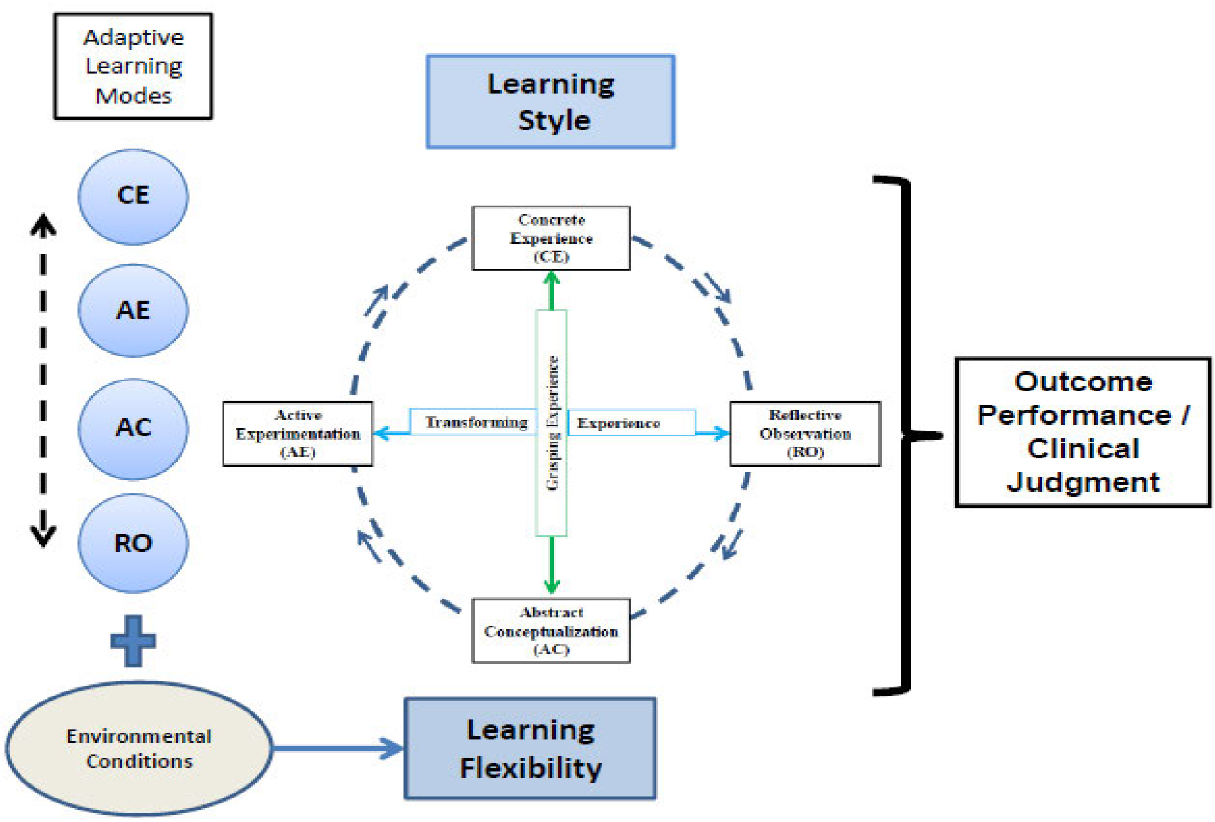

Figure 5. Theoretical framework model outlining the interrelationships between the variables incorporating experiential learning cycle. Adapted from “Your Learning Edge: The Art of Learning from Experience,” by A. Y. Kolb and D. A. Kolb, 2011, Workshop conducted by Weatherhead School of Management, Case Western Reserve University, Cleveland, OH. Copyright 2011 by Experience Based Learning Systems. Experiential learning cycle reprinted with permission (Appendix A).

Chapter Summary

The review of literature has provided a brief historical perspective of use of human patient computer simulation in nursing education and highlighted how the technology is being used in clinical instruction. Applicable learning theories were discussed with application to human patient computer simulation providing a detailed discussion of experiential learning theory which is the selected theoretical framework for the study. Experiential learning theory is discussed in relationship to nursing education, with a focus on the individual learner. Learning style research is addressed related to use in higher education, outlining two primary instruments used in higher education research to examine individual variables which might influence the learner. Clinical judgment component is discussed related to nursing and the clinical judgment model used to frame clinical judgment performance. The last section provided an overview of the theoretical framework used to support the study's research question.

CHAPTER III

METHODOLOGY

The methodology chapter includes a review of the research question and three hypotheses developed to frame the study. A discussion is provided to address the research design, threats to internal and external validity, participants, instrumentation, and procedures. The data analysis section provides a description of the study's statistical procedures necessary to analyze the data and support a nonexperimental correlation research design.

Review-Research Question and Hypotheses

The following research question frames the study: How do the individual and combined influences of learning style and learning flexibility of prelicensure nursing students within a human patient computer simulation environment relate to clinical judgment? Data for the quantitative research question include two independent variables, the prelicensure nursing students' learning style and learning flexibility scores, and the dependent variable, prelicensure nursing students' clinical judgment performance outcome. The following research hypotheses were formulated to address the research question.

H_1. There is a relationship between learning style and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

$H0_1$. There is no relationship between learning style and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

H_2. There is a relationship between learning flexibility and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

$H0_2$. There is no relationship between learning flexibility and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

H_3. The individual and combined influences of learning style and learning flexibility on clinical judgment of prelicensure nursing students within a human patient computer simulation environment will demonstrate multiple significant relationships.

$H0_3$. The individual and combined influences of learning style and learning flexibility on clinical judgment of prelicensure nursing students within a human patient computer simulation environment will demonstrate no multiple significant relationships.

Design

The study used a nonexperimental correlation design. Warner (2008) discusses use of correlation design for understanding the relationship between two variables, specifically the nature and degree of the relationship. A correlation design does not involve manipulation of the variables, but provides an opportunity to examine whether relationships exist among two or more variables (Peters, 2009). Three variables were examined: two independent variables, learning style and learning flexibility; and a dependent variable, clinical judgment.

Participants

Participants for the study were prelicensure nursing students from a state college located in the Southeastern portion of the United States in a non-urban community. The sample size was 51 participants. The level of power, effect size, and significance level all come into consideration when determining appropriate sample size for quantitative data analysis (Warner, 2008). To achieve the desired statistical level of .05 with statistical power of 80% using the population correlation value of .3, a sample size of 49 participants is necessary (Warner, 2008).

The sampling procedure incorporated convenience sampling. Creswell and Plano Clark (2011) comment on sampling which involves individuals in the population who are available and can be studied as a nonprobabilistic sample. A nonprobabilistic sample is not representative of the population but encompasses sampling requiring certain characteristics (Creswell & Plano Clark, 2011). Warner (2008) addresses concerns with convenience sampling in limiting the researcher to making tentative inferences to a broader population similar in characteristics to the study sample.

Participants were at the beginning of their second semester clinical course and completed a fundamental theory-based course, a first semester clinical rotation, and an introduction to pharmacology course. The timing of conducting the study was specific to collecting data early in the program, targeting a developmental approach to learning in which student outcomes can facilitate development of educational strategies to enhance performance of a nursing student's clinical judgment. Population information collected included demographic variables related to gender, age, and ethnicity. Most of the students had prior exposure to the human patient computer simulation environment through an introductory clinical skills learning scenario early in the first semester targeting physical assessment skills and an end-of-semester clinical scenario incorporating a medical condition discussed during the students' fundamental nursing course. There were four student transfers into the study group with one student having exposure to clinical simulation in a prior program. The unit of analysis for study was the prelicensure nursing student in an associate's degree nursing program.

Data were collected during human patient computer simulation activities routinely included within the prelicensure nursing program clinical curriculum. No ethical issues or dilemmas were anticipated or encountered during the study, but within the consent form participants were allowed to withdraw at any time from the study. No individuals elected to withdraw from the study, but four individuals who completed the first portion of the data collection process withdrew from the nursing program for various reasons prior to the completion of all data collection. Only individuals who signed the consent form (Appendix E) and did not withdraw from the program prior to completion of the data collection period were incorporated into the overall study. Permission to conduct the research study was granted by two Institutional Review Boards, that of the University of West Florida (Appendix F) and that of the educational institution in which the study was conducted (Appendix G).

Instrumentation

The independent variables, learning style and learning flexibility scores, were measured from an existing instrument, the Kolb Learning Style Inventory Version-4, a propriety instrument managed by the HayGroup® company (Appendix H). Learning style scores are based on how an individual responds to 12 forced-choice questions which align with the four learning modes within experiential learning theory (Kolb, A. Y. & Kolb, 2005b). Experiential learning theory posits learning style as not a fixed trait, therefore an individual's preference for learning or learning mode is examined from a rank order approach in relation to abstract, concrete, active, and reflective orientations (Kolb, A. Y. & Kolb, 2005b). The four orientations are considered interdependent (Kolb, A. Y. & Kolb, 2005b). Additionally, to appreciate the dialectic aspect of experiential learning theory, learning style includes examination of conflict resolution among opposite poles within the learning dimension: concrete and abstract, and action and reflection (Kolb, A. Y. & Kolb, 2005b). The Learning Style Inventory Version-4 provides six variable scores for learning style: four scores measuring an individual's relative emphasis on abstract conceptualization (AC), active experimentation (AE), concrete experience (CE), and reflective observation (RO), as well as two independent scores measuring how the individual grasps the experience in terms of abstract over concrete preference and deals with the experience in terms of action over reflection preference (Kolb, A. Y. & Kolb, 2005b). The dimension value on how an individual grasps the experience is derived from subtracting the score for concrete experience (CE) from the score from abstract conceptualization (AC; Kolb, A. Y. & Kolb, 2005b). The dimension value on how an individual deals with the experience is derived from subtracting the score for reflective observation (RO) from the score for active experimentation (AE; Kolb, A. Y. & Kolb, 2005b). Learning flexibility score is determined by the Learning Flexibility Index (LFI) which is derived from how an individual responds to eight questions formulated around different modes within the learning cycle (Sharma & Kolb, D. A., 2011). The measurement for calculating Learning Flexibility Index (LFI) is based on the Kendall's Coefficient of Concordance or W (Sharma & Kolb, D. A., 2011). Sharma and D. A. Kolb modified Kendall's Coefficient of Concordance or W in the process of developing the formula for determining the Learning Flexibility Index (LFI). The formula is defined as Learning Flexibility Index (LFI) = 1 – W (Sharma & Kolb, D. A., 2011).

The Kolb Learning Style Inventory has been widely used within research starting in 1971 with an evolving and updated instrument based on extensive research (Kolb, A. Y., & Kolb, 2010). A. Y. Kolb and Kolb catalogued 472 references during 2006 through 2010 using experiential learning theory which is the basis for the Kolb Learning Style Inventory instrument. A new version of the Kolb Learning Style Inventory was developed to incorporate the most recent version of the learning style instrument, Kolb Learning Style Inventory-Version 3.1 and another instrument used to measure learning flexibility, the Learning Flexibility Index (LFI; Kolb, D. A., n.d.). Reliability of the Kolb Learning Style Inventory-Version 3.1 as measured by Cronbach's alpha ranges from .77 to .84 (Kolb, A. Y. & Kolb, 2005b). Kolb Learning Style Inventory-Version 3.1's internal validity evidence has been examined empirically through first order correlation matrix of the six Learning Style Inventory scales and through factor analysis of the four primary scales (Kolb, A. Y. & Kolb, 2005b). Scores on Kolb Learning Style Inventory-Version 4 have shown high correlation with scores on Kolb Learning Style Inventory-Version 3.1, maintaining the instrument's external validity (Experience Based Learning Systems, 2012). Additionally, with research on experiential learning theory and the Learning Style Inventory dating back to 1984, the instrument is reported to have strong face validity and alignment with experiential learning theory constructs (Baker et al., 2007). Sharma and D. A. Kolb (2011) tested six hypotheses to determine the place of the Learning Flexibility Index (LFI) within the "nomological net of construct validity: the demographic variables of age, gender, educational level, and educational specialization as well as learning style and integrative development" (p. 63). Construct validity was shown to be strongly correlated with experiential learning theory (Sharma & Kolb, D. A., 2011).

The dependent variable, clinical judgment, was assessed for each participant by using a previously developed instrument, the Lasater Clinical Judgment Rubric© (Appendix D). Permission to use the instrument was obtained for the nursing program, as well as for collection of data (Appendix I). A total score related to clinical judgment performance was determined based on a Likert-scale approach within each of the component areas within the rubric (K. Lasater, personal communication, June 17, 2011). The Lasater Clinical Judgment Rubric© was developed based on Tanner's clinical judgment model which is a research-based model of clinical judgment in nursing (Lasater, 2007a). The tool was developed and refined based on a series of 53 observations over a 7-week period in which students experienced human patient computer simulation. Faculty feedback related to the instrument indicated the value of using the information in the rubric to communicate with students about the concept of clinical judgment (Lasater, 2007a).

Interrater reliability is important if more than one nursing instructor is using the Lasater Clinical Judgment Rubric©. Lasater (2007a) reports interrater reliability of two raters using the rubric as 90%. Adamson (2011) conducted a multisite study to collect data from 29 clinical instructors using the Lasater Clinical Judgment Rubric© with a series of human patient computer simulation scenarios. Adamson notes internal consistency using Cronbach's alpha of .974 with interrater reliability using intraclass correlation measure (95% confidence interval) of .889 and intrarater (test retest) reliability using intraclass correlation measure (95% confidence interval) of .908. Gubrud-Howe (2008) reports an interrater reliability alpha coefficient of .87 along with a subscale internal consistency range of .886 to .931 using Cronbach's alpha. Sideras (2007) and Gubrud-Howe investigated construct validity of the Lasater Clinical Judgment Rubric© used in human patient computer simulation and reported strong support for construct validity.

Lasater (2011a) commented on the variability of evidence related to the best way to conduct assessments using the Lasater Clinical Judgment Rubric© when multiple raters are involved; however, some common themes have arisen in communicating with other researchers using the instrument. Education for the rater is important to understand the theoretical underpinning of the rubric which aligns with the constructs identified in Tanner's clinical judgment model (Lasater, 2011a). Raters who are familiar with the level of performance of prelicensure nursing students being assessed seemed to provide consistent feedback on nursing student expectations for a particular educational level of the nursing student (Lasater, 2011a).

Training was conducted on use of Lasater Clinical Judgment Rubric© during the semester prior to data collection. Training included reviewing published information related to Tanner's clinical judgment model and the Lasater Clinical Judgment Rubric©. Assessments were conducted during scheduled clinical rotation of students involved with human patient computer simulation. The simulation clinical instructor involved with first-year clinical instruction received the training and was the designated research assistant for the data collection period of the study.

Procedures

Participants were assigned a unique identifier number used throughout the study to identify participant information in the various data collection instruments. Data collection occurred with first-year prelicensure nursing students completing the Kolb Learning Style Inventory-Version 4 through an online portal provided by the company that owns the instrument (HayGroup®). Part of the first-year clinical curriculum involves nursing students experiencing a simulated clinical scenario in a laboratory setting using a human patient computer simulator. The clinical scenario involves a medical scenario developed by a clinical instructor appropriate for second semester clinical instruction. Additionally, a local cardiologist provided a review of the scenario to ensure alignment with standard of practice for a patient being managed in an acute care setting with similar presenting symptoms noted in the scenario.

A research assistant who functions in the role as a simulation clinical instructor for the nursing program completed all assessments of nursing students' performance using the Lasater Clinical Judgment Rubric©. Additionally, the simulation clinical instructor collected postsimulation reflection comments from students to assist with validating the assessment given for the section on the rubric describing effective reflecting (Appendix J). The simulation clinical instructor annotated participant information with the unique identifier numbers to allow for participant data anonymity prior to providing the results to the researcher. An administrative assistant to the researcher annotated individual results of data collected from the Kolb Learning

Style Inventory-Version 4 using the unique student identifier number to allow results to be entered into a spreadsheet file for analysis.

All data collection items are being maintained in a locked administrative file which is kept in a locked administrative office when individuals are not present in the office. Electronic file management data are maintained within a password secure file management system. Data collection information controlled by the researcher will be kept for a period of 5 years, and then destroyed. Kolb Learning Style Inventory-Version 4 data are centrally controlled by HayGroup® to comply with the Conditional Use Agreement (Appendix K). The company provides safeguarding of any personal identifying information collected during the data collection process.

Data Analysis

The purpose of the study was to examine relationships between independent variables, learning style and learning flexibility and the dependent variable, clinical judgment (Figure 6). Learning style is determined by interval level scores from six variables. Four scores represent the components of abstract conceptualization (AC), active experimentation (AE), concrete experience (CE), and reflective observation (RO), and two scores represent how the individual grasps the experience, the dimension of abstract conceptualization over concrete experience(ACCE) and deals with the experience, the dimension of active experimentation over reflective observation (AERO; Kolb, A. Y. & Kolb, 2011). Learning Flexibility Index (LFI) score and clinical judgment performance score are single interval level scores.

Correlation analysis between the independent and dependent variables was conducted using the statistical procedure, Pearson product-moment correlation (Pearson *r*), a parametric measurement used to examine the strength of the linear association between scores on the independent and dependent variables (Warner, 2008). Warner discusses correlation analysis in terms of understanding the relationship between two variables, specifically the nature and degree of the relationship, without implying a causal relationship. If a significant relationship is identified between variables, then regression analysis will determine the amount of variability in the dependent variable of clinical judgment that could be attributed to learning style and learning flexibility variables.

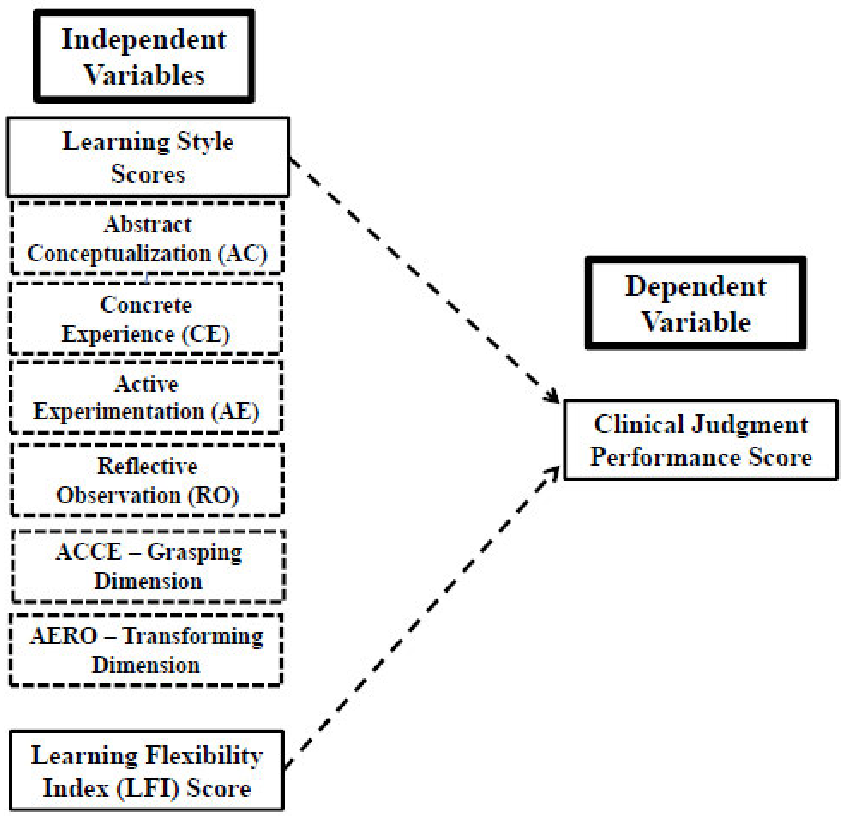

Figure 6. Model depicting independent and dependent variables.

Chapter Summary

The quantitative, nonexperimental correlation study attempts to investigate the influence of two independent variables, learning style and learning flexibility on the dependent variable, clinical judgment of prelicensure nursing students within a human patient computer simulation environment. Instrumentation selected for use in the study supports the primary constructs within the theoretical framework of experiential learning theory to explore the influence of the independent variables of learning style and learning flexibility on the dependent variable clinical judgment which was selected as the performance-based outcome variable assessed within a human patient computer simulation environment. Data analyses incorporate statistical tools for correlation and regression procedures using interval level data.

CHAPTER IV

RESULTS

The study was conducted to address the research question: how do the individual and combined influences of learning style and learning flexibility of prelicensure nursing students within a human patient computer simulation environment influence clinical judgment? Three hypotheses were developed to address the research question, focusing on whether a relationship exists between the independent variables of learning style and learning flexibility and the dependent variable of clinical judgment.

The chapter presents the results of the nonexperimental correlation study. The initial section will provide some descriptive statistics related to the study participants. The second section will provide frequency data related to learning style preference and Learning Flexibility Index (LFI) scores of the study participants. The third section addresses results of inferential statistical procedures used to examine the research question and the hypotheses. A summary paragraph completes the fourth section of the chapter.

Descriptive Statistics

The population used for the study included prelicensure nursing students ($N = 51$) in their first year of a prelicensure nursing program at a state college located in the Southeastern portion of the United States in a non-urban community. Demographic data collected from the participants included gender, age, and ethnicity. The majority of the participants were female (Table 1). Self-reported age demographics of the participants ranged from 20 to 53 with a mean age of 33 and a median age of 31 (Table 1). Ethnicity of the participants was categorized as Caucasian, African American, Asian American, Hispanic American, and Native American. The majority of the participants identified themselves as Caucasian (Table 1).

Table 1

Gender, Age, and Ethnicity of Participants (N = 51)

Demographic categories	*f*	(Valid %)
Gender		
Female	46	(90)
Male	5	(10)
Age by group		
20 – 25	12	(22)
26 – 30	11	(22)
31 – 35	11	(22)
36 – 40	6	(12)
41 – 45	3	(6)
46 – 50	6	(12)
> 50	2	(4)
Ethnic group		
Caucasian	44	(86)
African American	3	(6)
Asian American	2	(4)
Hispanic American	1	(2)
Native American	1	(2)

Note. f = frequency

Descriptive data are shown relative to the different learning style type preferences identified in the Kolb Learning Style Inventory Version-4 (Table 2). All of the learning style types (Figure 3) were represented within the sample population. The initiating style represented the largest percentage within the sample with 21.6% of the participants.

Table 2

Learning Style Preference (N = 51)

Learning Style Type	*f*	(Valid %)
Initiating	11	(21.6)
Balancing	8	(15.7)
Reflecting	8	(15.7)
Imagining	6	(11.8)
Acting	4	(7.8)
Analyzing	4	(7.8)
Deciding	4	(7.8)
Experiencing	3	(5.9)
Thinking	3	(5.9)

Note. *f* = frequency

Learning flexibility provides an overall assessment of an individual's flexibility to change their learning style to different contextual situations (Sharma & D. A. Kolb, 2011). The population mean and frequency related to Learning Flexibility Index (LFI) are provided. Learning Flexibility Index (LFI) score ranged from .37 to .96, with a mean of .74 (.174).

Frequency data of a specific Learning Flexibility Index (LFI) score ranged from 1 to 3 within the sample population (Table 3).

Table 3

Learning Flexibility Index (LFI; N = 51)

Score	Range	*f*	(Valid %)	(Cumulative %)
.37	(0-1)	1	(2.0)	(2.0)
.39	(0-1)	1	(2.0)	(3.9)
.43	(0-1)	2	(3.9)	(7.8)
.45	(0-1)	1	(2.0)	(9.8)
.48	(0-1)	2	(3.9)	(13.7)
.49	(0-1)	1	(2.0)	(15.7)
.51	(0-1)	2	(3.9)	(19.6)
.58	(0-1)	1	(2.0)	(21.6)
.61	(0-1)	2	(3.9)	(25.5)
.63	(0-1)	2	(3.9)	(29.4)
.64	(0-1)	3	(5.9)	(35.3)
.66	(0-1)	1	(2.0)	(37.3)
.71	(0-1)	1	(2.0)	(39.2)
.75	(0-1)	1	(2.0)	(41.2)
.76	(0-1)	2	(3.9)	(45.1)
.77	(0–1)	2	(3.9)	(49.0)

(*Table continues*)

Table 3 (*continued*)

Score	Range	*f*	(Valid %)	(Cumulative %)
.78	(0-1)	2	(3.9)	(52.9)
.81	(0-1)	1	(2.0)	(54.9)
.83	(0-1)	3	(3.9)	(60.8)
.84	(0-1)	1	(2.0)	(62.7)
.86	(0-1)	3	(5.9)	(68.6)
.87	(0-1)	2	(3.9)	(72.5)
.88	(0-1)	2	(3.9)	(76.5)
.89	(0-1)	3	(5.9)	(82.4)
.91	(0-1)	2	(3.9)	(86.3)
.92	(0-1)	2	(3.9)	(90.2)
.93	(0-1)	2	(3.9)	(94.1)
.96	(0-1)	3	(5.9)	(100.0)

Note. f = frequency

Data Analysis and Results

The following research question frames the study: how do the individual and combined influences of learning style and learning flexibility of a prelicensure nursing student within a human patient computer simulation environment relate to clinical judgment? Three research hypotheses were formulated to address the research question and align with theoretical constructs of experiential learning theory to support the study's focus on exploring the relationship between the independent variables, learning style and learning flexibility, and the dependent variable, clinical judgment (Figure 6).

Hypothesis 1. The purpose of hypothesis 1 was to explore the relationship between learning style and clinical judgment of prelicensure nursing students within a human patient computer simulation environment. The Pearson Product-Moment Correlation procedure (Pearson *r*) was used to examine the strength of the linear association between scores on the independent and dependent variables. Two correlations were found to be significant at the alpha level of .05. The independent variables of learning style for the variable components of reflective observation (RO) and active experimentation over reflective observation (AERO), which tells how the individual transforms the experience, were correlated with the dependent variable of clinical judgment. Learning style variable component of reflective observation (RO) was negatively correlated with clinical judgment, $r = -.287$, $p < .05$ (Table 4). The learning style dimension of active experimentation over reflective observation (AERO) was positively correlated with clinical judgment, $r = .297$, $p <.05$ (Table 4). There are significant variable correlations noted within the constructs of the learning style variables, but are not considered meaningful, as the correlations involve ipsative scales, producing a method-induced negative correlation (Kolb, A. Y. & Kolb, 2005b). The prediction by A. Y. Kolb and Kolb that the dimensions of abstract conceptualization over concrete experience (ACCE) and active experimentation over reflective observation (AERO) scores are “uncorrelated” (p. 21) is supported by the data.

Table 4

Correlation of Variables ($N = 51$)

Variables		AC	AE	CE	RO	ACCE	AERO	LFI	CJ
AC	Pearson *r*		-.514**	-.503**	-.145	.890**	-.136	.268	-.038
AE	Pearson *r*	-.514**		-.158	-.386**	-.392**	.752	-.351*	.188
CE	Pearson *r*	-.503**	.158		-.304*	-.828**	.287*	.004	-.097
RO	Pearson *r*	-.145	-.386**	-.304*		.045	-.893**	-.014	-.287*
ACCE	Pearson *r*	.890**	-.392**	-.828**	.045		-.211	.142	.043
AERO	Pearson *r*	-.136	.752**	.287*	-.893**	-.211		-.155	.297*
LFI	Pearson *r*	.268	-.351*	.004	-.014	.142	-.155		-.033
CJ	Pearson *r*	-.038	.188	-.097	-.287*	.043	.297*	-.033	

Note. AC = Abstract Conceptualization, AE = Active Experimentation, CE = Concrete Experience, RO = Reflective Observation, ACCE = Dimension of Abstract Conceptualization over Concrete Experience, AERO = Dimension of Active Experimentation over Reflective Observation, LFI = Learning Flexibility Index, CJ = Clinical Judgment.

** Correlation is significant at $p < 0.01$ level
* Correlation is significant at $p < 0.05$ level

Hypothesis 2. The purpose of hypothesis 2 was to explore the relationship between learning flexibility and clinical judgment of prelicensure nursing students within a human patient computer simulation environment. The correlation between the independent variable, Learning Flexibility Index (LFI) was not significantly ($r = -.033$, $p > .05$) related to the dependent variable of clinical judgment (Table 4).

Hypothesis 3. The purpose of hypothesis 3 was to explore whether the individual and combined influences of learning style and learning flexibility on clinical judgment of prelicensure nursing students within a human patient computer simulation environment may demonstrate multiple significant relationships. Two variables within learning style were statistically significant and were further analyzed using the bivariate linear regression procedure. A bivariate linear regression analysis was performed on the learning style variable components of active experimentation over reflective observation (AERO) dimension and adaptive learning mode of reflective observation (RO) to evaluate the predictability of these variables on clinical judgment. Learning style regression results indicated $r^2 = .088$ (adjusted $r^2 = .069$) for predicting the dimension of active experimentation over reflective observation (AERO). The learning style variable dimension of active experimentation over reflective observation (AERO) accounted for 8.8% of the variance (6.9% adjusted) in clinical judgment (Table 5). For the second statistically significant variable, the regression results indicated $r^2 = .083$ (adjusted $r^2 = .064$) for predicting the learning style variable of reflective observation (RO) from clinical judgment (Table 6). The learning style variable of reflective observation (RO) accounted for 8.3% of the variance (6.4% adjusted) in clinical judgment.

Table 5

Regression Model Summary for Active Experimentation over Reflective Observation (AERO) Dimension

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.297[a]	.088	.069	2.915

Note. a = Predictors: (Constant), Active Experimentation over Reflective Observation (AERO) Dimension

Table 6

Regression Model Summary for Reflective Observation (RO)

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.287[a]	.083	.064	2.924

Note. a = Predictors: (Constant), Reflective Observation (RO)

Chapter Summary

In this chapter descriptive data of the participants were provided related to gender, age, ethnicity, preferred learning style type, and Learning Flexibility Index (LFI). To examine the research question and hypotheses data were analyzed and presented to determine if there was a relationship among learning style, learning flexibility, and clinical judgment. The results indicate a significant positive correlation for the variable of learning style which deals with how an individual transforms the experience, the dimension of active experimentation over reflective observation experience (AERO) and clinical judgment, which accounted for the variance in clinical judgment. Additionally, there was a significant negative correlation for the variable of learning style which focuses on the reflective observation (RO) learning mode and clinical judgment, which accounted for the variance in clinical judgment.

CHAPTER V

CONCLUSIONS

The conclusion chapter includes a summary of the study, a discussion of the theoretical framework used to examine the research question and hypotheses. The chapter begins with a discussion of the research setting, sample population, and research procedures. A summary follows discussing the research findings and results relative to the three hypotheses. Next, limitations and implications of the study are presented with recommendations for future research. The final section provides a summary of the chapter.

Summary of the Study

Nursing education is experiencing a paradigm shift in how students are exposed to clinical situations. Technology is being used as an alternative to human exposure in clinical education (Nehring, 2010b). Human patient computer simulation continues to gain popularity as an evolving technology to provide authentic experiences to students in a low-risk environment and brings an experiential approach to learning (Jefferies, 2011). Learning with technology requires educators to explore learner variables which might influence student performance outcomes. The study was designed to explore specific learner variables of learning style and learning flexibility on student performance, specifically clinical judgment during a human patient computer simulation scenario. The variables of learning style and learning flexibility support the theoretical framework of experiential learning theory as outlined by D. A. Kolb (1984), which discusses learning from an adaptive approach by ascribing to a four-stage cycle involving four adaptive learning modes. Within the structural process, knowledge is obtained depending on whether experience is grasped by apprehension or comprehension and transformed via extension or intention (Kolb, D. A., 1984). Human adaptation to the environment is central to experiential learning theory (Kolb, D. A., 1984). A higher level of synthesis occurs when the adult develops the ability to adapt to world experiences through the developmental growth of integration and recognition of needing to use nondominant modes within the dialectic process (Kolb, D. A., 1984).

A convenience sampling of prelicensure nursing students enrolled in an associate of science in nursing program at a non-urban state college in the Southeastern portion of the United States was used in this study. All 51 participants signed an informed consent form prior to data collection (Appendix E). There were two instruments used in the study. The Kolb Learning Style Inventory-Version 4 (Appendix H), a proprietary instrument managed by the HayGroup®, provided the data for the independent variables, learning style and learning flexibility. The Lasater Clinical Judgment Rubric© (Appendix D) provided data for the dependent variable, clinical judgment of a prelicensure nursing student within a human patient computer simulation environment. Both instruments provided interval level data. The Kolb Learning Style Inventory Version-4, released in July of 2011, incorporates psychometric properties of the most recent version of the learning style instrument, Kolb Learning Style Inventory-Version 3.1 and another instrument used to measure learning flexibility, the Learning Flexibility Index (LFI; Kolb, D. A., n.d.). The Kolb Learning Style Inventory-Version 4 provides scores related to the following variables: abstract conceptualization (AC), active experimentation (AE), concrete experience (CE), reflective observation (RO), abstract conceptualization over concrete experience (ACCE), active experimentation over reflective observation (AERO), and Learning Flexibility Index (LFI; P. Flinch, personal communication, January 30, 2012).

The following research question frames the study: how do the individual and combined influences of learning style and learning flexibility of a prelicensure nursing student within a human patient computer simulation environment relate to clinical judgment? Three research hypotheses were formulated to address the research question and align with theoretical constructs of experiential learning theory to support the study's intent to explore the relationship between the independent variables and dependent variable.

H_1. There is a relationship between learning style and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

H_2. There is a relationship between learning flexibility and clinical judgment of prelicensure nursing students within a human patient computer simulation environment.

H_3. The individual and combined influences of learning style and learning flexibility on clinical judgment of prelicensure nursing students within a human patient computer simulation environment will demonstrate multiple significant relationships.

Findings and Interpretation of Results

The Pearson product-moment correlation procedure (Pearson *r*) was used to examine the strength of the linear association between scores on the independent and dependent variables: learning style, learning flexibility, and clinical judgment. The relationship between the independent variable of learning style and the dependent variable of clinical judgment was found to be statistically significant; therefore, the null hypothesis was rejected. A more indepth examination of the learning style variable component scores indicated a positive correlation between the component that focuses on the dimension of active experimentation over reflective observation (AERO) and clinical judgment. Specifically, this dimension addresses how an individual transforms or deals with the experience (Kolb, D. A., 1984). D. A. Kolb characterizes the dimension in terms of extension on one end and intention on the other; the extension part of the dimension relies on "active external manipulation of the external world" (p. 41), whereas the intention dimension relies on "internal reflection" (p. 41). Resolution of conflict between the dialectically opposed adaptive orientations occurs in a patterned, characteristic manner, incorporating the individual's preference for each of the four modes of the learning process (Kolb, D. A., 1984).

The clinical judgment model outlined by Tanner (2006b) formed the basis for development of the Lasater Clinical Judgment Rubric© (Lasater, 2007a). Tanner's model of clinical judgment includes the actions of noticing, interpreting, responding, and reflecting (Figure 4). The aspects of noticing, interpreting, and reflecting contributed to the statistically significant positive correlation related to the learning style variable on how the individual transforms or deals with the experience. The process of noticing includes the individual's having an initial grasp of the situation in order to move to the next phase of interpreting in which sufficient understanding of the situation has developed to allow a response (Tanner, 2006b). The component of reflection identified by Tanner incorporates two processes: reflection-in-action, which identifies how an individual is able to respond to patient cues and adjust intervention, and reflection-on-action, which provides an overall perspective on what was gained from the experience.

A negative relationship was noted between the learning style variable component that focuses on reflective observation (RO) and clinical judgment. D. A. Kolb (1984) discusses an individual with a propensity toward the reflective observation (RO) mode of learning preferring to have an understanding of the meaning of the situation through careful observation. An individual's learning style geared toward reflection appreciates the understanding of an idea or situation versus practical application (Kolb, D. A., 1984). These individuals tend to have difficulty putting a plan into action and thrive in environments which allow for discussion and interaction of ideas (Kolb, A. Y. & Kolb, 2009). When examining the negative relationship relative to Tanner's clinical judgment model as outlined by the Lasater Clinical Judgment Rubric©, contributing components were noticing and reflecting. Lasater (2007a) integrates specific aspects of noticing within the rubric to include "focused observation, recognizing deviations form expected patterns, and information seeking activities" (p. 500). These processes are activities requiring action and do not support an individual's preference for understanding the meaning of the situation, which is consistent with a characteristic of the reflection mode of learning. The effective reflecting component of the Lasater Clinical Judgment Rubric© identifies an exemplary individual as one who actively demonstrates an action process through self-analysis and evaluation and commits to a specific improvement plan (Lasater, 2007a). The preference for the adaptive mode of reflection supports a cautionary approach to understanding the situation, and this individual is more comfortable with examining different perspectives versus developing a specific action plan based on the overall situation (Kolb, D. A., 1984).

For the second hypothesis, the independent variable of learning flexibility and the dependent variable of clinical judgment were not found to be related. In terms of experiential learning theory the adult develops the ability to adapt to world experiences through a developmental process and comfort in using nondominant learning modes within the learning cycle (Kolb, D. A., 1984). Adaptation allows an individual to embrace components of his or her nondominant modes to reach higher-level functioning (Kolb, D. A., 1984). D. A. Kolb refers to this behavior as an individual's adaptive flexibility and views adaptive flexibility from a contextual aspect by understanding an individual's flexibility along the two dimensions. An individual's learning flexibility represents a developmental process in which the learner moves freely using all four modes of learning (Kolb, D. A., 1984; Sharma & Kolb, D. A., 2011). The single event in collection of clinical judgment requires a cautionary perspective related to the influence of learning flexibility on an outcome performance variable. Lasater (personal communication, August 2, 2011) comments on the use of the Lasater Clinical Judgment Rubric© as an assessment instrument for collecting data during multiple situations versus a single point in time. Although the null hypothesis was not rejected, the data related to the sample population's Learning Flexibility Index (LFI) scores provided information not previously found in nursing literature related to adaptive characteristics of prelicensure nursing students. D. A. Kolb suggests individuals with increasing adaptive flexibility have higher integrative development displaying self-directed behaviors and higher levels of cognitive and ego development than individuals with low adaptive flexibility.

The third hypothesis addressed whether the individual and combined influences of learning style and learning flexibility on clinical judgment of prelicensure nursing students within a human patient computer simulation environment demonstrated multiple significant relationships. Variable components within learning style to include reflective observation (RO) and the dimension of active experimentation over reflective observation (AERO) were found to relate to clinical judgment. The results indicate a positive relationship for the variable of learning style which deals with how an individual transforms the experience and clinical judgment. Additionally, findings suggest a negative relationship between the variable of learning style focused on the reflection learning mode and clinical judgment.

Limitations

The sample is from a specific population of students enrolled in an associate's degree nursing program at a small, non-urban state college in the Southeastern United States, therefore providing a convenience sampling that limits the findings relative to other prelicensure nursing programs. The study design incorporated a point in time of data collection related to the performance outcome of clinical judgment. Lasater (personal communication, August 2, 2011) cautions the use of a single episode of assessment data with the Lasater Clinical Judgment Rubric© in drawing conclusions related to the data. Additionally, the Kolb Learning Style Inventory-Version 4 relies on self-reported data within a forced-choice questioning format. An additional limitation involves the subjective influences of self-reported data. Social desirability bias might occur with a self-reported instrument format where individuals respond to choices based on what the individual might consider as a socially acceptable response (Warner, 2008).

Implications of the Study

The individual learner in higher education brings with him or her a variety of experiences and knowledge to the classroom. Learning styles research provides evidence to guide the educator to examine whether individual learner preference might influence student outcomes in certain contextual environments. Within the theoretical framework of experiential learning theory, learning style variables related to how the individual deals with the experience and the knowledge mode of reflection influenced clinical judgment performance of prelicensure nursing students within a human patient computer simulation environment involving a single simulation event. Opportunities to develop clinical judgment begin early in the prelicensure nursing program. Incorporating an understanding of students' learning style variables within an experiential learning approach provides an opportunity to facilitate the positive growth of clinical judgment with the emphasis of moving the prelicensure nursing student along a developmental continuum.

An additional finding revealed a high degree of learning flexibility within the sample population with a Learning Flexibility Index (LFI) mean of .74 (range of 0 to 1). The Learning

Flexibility Index (LFI) mean score indicates that participants within the study demonstrated a high degree of flexibility or willingness to change their learning style preference to meet the demands of the learning situation. Learner adaptability within this specific prelicensure nursing student population indicates high flexibility to adapt learning style to different situations supporting the opportunity to vary methodologies within the nursing curriculum.

The study provides new information concerning prelicensure nursing students' preferred learning style using the nine-style typology incorporated in the Kolb Learning Style Inventory-Version 4. A. Y. Kolb and Kolb (2005a) describe the nine learning styles as initiating, experiencing, imagining, reflecting, analyzing, thinking, deciding, acting, and balancing (Figure 3). The initiating style represented the largest percentage within the sample. A person with this style type initiates action and prefers hands-on experiences, thriving in dynamic environments (Kolb, D. A. & Kolb, 2011). All the remaining style types were represented within the sample population but to a lesser extent than the initiating style. Learning style types of initiating, acting, and deciding prefer the action adaptive learning mode over reflection, representing more than one third of the sample population. D. A. Kolb (1984) discusses an orientation toward the action adaptive mode of learning includes situations in which the individual is involved with the experience in terms of practical application. Human patient computer simulation provides an environment of learning which is highly interactive and the student can actively engage in the process.

The study's findings indicate students' preferences for active experimentation (AE) adaptive modes of learning over reflective observation (RO) adaptive modes of learning. Others studies involving prelicensure nursing students indicate a preference for abstract conceptualization (AC) or concrete experience (CE) modes of adaptation. Earlier studies by

Rakoczy and Money (1995) and Joyce-Nagata (1996) using the initial version of the Learning Style Inventory indicated a preference for the abstract conceptualization adaptive mode of learning. Molsbee (2011) used the Learning Style Inventory-Version 3.1 and found a similar preference for the abstract conceptualization (AC) over concrete experience (CE). Laschinger's (1986) research conducted with prelicensure nursing students revealed the predominant style types aligned within the concrete experience area. Rassool and Rawaf (2007) support similar findings within their sample population of prelicensure nursing students with two thirds showing a preference for style types within the concrete experience area. Wagner et al. (2010) discuss 60% of the prelicensure nursing students' having learning style types within the concrete experience area. The Kolb Learning Style Inventory-Version 3.1 had four primary learning style types and the Kolb Learning Style Inventory-Version 4 now has nine primary learning style types, making specific comparison data difficult.

The Kolb Learning Style Inventory-Version 4 scores aligned with the technical data findings noted by A. Y. Kolb and Kolb (2005b). A. Y. Kolb and Kolb comment on the predicted correlation of the combination score of abstract conceptualization over concrete experience (ACCE) dimension not correlating with the combination score of active experimentation over reflective observation (AERO) dimension. The scores generated by the sample population in the study support the internal validity evidence noted by A. Y. Kolb and Kolb as being "uncorrelated" (p. 21).

Recommendations for Future Research

Further research should focus on collection of the dependent variable data over time to incorporate multiple collection points related to clinical judgment performance. Lasater (2011b) supports use of the Lasater Clinical Judgment Rubric© through the approach of providing an opportunity to assess development of clinical judgment and provide feedback on the student's progress to frame a developmental approach to the clinical judgment process. A longitudinal study which examines clinical judgment using human patient computer simulation across the curriculum would support assessment of clinical judgment using multiple opportunities.

Use of the Kolb Learning Style Inventory-Version 4 provides an avenue of self-awareness of an individual's preferred way of learning to allow for personal growth and enhanced learning opportunities (Kolb, D. A. & Kolb, 2011). Burruss (2010) surveyed 219 prelicensure students enrolled in six baccalaureate nursing programs and found intent to use learning style preference information was greater in individuals who perceived their learning style assessment information to be useful. The variability of research results related to preferred learning style among prelicensure nursing students support an opportunity to examine whether an understanding of one's learning style and incorporating the information to maximize learning opportunities will improve performance outcomes, specifically targeting development of clinical judgment through use of human patient computer simulation as well as traditional clinical venues involving real patients.

Chapter Summary

In Chapter 5, the summary of the findings are outlined, including a review of the research question and hypotheses. Findings and interpretation of the results follow with the discussion highlighting the statistically significant finding related to hypothesis 1. Implications of the study related to findings and opportunity to contribute to nursing literature on learning style types with the newly identified nine-style typology approach are addressed. Recommendations for future research are presented, addressing opportunities to understand the role of student variables influencing clinical judgment performance from a developmental and self-improvement approach with human patient computer simulation integrated throughout the curriculum.

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APPENDIXES

Appendix A

Copyright Permission Letter for Figures 1, 3, and 5

Robison, Elizabeth

From:	Alice Kolb [aliceykolb@gmail.com]	**Sent:**	Mon 4/16/2012 2:25 PM
To:	Elizabeth Robison		
Cc:	dak5@msn.com		
Subject:	Re: Requesting Permission to Use Figures from Workshop "Your Learning Edge" 19 July 2011		
Attachments:			

Hi Elizabeth:

Congratulations on your soon to be completed dissertation. You are welcome to cite the figures in your thesis with changes. On the figure on Nine regions of the learning space, please delete the symbols, N, NW ,SW, etc. We do not use those symbols any longer. The citation should read: copyright D. A. Kolb & A. Kolb, Experience Based Learning Systems, Inc.

Let me know if you have any questions.

Best,

On Sun, Apr 15, 2012 at 8:08 PM, Elizabeth Robison <esr8@students.uwf.edu> wrote:

> Hello Drs David and Alice Kolb
>
> As I'm finishing details within my dissertation in which I used KLSI-4, I'm wondering if I can use two figures you provided in the handout during your workshop last Summer (July 19th) I attended titled, "Your Learning Edge: The Art of Learning from Experience." I'm excited to soon defend my dissertation (end of May/beginning of June timeframe) and hopefully soon share results with you after all goes through my committee. I'd like to use two figures, the one figure showing "The Experiential Learning Cycle" and the other figure in the slide showing "The Nine Regions of the ELT Learning Space." Please see attached figures I put together to mirror these two figures.
>
> Thank you.
>
> Elizabeth Robison, EdD(c)
> University of West Florida

--
Alice Kolb Ph.D.
Adjunct Professor of Organizational Behavior
Case Western Reserve University
President
Experience Based Learning Systems, Inc.
www.learningfromexperience.com

Appendix B

Copyright Permission Letter for Figure 2

Robison, Elizabeth

From:	Polly Flinch [Polly.Flinch@haygroup.com]	**Sent:**	Tue 4/24/2012 9:34 AM
To:	Robison, Elizabeth		
Cc:			
Subject:	RE: Permission Request for Figure Use in Dissertation		
Attachments:			

Hi Liz,

You have permission to use the requested figure in your dissertation please source it as follows:

Adapted from Kolb, Learning Style Inventory, 2007 with permission from Hay Group.

Best,

Polly

-----Original Message-----
From: Robison, Elizabeth [mailto:robisone@nwfsc.edu]
Sent: Monday, April 23, 2012 5:11 PM
To: Polly Flinch
Subject: Permission Request for Figure Use in Dissertation

Hi Polly - Requesting permission (if you are the person to go through) to use an adaption of the version of the experiential learning theory model in the KLSI 3.1 Workbook, page 13. Please see attach adaptation. This would be for use only in my dissertation.

Thank you.

Elizabeth (Liz) Robison, EdD(c),MSN, RN,CNE Professor of Nursing Northwest Florida State College 100 College Blvd Niceville, FL 32578
(850) 729-6474

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit http://www.symanteccloud.com

Appendix C

Lasater Clinical Judgment Rubric©

Dimension	Exemplary	Accomplished	Developing	Beginning
Effective noticing involves:				
Focused observation	Focuses observation appropriately; regularly observes and monitors a wide variety of objective and subjective data to uncover any useful information	Regularly observes and monitors a variety of data, including both subjective and objective; most useful information is noticed; may miss the most subtle signs	Attempts to monitor a variety of subjective and objective data but is overwhelmed by the array of data; focuses on the most obvious data, missing some important information	Confused by the clinical situation and the amount and kind of data; observation is not organized and important data re missed, and/or assessment errors are made
Recognizing deviations from expected patterns	Recognizes subtle patterns and deviations from expected patterns in data and uses these to guide the assessment	Recognizes most obvious patterns and deviations in data and uses these to continually assess	Identifies obvious patterns and deviations, missing some important information; unsure how to continue the assessment	Focuses on one thing at a time and misses most patterns and deviations from expectations; misses opportunities to refine the assessment
Information seeking	Assertively seeks information to plan intervention; carefully collects useful subjective data from observing and interacting with the patient and family	Actively seeks subjective information about the patient's situation from the patient and family to support planning interventions; occasionally does not pursue important leads	Makes limited efforts to seek additional information from the patient and family; often seems not to know what information to seek and/or pursues unrelated information	Is ineffective in seeking information; relies mostly on objective data; has difficulty interacting with the patient and family and fails to collect important subjective data
Effective interpreting involves:				
Prioritizing data	Focuses on the most relevant and important data useful for explaining the patient's condition	Generally focuses on the most important data and seeks further relevant information but also may try to attend to less pertinent data	Makes an effort to prioritize data and focus on the most important, but also attends to less relevant or useful data	Has difficulty focusing and appears not to know which data are most important to the diagnosis; attempts to attend to all available data

Dimension	Exemplary	Accomplished	Developing	Beginning
Effective interpreting involves:				
Making sense of data	Even when facing complex, conflicting, or confusing data, is able to (a) note and make sense of patterns in the patient's data, (b) compare these with known patterns (from the nursing knowledge base, research, personal experience, and intuition), and (c) develop plans for interventions that can be justified in terms of their likelihood of success	In most situations interprets the patient's data patterns and compares with known patterns to develop an intervention plan and accompany rationale; the exceptions are rare or in complicated cases where it is appropriate to seek the guidance of a specialist or a more experienced nurse	In simple, common, or familiar situations, is able to compare the patient's data patterns with those known and to develop or explain intervention plans; has difficulty, however, with even moderately difficult data or situations that are with the expectations of students; inappropriately requires advice or assistance	Even in simple, common, or familiar situations, has difficulty interpreting or making sense of data; has trouble distinguishing among competing explanations and appropriate interventions, requiring assistance both in diagnosing the problem and developing an intervention
Effective responding involves:				
Calm, confident manner	Assumes responsibility; delegates team assignments; assesses patients and reassures them and their families	Generally displays leadership and confidence and is able to control or calm most situations; may show stress in particularly difficult or complex situations	Is tentative in the leader role; reassures patients and families in routine and relatively simple situations, but becomes stressed and disorganized easily	Except in simple and routine situations, is stressed and disorganized, lacks control, makes patients and families anxious or less able to cooperate
Clear communication	Communicates effectively; explains interventions; calms and reassures patients and families; directs and involves team members, explaining and giving directions; checks for understanding	Generally communicates well; explains carefully to patients; gives clear directions to team; could be more effective in establishing rapport	Shows some communication ability (e.g., giving directions); communication with patients, families, and team members is only partly successful; displays caring but not competence	Has difficulty communicating; explanations are confusing; directions are unclear or contradictory; patients and families are made confused or anxious and are not reassured
Well-planned intervention/ flexibility	Interventions are tailored for the individual patient; monitors patient progress closely and is able to adjust treatment as indicated by patient response	Develops interventions on the basis of relevant patient data; monitors progress regularly but does not expect to have to change treatments	Develops interventions on the basis of the most obvious data; monitors progress but is unable to make adjustments as indicated by the patient's response	Focuses on developing a single intervention, addressing a likely solution, but it may be vague, confusing, and/or incomplete; some monitoring may occur

Dimension	Exemplary	Accomplished	Developing	Beginning
Effective responding involves:				
Being skillful	Shows mastery of necessary nursing skills	Displays proficiency in the use of most nursing skills; could improve speed or accuracy	Is hesitant or ineffective in using nursing skills	Is unable to select and/or perform nursing skills
Effective reflecting involves:				
Evaluation/ self-analysis	Independently evaluates and analyzes personal clinical performance, noting decision points, elaborating alternatives, and accurately evaluating choices against alternatives	Evaluates and analyzes personal clinical performance with minimal prompting, primarily about major events or decisions; key decision points are identified, and alternatives are considered	Even when prompted, briefly verbalizes the most obvious evaluations; has difficulty imaging alternative choices; is self-protective in evaluating personal choices	Even prompted evaluations are brief, cursory, and not used to improve performance; justifies personal decisions and choices without evaluating them
Commitment to improvement	Demonstrates commitment to ongoing improvement; reflects on and critically evaluates nursing experiences; accurately identifies strengths and weaknesses and develops specific plans to eliminate weaknesses	Demonstrates a desire to improve nursing performance; reflects on and evaluates experiences; identifies strengths and weaknesses; could be more systematic in evaluating weaknesses	Demonstrates awareness of the need for ongoing improvement and makes some effort to learn from experience and improve performance but tends to state the obvious and needs external evaluation	Appears uninterested in improving performance or is unable to do so; rarely reflects; is uncritical of himself or herself or overly critical (given level of development); is unable to see flaws or need for improvement

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Used with permission.

Appendix D

Copyright Permission Letter for Figure 4

SLACK
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April 23, 2012

Elizabeth Robison
Doctoral Student

Reference #: J13086037
Material Requested: Figure
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Citations: 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.

Dear Ms. Robison:

Permission is granted for the requested materials and usage listed above, subject to the following conditions:

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Requestor accepts conditions above:

Signature: ______________ **Date:** 2 May 2012

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SLACK
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April 23, 2012

Elizabeth Robison
Doctoral Student

Reference #: J13076037
Material Requested: Figure
Usage Requested: Reprinted in electronic version for dissertation
Citations: 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.

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Signature: ______ **Date:** 2 May 2012

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Appendix E

Consent Form

Participant Informed Consent Form

Learning Style/Flexibility and Clinical Judgment Study

Date: ____________________

Description:
The purpose of this study is to examine the influence of an individual's learning style and learning flexibility on clinical judgment performance of students who experience human patient computer simulation as a clinical component in the Nursing Process II Clinical Experience course. The results of this study will be used to determine the influence of an individual's learning style and flexibility on clinical judgment when experience a human patient computer simulation clinical scenario for further implication on how to use teaching strategies to enhance student performance outcomes.

The **Principal Investigator** is:
Elizabeth S Robison, Professor of Nursing
Northwest Florida State College (NWFSC)
Niceville, FL 32758
850-729-6474

Risks and Benefits:
There are no additional risks associated with this study that are not present in the typical education environment at NWFSC.

Costs and Payments:
There are no personal costs or payments associated with this study.

Confidentiality:
All information obtained in this study is strictly confidential unless disclosure is required by law. All data collected will remain confidential for the duration of the study. Provisions have been made to protect privacy and to maintain the confidentiality of data acquired through this research project.

Participants Right to Withdraw from the Study:
Participants have the right to withdraw after a consultation with the principal investigator at anytime. Withdrawing from the study means any data collected will not be used in the study results.

Voluntary Consent by the Participant:
I have read this consent form and I fully understand the contents of this document and voluntarily consent to participate. Participation in this research project is completely voluntary, and my consent is required before any data can be used in the research project. All of my questions regarding this research have been answered. I understand clearly that I may withdraw at any time from this research project after consultation with the principal investigator without penalty. If I have any questions in the future I may freely ask the Principal Investigator.

_______________________________ Date: __________
Signature of person giving consent (participant)

_______________________________ Date: __________
Signature of experimenter (witness)

Appendix F

The University of West Florida Institutional Review Board Approval Letter

University of West Florida

Research and Sponsored Programs
11000 University Parkway, Bldg. 11
Pensacola, FL 32514-5750

Ms. Elizabeth Robison

January 12, 2012

Dear Ms. Robison:

The Institutional Review Board (IRB) for Human Research Participants Protection has completed its review of your proposal titled "Influence of Learning Style & Learning Flexibility on Clinical Judgment of Pre-Licensure Nursing Students within a Human Patient Computer Simulation Environment," as it relates to the protection of human participants used in research, and granted approval for you to proceed with your study on 12-12-2012. As a research investigator, please be aware of the following:

* You will immediately report to the IRB any injuries or other unanticipated problems involving risks to human participants.

* You acknowledge and accept your responsibility for protecting the rights and welfare of human research participants and for complying with all parts of 45 CFR Part 46, the UWF IRB Policy and Procedures, and the decisions of the IRB. You may view these documents on the Research and Sponsored Programs web page at http://www.research.uwf.edu/internal. You acknowledge completion of the IRB ethical training requirements for researchers as attested in the IRB application.

* You will ensure that legally effective informed consent is obtained and documented. If written consent is required, the consent form must be signed by the participant or the participant's legally authorized representative. A copy is to be given to the person signing the form and a copy kept for your file.

* You will promptly report any proposed changes in previously approved human participant research activities to Research and Sponsored Programs. The proposed changes will not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the participants.

* **You are responsible for reporting progress of approved research to Research and Sponsored Programs at the end of the project period 04-30-2012. If the data phase of your project continues beyond the approved end date, you must receive an extension approval from the IRB.**

Good luck in your research endeavors. If you have any questions or need assistance, please contact Research and Sponsored Programs at 850-857-6378 or irb@uwf.edu.

Sincerely,

Dr. Richard S. Podemski, Associate
Vice President for Research
And Dean of the Graduate School

Dr. Carla Thompson, Chair
IRB for the Protection of Human
Research Participants

CC: Carla Thompson, Karen Rasmussen

Phone 850.474.2824 Fax 850.474.2802
Web research.uwf.edu
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Appendix G

The Northwest Florida State College Institutional Review Board Approval Letter

NORTHWEST FLORIDA
STATE COLLEGE

100 College Boulevard • Niceville, FL 32578-1295 • (850) 678-5111 • www.nwfstatecollege.edu

August 31, 2011

Elizabeth Robison

Re: Dissertation project approval #2012-2

Dear Ms. Robison,

Northwest Florida State College's Institutional Review Board (IRB) has reviewed and approved your research project, "Pre-licensure Nursing Students within a High Fidelity Simulation Environment: Influence of Learning Style and Flexibility on Clinical Judgment," with the understanding that the University of West Florida IRB approval is forthcoming. The Board finds that your project complies with the requirements of the Code of Federal Regulations on the Protection of Human Subjects (45 CFR 46).

The review date was August 31, 2011; approval is valid for one calendar year from this date. If the project continues beyond this date, you must submit paperwork for a Continuing Review.

Please note the following:

- You must report any unanticipated problems involving risks to the participants or others to the IRB immediately.
- You must advise the IRB when the study is finished or discontinued.
- Data from this project may not be disseminated to other parties.
- IRB approval does not constitute funding by the college.

Best wishes for your project's successful completion,

Anne H. Southard
Dean, Teacher Education, Research, and Learning Support

NWF State College Fort Walton Beach Campus • (850) 863-6500 Chautauqua Center, DeFuniak Springs • (850) 892-8100
Eglin Center, Eglin Air Force Base • (850) 678-1717 Hurlburt Center, Hurlburt Field • (850) 884-6296
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Appendix H

Permission to use Kolb Learning Style Inventory-Version 4

HayGroup®

Elizabeth Robison

July 26, 2011

Dear Elizabeth,

Congratulations! Your request regarding use of the Learning Styles Inventory in your research has been approved. You stated that you wanted to use the LSI 4.0 in your study, we can offer this to you at a cost of $5 per participant. Participants will not have access to their results.

As with the paper version these files are for data collection only. This permission to use the LSI 4.o does not extend to include a copy of the questionnaire in your research paper. It should be sufficient to source it.

We are still working out a couple of kinks regarding the LSI 4.0 - in this instance you will not be able to run a composite report; however, if you would like a break-down of your participants scored or raw data - just let me know and I can run the report for you. All you need to do is place all your participants into program (I have attached a copy of our self service user guide which explains how to do that).

We wish you luck with your research and look forward to hearing about your results. Please email a copy of your completed research to me at Polly_Flinch@haygroup.com or you can send a hard copy to:

LSI Research Contracts
c/o Polly Flinch
Hay Group
116 Huntington Ave, 4th Floor
Boston, MA 02116

Please let me know if you have any questions and if the LSI 4.0 set up will work for you - if so I can go ahead and get those links set up today.

Best,

Polly Flinch
Customer Service and Sales Representative
617-927-50206
Polly_Flinch@haygroup.com

www.haygroup.com

Appendix I

Permission to use Lasater Clinical Judgment Rubric©

From: Kathie Lasater [mailto:lasaterk@ohsu.edu]
Sent: Tue 8/2/2011 5:17 PM
To: Robison, Elizabeth
Subject: RE: Request Permission for use of LCJR

Hi Elizabeth,

Yes to both requests-- Obviously, I would ask that you cite the rubric properly, and when you've finished your research, I'd love it if you'd share your thoughts about using it. Your experience broadens mine and helps me to help others. Here is a standard response to general queries I send:

"You should be aware that the LCJR describes four aspects of the Tanner Model of Clinical Judgment—Noticing, Interpreting, Responding, and Reflecting—and as such, does not measure clinical judgment per se but does provide a framework for discussion about it. There is evidence that clinical judgment/clinical reasoning is not a generalizable skill but rather is influenced by what the clinician brings to the patient situation, their knowledge about and experience with similar situations, as well as many other factors (Tanner, 2006). Studies in both nursing and medicine suggest that valid assessment of skill in clinical judgment requires observation of students responding to multiple scenarios, which vary by type of problems and complexity.

The LCJR was designed as an instrument to describe the trajectory of students' clinical judgment development over the length of their program. The purposes were to offer a common language between students, faculty, and preceptors in order to talk about students' thinking and to serve as a help for offering formative guidance and feedback (see attached new article). So for measurement purposes, the rubric appears to be most useful with multiple opportunities for clinical judgment vs. one point/patient in time."

Please let me know if I can be of help,
Kathie

Kathie Lasater, EdD, RN, ANEF
Associate Professor
OHSU School of Nursing, SN-4S
3455 SW Veterans' Hospital Rd.
Portland, OR 97239
503-494-8325

-----Original Message-----
From: Robison, Elizabeth
Sent: Saturday, July 23, 2011 10:24 AM
To: Kathie Lasater
Subject: Request Permission for use of LCJR

Hello Dr Lasater - It was a pleasure to meet you and listen to your presentation at the recent INACSL Conference in Orlando.

I have two requests, one to use the LCJR for my dissertation work, but also our faculty wants to begin to explore use of LCJR within our curriculum for use with simulation, so making a separate request to allow Northwest Florida State College Associate degree program to use your copyright rubric within our nursing program.

Appendix J

Simulation Reflective Assignment

Simulation Reflective Assignment: Participant Identifier____________

Please be specific and write your thoughts about this experience.

1. How will you implement or utilize the strategies you have learned today in your clinical simulation experience?

2. Specify areas for practice to expand your learning, improve performance, and confidence in the clinical area.

3. State your plan to improve your clinical performance and confidence.

Appendix K

HayGroup® Conditional Use Agreement

CONDITIONAL USE AGREEMENT

For good and valuable consideration, the receipt and legal sufficiency of which are hereby acknowledged, I hereby agree that the permission granted to me by the Hay Group ("Hay") to receive and utilize, without charge (paper version, $3 per participant fee for online version), the Kolb Learning Style Inventory Version 4.0 ("LSI")is subject to the following conditions, all of which I hereby accept and acknowledge:

1. I will utilize the LSI for research purposes only and not for commercial gain.

2. The LSI, and all derivatives thereof, is and shall remain the exclusive property of Hay; Hay shall own all right, title and interest, including, without limitation, the copyright, in and to the LSI.

3. I will not modify or create works derivative of the LSI or permit others to do so. Furthermore, I understand that I am not permitted to reproduce the LSI for inclusion in my thesis/research publication.

4. I will provide Hay with a copy of any research findings arising out of my use of the LSI and will cite Hay in any of my publications relating thereto.

5. To translate the LSI, I need specific permission from Hay. If permission is granted, I will use the translation for my research only, and I am not permitted to include this translation in my thesis/research publication.

6. Hay will have no obligation to provide me with any scoring services for my use of the LSI other than the Algorithm used to score results.

7. Hay will not be deemed to have made any representation or warranty, express or implied, in connection with the LSI, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

8. My rights under this Agreement are non-transferable and non-exclusive and will be limited to a period of two (2) years from the date of this Agreement.

9. Hay may immediately terminate this Agreement by giving written notice to me in the event I breach any of this Agreement's terms or conditions.

10. This Agreement will be construed in accordance with the laws of Massachusetts without recourse to its conflict of laws principles.

11. This Agreement may not be assigned by me without the prior written consent of Hay.

12. Failure by Hay to enforce any provisions of this Agreement will not be deemed a waiver of such provision, or any subsequent violation of the Agreement by me.

13. This is the entire agreement with Hay pertaining to my receipt and use of the LSI, and only a written amendment signed by an authorized representative of Hay can modify this Agreement.

Agreed and understood:

Signature	Print Name	Date