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Comparison of selected outcomes based on teaching strategies that promote active learning in nursing education

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University of Iowa

COMPARISON OF SELECTED OUTCOMES BASED ON TEACHING STRATEGIES THAT PROMOTE ACTIVE LEARNING IN NURSING EDUCATION

by

Anita Christine Nicholson

An Abstract

Of a thesis submitted in partial fulfillment of the requirements
for the Doctor of Philosophy degree in
Educational Policy and Leadership Studies
in the Graduate College of The University of Iowa

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Thesis Supervisor: Professor Michael B. Paulsen

ABSTRACT

This study examined differences in the effects of three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on the outcomes of nursing student performance of intervention activities, performance retention of intervention activities, student satisfaction, self-confidence, and educational practice preferences. Engagement theory of student learning provided the overarching theoretical framework. An experimental posttest-only design incorporating two posttests (first performance and retention performance) was used with a sample of 74 nursing students at the University of Iowa College of Nursing. Students attended a cardiac lecture and completed a cardiac test prior to the teaching strategies. Students were randomly assigned and participated in one of the three active-learning teaching strategies and completed the Demographic Questionnaire, the Satisfaction and Self-Confidence in Learning Instrument, and the Educational Practices Questionnaire. Week 3 of the study, after the teaching strategies students participated in an individual performance demonstration in which they implemented nursing intervention activities in response to a cardiovascular scenario interacting with a high-fidelity mannequin. Week 8 of the study, another individual retention performance demonstration was completed by the students using a different case scenario. Both performance demonstrations were digitally recorded and scored using the Student Performance Demonstration Rubric.

Two-way mixed analysis of variance (ANOVA) revealed a significant main effect (within-subjects effect) of time, meaning that students in all three teaching strategy groups experienced improved performance of nursing interventions over time, from first performance to retention performance. No significant interaction effect (within-subjects) for time and teaching strategy groups were found. There was also no significant main effect (between-subjects effect) of teaching strategy groups ($F\ 2, 71 = 2.33$, $p = .105$). An exploratory one-way ANOVA on student's first performance rubric scores revealed results approaching significance for the three groups ($F\ 2, 71 = 2.90$, $p = .06$). The

simulation with narrative pedagogy group had the highest first performance mean (72.74), followed by the case-based learning group mean (70.68), and finally the simulation group scored the lowest mean (66.16). One-way ANOVA revealed no significant differences across the groups for students' Satisfaction Total scores, Self-Confidence Total scores, and Presence and Importance of Educational Practices Total scores.

Abstract Approved: _____
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Graduate College
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CERTIFICATE OF APPROVAL

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PH.D. THESIS

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This is to certify that the Ph.D. thesis of

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To my family

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INTRODUCTION

Research Problem

Nurse educators struggle on how to best prepare nursing students to care for patients in the increasingly complex healthcare environment of the twenty-first century. This challenge is intensified by the shortage of nursing faculty, which necessitates creative teaching strategies to provide students with appropriate preparation and clinical experiences to ensure competency. Nurses are frequently confronted with technological changes and management of intense patient care situations (Ravert, 2002). Employers expect new graduates to transition quickly into the independent role of the nurse after brief orientation programs. New nurses must be prepared to problem solve and critically think in providing quality care to patients with severe illnesses. Nurses need to be able to work collaboratively, analyze data, interpret results, think critically, draw reasoned conclusions, and make complex decisions (DeYoung, 2003). Early assessment and detection of declining health status and quick intervention is essential to the patient's recovery. Nurse educators assist nursing students to apply knowledge from nursing, related sciences, and other disciplines in making independent decisions in providing comprehensive nursing care (Billings & Halstead, 2005; DeYoung, 2003;Valiga, 1983). Educators need to adequately prepare nursing students to face the challenges of the complex health care arena.

Background

Addressing the crucial aspect of preparing nursing students requires educators to examine creative teaching strategies that focus on engaging students in active learning. Engagement of students in learning increases their motivation, sharpens thinking, deepens learning, and strengthens collaboration in the classroom (Chickering & Gamson, 1987). Active-learning teaching strategies engage students in learning and stimulate higher thinking processes (Bean, 1996).

Simulation has been used in nursing education for many years to engage students in learning. Simulation mimics a hospital environment for students to practice applying nursing knowledge by performing procedures, making clinical decisions and critically thinking through a patient-care scenario in a safe setting (Billings & Halstead, 2005; DeYoung, 2003). Recent technology introduced high-fidelity simulation, which consists of a life-sized computerized mannequin and display monitor that replicates human responses such as breathing, lung sounds, heart sounds, electrocardiographic tracings, and blood pressure monitoring. High-fidelity simulation in nursing education has been gaining popularity in the last decade (Jeffries, 2007; Jeffries & Rizzolo, 2006).

Nurse educators are exploring engaging and active-learning teaching strategies, such as high-fidelity simulation, to adequately prepare students for the complex health care environment. The use of high-fidelity simulation is costly in purchasing equipment and training faculty, so it is important to determine whether its use makes a difference in preparing students compared to traditional active-learning teaching strategies. Despite the increasing popularity of high-fidelity simulation in nursing curriculums, little is known about how its effectiveness compares to other active-learning teaching strategies.

Studies Addressing the Problem

A majority of the nursing literature on the teaching strategy of high-fidelity simulation is anecdotal, with educators sharing pioneering efforts of developing and implementing simulation. Nursing educators convey anecdotal information related to the use of simulation such as student enjoyment of interactive learning, self-paced learning, ability to give immediate feedback on student performance, remediation capabilities, and safe practice environment (Alinier, 2003; Bearnson & Wiker, 2005; Day, 2007; Feingold, Calaluce, & Kallen, 2004; Haskvitz & Koop, 2004; Medley, 2005; Rauen, 2004, Ravert, 2002; Rhodes & Curran, 2005; Rystedt & Lindstrom, 2001; Seropian, Brown, Gavilanes, & Driggers, 2004). Another segment of the literature involves the development of

frameworks for using simulation in nursing education (Jeffries, 2005; Jeffries, 2007; Waldner & Olson, 2007).

Nursing research studies on simulation include survey (Nehring & Lashley, 2004), qualitative (Reilly & Spratt, 2007), descriptive (exploratory) (Childs & Sepples, 2006; Johnson, Zerwic, & Theis, 1999; Lasater, 2007), and experimental designs (Engum, Jeffries, & Fisher, 2003; Griggs, 2002; Howard, 2007; Jeffries & Rizzolo, 2006; Jeffries, Woolf, & Linde, 2003; Nehring, Ellis, & Lashley, 2001; Ravert, 2004; Scherer, Bruce, & Runkawatt, 2007). Simulation studies revealed nursing students' perceptions of enhanced critical thinking (Cioffi, 2001; Howard, 2007; Jeffries et al., 2003; Johnson et al., 1999; Ravert, 2004; Scherer et al., 2007), increased self confidence (Cioffi, 2001; Jeffries & Rizzolo, 2006; Johnson et al., 1999; Ravert, 2004; Reilly & Spratt, 2007), greater satisfaction and enthusiasm with the learning experience (Childs & Sepples, 2006; Cioffi, 2001; Howard, 2007; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Johnson et al., 1999; Ravert, 2004), appreciation of the safe practice environment (Reilly & Spratt, 2007), promotion of active learning (Childs & Sepples, 2006; Jeffries & Rizzolo, 2006; Reilly & Spratt, 2007), benefits of collaboration with peers and faculty (Childs & Sepples, 2006; Lasater, 2007), perceived value and ability to transfer learning to the clinical setting (Howard, 2007), and importance of reflection sessions and feedback after the simulation experience (Childs & Sepples, 2006; Howard, 2007; Jeffries & Rizzolo, 2006; Lasater, 2007; Ravert, 2004).

Jeffries and Rizzolo (2006) lead a 3-year national study sponsored by the National League for Nursing in collaboration with the Laerdal Corporation (a simulator manufacturer) to explore, implement, and evaluate the use of high-fidelity simulation as a teaching strategy in nursing education. The researchers also developed a simulation teaching-learning framework to guide their research and future nursing simulation research. This was the first nursing high-fidelity simulation research implemented at a national level with multiple sites.

Deficiencies in the Studies

A key deficiency in nursing high-fidelity simulation research is capturing students' knowledge growth related to using this technology. Multiple nursing studies revealed students in the simulation group had no significant differences in knowledge gain compared to the control group (Engum et al., 2003; Griggs, 2002; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Ravert, 2004; Scherer et al., 2007). Only one study to date has found significant difference with respect to knowledge gain in the experimental simulation group (Howard, 2007). Despite the rigor of Jeffries and Rizzolo's (2006) multi-method, multi-site, national study, the researchers did not find significant differences in knowledge gain. They attributed the lack of significant findings on knowledge gain to the fact that simulation focuses on the opportunity to apply knowledge in ways that written pretests-posttests do not capture. A significant gap in the nursing simulation literature exists related to developing research strategies that measure the application of knowledge and performance. New instrumentation and research methods need to be developed to test application of knowledge.

This experimental study was closely modeled after Jeffries and Rizzolo's (2006) study, yet differs in a significant way by attempting to capture the growth of knowledge by measuring students' performance of nursing interventions. Students' ability to perform nursing interventions demonstrates their application of nursing knowledge. Student performance and retention of student performance of nursing interventions were measured by the Student Performance Demonstration Rubric developed by nurse experts from the simulation research team at the University of Iowa College of Nursing. To date, no studies in the nursing literature have examined the effects of high-fidelity simulation on students' performance of nursing interventions and retention of performing nursing interventions. Focusing on student performance of nursing interventions may provide the needed evidence that high-fidelity simulation helps students apply knowledge related to providing patient care.

Statement of the Purpose

The purpose of this experimental research study was to determine if there were differences in the effects of three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on the outcomes of nursing student performance of intervention activities, performance retention of intervention activities, student satisfaction, student self-confidence, and educational practice preferences.

Significance of the Study

Nursing educators work diligently to engage students in active learning of theoretical and practical content in the classroom, clinical laboratory, and clinical patient care settings. Yet there is controversy in nursing education as to the best strategies to engage and prepare students to think critically and to provide the hands-on care of implementing nursing interventions to patients. The use of high-fidelity simulation is costly in terms of purchasing equipment and training faculty, so it is important to determine whether its use is more effective in preparing students than are traditional active-learning teaching strategies. This study examined if using high-fidelity simulation improved nursing students' performance and retention of performance of nursing interventions over the traditional case-based learning teaching strategy. The ability of nursing students to perform nursing interventions demonstrates their ability to think critically and to apply knowledge learned. In light of the high cost of high-fidelity simulation and increasing complexity of the health care environment, nursing educators and administrators want to know that simulation enhances student preparation for performing nursing interventions.

Research Questions

1. What is the difference in *performance of nursing intervention activities* among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

2. What is the difference in *retention of performing nursing intervention activities* among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?
3. What is the difference in *student satisfaction and self-confidence* among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?
4. What is the difference in *educational practice preferences* among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

Brief Overview of Research Methodology

The study used an experimental posttest-only design incorporating two posttests (first performance and retention performance). Three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) were evaluated on the defined outcomes of student performance of nursing intervention activities, retention of performing intervention activities, student satisfaction, self-confidence, and educational practice preferences.

An experimental posttest-only design was chosen to provide empirical support for teaching strategies that help nursing students' performance of nursing interventions. A cardiac test prior to the teaching strategies served as a covariate to control for differences in knowledge level of the three groups. Dependent variable posttest measures included the Student Performance Demonstration Rubric, the Student Satisfaction and Self-Confidence in Learning Instrument, and the Educational Practices Questionnaire. All of these measures focused on student responses and performance related to the active-learning teaching strategies.

The following description provides an overview of data collection methods. The study used a convenience sample of nursing students at the University of Iowa College of Nursing enrolled in the course 96:135, Complex Concepts of Nursing Care (a second-

semester nursing course). The study began with consenting students taking a cardiac knowledge test and attending the 96:135 Complex Concepts cardiac lecture. After the lecture, students were randomly assigned and participated in one of the three treatment active-learning teaching strategies (integrated into students' scheduled laboratory sessions) and completed instruments on the dependent variables. Week 3 of the study, after the teaching strategies and after the cardiovascular unit exam, students participated in an individual performance demonstration in which they implemented nursing intervention activities in response to a cardiovascular scenario interacting with a high-fidelity mannequin. Week 8 of the study, another individual retention performance demonstration was completed by the students using a different case scenario. Both performance demonstrations were digitally recorded and scored using the Student Performance Demonstration Rubric.

The research questions for this study focused on examining the differences in performance and retention of performance of nursing intervention activities among students who participated in case-based learning, simulation, and simulation with narrative pedagogy as well as on examining difference in student satisfaction, self-confidence, and educational practice preferences among students who participated in three different teaching strategies. The procedure for analysis was based on the type of data. Demographic Questionnaires and Follow-up Information Questionnaires were tallied by frequency counts, means, and standard deviations when appropriate and by narrative comments. When comparing demographic characteristics between the groups, the researcher conducted Chi-Square analysis. Two-way mixed analysis of variance (ANOVA) determined whether there were significant differences in the means of students' first performance scores and retention performance scores for the three teaching strategy treatment groups. Students' total scores for satisfaction, self-confidence, the presence of educational practices, and the importance of educational practices were calculated using one-way ANOVA.

Definitions of Terms

Conceptual Definitions

Active learning: Students are engaged with the content through writing, discussion, application, and reflection (Chickering & Gamson, 1987; Jeffries, 2005).

Case-base learning: A teaching approach that uses a written case scenario with questions to help students develop critical thinking patterns and integrate theoretical content (Thomas, O'Connor, Alber, Boutain, & Brandt, 2001).

Clinical: A common term used in health care education to refer to a place where students perform patient care in a hospital, community, or home care setting under the supervision of an instructor (DeYoung, 2003).

Simulation: An event or situation made to resemble clinical practice as closely as possible (Jeffries, 2005).

Narrative pedagogy: A teaching approach that encourages mutual dialogue between students and teachers that evokes thinking to explore, examine, and critique learning (Diekelmann, 2001).

Reflective thinking: A teaching approach that provides students and teachers the opportunity to review aspects of learning experience to link theory to practice and discuss the process, outcomes, and application of information (Jeffries, 2005).

Nursing interventions: Any treatment based upon clinical judgment and knowledge that a nurse performs to enhance patient outcomes. Nursing interventions include both direct and indirect care (Dochterman & Bulechek, 2004).

Nursing activities: The specific behaviors or actions that nurses perform to implement an intervention and that assist patients to move toward a desired outcome. Nursing activities are at the concrete level of action. A series of actions is necessary to implement an intervention (Dochterman & Bulechek, 2004).

Performance of intervention activities: Observable demonstration of intervention activities in accordance with evidenced-based standards (Burman, Hart, Brown, & Sterad, 2007).

Retention of performing intervention activities: Observable demonstration of intervention activities in accordance with evidenced-based standards after an interval of time (Burman et al., 2007; Rogers, Jacob, Rashwan, & Pinsky, 2001).

Satisfaction: The perception of full explanations and contentment with teaching (Billings & Halstead, 2005; DeYoung, 2003).

Self-confidence: Trusting the soundness of one's own judgment and performance (Jeffries, 2005).

Educational practice preferences: Preference of best educational practices based on Chickering and Gamson's (1987) seven principles of good practice in undergraduate education: active learning, collaboration with peers, student/faculty interaction, feedback, high expectations, diverse ways of learning, and time on task.

Learning/Teaching: Learning is the act of gaining knowledge or skill. Teaching is the act or process of imparting knowledge or helping others to develop understanding or skills (Billings & Halstead, 2005; DeYoung, 2003; Weimer, 2002).

Operational Definitions

Case-based learning: The use of a written case and questions on a patient with cardiovascular disease to facilitate students' ability to identify assessment data and immediate nursing interventions. Students read the case and then interact with members of their small group to apply theory to the case followed by teacher guided reflective thinking.

Simulation: The use of a high-fidelity mannequin to mimic a patient with cardiovascular disease in which students demonstrate assessment and implementation of immediate nursing intervention activities followed by teacher-guided reflective thinking.

Narrative pedagogy: The use of a high-fidelity mannequin to mimic a patient with cardiovascular disease in which students demonstrate assessment and implementation of immediate nursing intervention activities with the use of mutual dialogue among students and teacher throughout the experience followed by teacher-guided reflective thinking.

Reflective thinking: Teacher guided discussion to assist students to analyze the process, outcomes and application of information to the care of a patient with cardiovascular disease.

Performance of intervention activities: Two weeks after the teaching strategy (Week 3 of the study), students demonstrate intervention activities in the care of a patient with cardiovascular disease in a simulated environment measured by a score on the Student Performance Demonstration Rubric.

Retention of performing intervention activities: Seven weeks after the teaching strategy (Week 8 of the study), students demonstrate intervention activities in a new scenario of a patient with cardiovascular disease in a simulated environment measured by a score on the Student Performance Demonstration Rubric.

Satisfaction: Student satisfaction score on a learning subscale of attitudes towards current instructional methods using the Student Satisfaction and Self-Confidence in Learning Instrument (http://www.nln.org/research/nln_laerdal/ instruments.htm).

Self-confidence: Student self-confidence score on a learning subscale of attitudes towards current instructional methods using the Student Satisfaction and Self-Confidence in Learning Instrument (http://www.nln.org/research/nln_laerdal/instruments.htm).

Educational practice preferences: Educational practices score on a learning subscale of perceptions towards current instructional methods using the Educational Practices Questionnaire (http://www.nln.org/research/nln_laerdal/instruments.htm).

Assumptions

This study was guided by the following assumptions:

- The increasingly complex health care environment requires nurse educators to evaluate teaching strategies to best prepare nursing students.
- Engagement in active-learning teaching strategies enhances nursing student learning.
- Active-learning teaching strategies focused on patient care scenarios help prepare nursing students to care for patients by enhancing critical thinking skills and knowledge.
- Nursing student performance of nursing interventions requires critical thinking skills and demonstrates application of knowledge.
- The benefit of using high-fidelity simulation on performance outcomes of nursing students is unknown.

Delimitations

This study narrowly focused on a sample of second-semester nursing students at the University of Iowa College of Nursing for convenience to access a large number (86) of students per class and the innovative nursing high-fidelity simulation laboratory.

An experimental posttest only design was used for this study to evaluate the effects of three active-learning teaching strategies on the measured outcomes of student performance and retention of nursing intervention activities for treatment of a patient with cardiovascular disease in a particular case scenario. A cardiac test prior to the teaching strategies served as a potential covariate to control for differences in the knowledge level of the three groups. However, because the cardiac test was a knowledge-based test and the posttest was a performance-based outcome assessment, instrumentation precluded the applicability of a pretest-posttest design in this study.

Limitations

The study used a convenience sample of second-semester nursing students at the University of Iowa College of Nursing and an experimental posttest-only design. Nursing students were randomly assigned to one of the three active-learning teaching strategies to strengthen the study design and minimize limitations. The use of a nonprobability convenience sample can potentially threaten external validity and limit the generalizability of findings to similar-level students at a similar-type of university (McMillan & Schumacher, 2001). Despite random assignment of students to groups, there still may be selection threats to internal validity, such as differences between subjects in the groups (McMillan & Schumacher, 2001). Therefore, the study used a cardiac knowledge test prior to implementing the teaching strategies to assess whether there were differences in the groups and to control for this type of variance.

Several other techniques were also incorporated to reduce extraneous variance, minimizing threats to internal validity and strengthening the study design, such as random assignment of students to groups and standardization of the teaching strategies, scenarios, scripts, and individual performance demonstration procedures. One researcher implemented all three active-learning teaching strategies to ensure consistency.

A threat to internal validity, diffusion of treatment may occur because students were in the same nursing course. Students in different teaching strategy sessions could share their learning insights with other students in the study. Students were asked to sign a confidentiality statement at the beginning of the study in an attempt to minimize this threat. The teaching strategies were conducted from 8:00 a.m. to 5:00 p.m. because of the numbers of participating students. The inability to hold the time of day constant for the study may increase extraneous variance and constitute a potential threat to internal validity (McMillan & Schumacher, 2001).

Quantitative measurement of students' performance of nursing intervention activities poses a potential limitation. Students' performance was measured using the

Student Performance Demonstration Rubric, which incorporated low-inference behaviors. Low-inference behaviors mean that each rubric item addresses one separate and distinct behavior, requiring little judgment to consistently rate behaviors. The researcher observing each student's digitally recorded DVD sees and hears specific behaviors to score the rubric. Although the reliability and validity of measurement for low-inference behaviors is high, the potential exists for difficulty scoring some behaviors unless students state out loud what they are doing in implementing nursing interventions.

Another potential limitation of the study relates to the length and strength of the teaching strategy to impact student learning. The teaching strategy sessions were 90-minutes and included three or four students per group allowing each student to have an intensive learning experience. A review of the nursing research on high-fidelity simulation revealed teaching strategies ranged from thirty minutes to four hours and four to eight students per group (Engum et al., 2003; Griggs, 2002; Jeffries et al., 2003; Jeffries & Rizzolo, 2006; Ravert, 2004; Scherer et al., 2007).

The extraneous variable of student growth as the semester progresses creates a potential limitation to the study. Maturation is defined as changes in subjects of a study over time (McMillan & Schumacher, 2001). Students' ability to learn how to perform nursing interventions occurs over time, which makes it difficult to determine if differences between groups are due to the teaching strategy or to maturation over time. Comparison of data from the three teaching strategy groups provided some insight into the extraneous factor of maturation over time.

Conclusion

In summary, educators work diligently to engage nursing students in active learning to adequately prepare them to face the challenges of the complex health care arena. This study focused on examining the differences in performance and retention of performance of nursing intervention activities among students who participated in three

active-learning teaching strategies: case-based learning, simulation, and simulation with narrative pedagogy.

The next chapter elaborates on an extensive review of the literature. The literature review begins with engagement theory of student learning as an overarching theoretical framework for the study followed by literature on the teaching strategies (independent variables) used in this study, which were case-based learning, narrative pedagogy, and simulation. Studies similar to this research are presented, focusing more specifically on the relationship of independent variables and dependent variables.

Chapter 3 describes the research methodology including the research design, research questions, population and sample, instruments, data collection procedures, data analysis procedures, and limitations. Chapter 4 provides a description of the sample and presents the results of the study. The final chapter elaborates on discussion and conclusions from the research findings as well as implications for nursing education and nursing research.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

The increasingly complex healthcare environment challenges nurse educators to prepare students for practice in the real world. Educators work diligently to discover educational practices that engage nursing students in active learning of theoretical and practical content in the classroom, clinical laboratory, and clinical patient care settings. Yet there is little empirical evidence in nursing education as to the best strategies to engage and prepare students to critically think and perform nursing care. High-fidelity simulation is gaining popularity as a teaching strategy, yet is costly in purchasing equipment and training faculty. Educators want to know if simulation is effective in preparing students compared to traditional active-learning teaching strategies. The purpose of this experimental study is to determine what differences exist in three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on the outcomes of nursing student performance of intervention activities, performance retention of intervention activities, student satisfaction, self-confidence, and educational practice perceptions.

The overarching theoretical framework for this study is engagement theory of student learning. Student engagement and active-learning teaching strategies are important in developing knowledge. Chickering and Gamson's (1987) seven principles of good practice link the importance of relationships between the teacher, student, and educational practices to engagement in learning. The educational practices incorporated into this framework include active learning, feedback, student-faculty interaction, collaboration, high expectations, diverse learning, and time on task (Chickering & Gamson, 1987).

The literature review begins with engagement theory of student learning, followed by literature on teaching strategies of case-based learning, narrative pedagogy, and

simulation. High-fidelity simulation teaching strategy is an integral aspect of this study and is discussed in detail. Based on a critical analysis of the simulation research literature, a simulation teaching-learning framework is presented followed by research on simulation design characteristics and student outcomes of knowledge, critical thinking, skill performance, learner satisfaction, and self-confidence. Finally, the conclusion analytically summarizes major points and reviews central arguments for the study.

Engagement Theory

The scope of the literature review on engagement theory focuses on student engagement. Student engagement as a construct has two critical components (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2007; Kuh, Kinzie, Shu, & Whitt, 2005; Nelson Laird, Chen, & Kuh, 2008). The first component is the amount of time and effort students put into academic pursuits and educational activities. The second component is how the institution uses resources and faculty to create or organize learning environments that encourage students' active participation in educationally productive opportunities. The approaches to teaching and learning that faculty use to generate student engagement are of particular importance because (a) they represent faculty-teaching and student-learning behaviors that can be influenced and monitored, and (b) different active-learning teaching strategies constitute the primary treatment variables used in the present study. Engagement theory provides a foundation for the active-learning teaching strategies: case-based learning, simulation, and simulation using narrative pedagogy.

Many scholars contributed to the development of student engagement theory in higher education (Astin, 1984, 1993, 1999; Chickering & Gamson, 1987, 1999; Chickering, Gamson, & Barsil, 1989; Kuh, 2001, 2003, 2004; Kuh & Hu, 2001; Kuh et al., 2005; Kuh et al., 2007; Kuh, Pace, & Vesper, 1997; Pace, 1964, 1980). Pace (1964), an early pioneer in the area of understanding student engagement, focused attention on quality of student effort. He argued that students' effort and active participation rather than passivity in the learning process contributed positively to college outcomes (Pace,

1980). Similarly, Astin's (1984) student involvement theory centered on students' psychological and physical energy as well as on quality and quantity of time concentrated on academic pursuits. The level of student involvement in academics and investment in college experiences contributed to personal development and greater college success (Astin, 1984, 1993, 1999). More current research has reinforced earlier findings that the time and effort students apply to learning promotes the development of general cognitive skills, knowledge, and understanding (Pascarella & Terenzini, 2005).

Other important aspects of student engagement theory include institutional conditions and faculty-teaching behaviors. Kuh and colleagues (2007) described this best in their model that includes two dimensions: student behaviors and institutional conditions linked to student engagement. Kuh and others (2007) stated:

> Student behaviors include such aspects as the time and effort students put into their studies, interaction with faculty, and peer involvement. Institutional conditions include resources, educational policies, programs and practices, and structural features. At the intersection of student behaviors and institutional conditions is student engagement, which represents aspects of student behavior and institutional performance that colleges and universities can do something about, at least on the margins. (p. 11)

The authors emphasized that institutional environments that provide positive first year experiences, academic support, affirming campus environment, peer support, and interactive teaching and learning approaches enhance student engagement and success at college.

The research of Pascarella and Terenzini (2005) concurred that student engagement is a critical determinant of the impact of college; thus, institutions must facilitate creating environments that encourage student engagement. This can be accomplished by creating policies and practices that support student-friendly campus cultures, faculty-teaching behaviors, and student behaviors. Policies and practices that direct faculty and student behavior into educationally purposeful activities include extensive orientation programs, first-year experience programs, first-year seminars,

supportive student advising, and academic support services (Kuh et al., 2005; Kuh et al., 2007).

Institutions play a key role in supporting pedagogical practices that engage students such as teaching and learning approaches that incorporate active learning and classroom-based problem solving. Emphasis of teaching needs to focus on student learning. Additional institutional strategies include support of faculty student contact, peer interactions, and co-curricular activities that facilitate student engagement (Kuh et al., 2005; Kuh et al., 2007).

Nelson Laird and colleagues (2008) examined student engagement and faculty practices at institutions that had higher-than-expected persistence rates. They examined the results of the National Survey of Student Engagement (NSSE) and found institutions with better-than-expected persistence had " higher level of academic challenge and were viewed by students as more supportive, on average, compared to institutions with as-expected persistence rates" (p. 96). The better-than-expected institutions placed more emphasis on the social and collaborative aspects of learning including higher levels of active learning in the classroom and more collaboration on academic tasks in and out of the classroom. The authors emphasized, "active and collaborative learning practices are specially important in the first college year" (p. 96). The results from the Faculty Survey of Student Engagement (FSSE) revealed that at institutions with better-than-expected persistence rates, faculty teaching placed "more emphasis on all three essential learning outcomes: intellectual skills, practical skills, and individual and social responsibility" (p. 97). These learning outcomes focused on faculty engaging students in activities such as writing and speaking clearly, solving real life problems, and understanding people of other ethnic backgrounds. Faculty members play an essential role in engaging students through active learning and collaborative teaching strategies in the classroom.

Decades of research and collaboration exploring the components of engagement, including the time and effort students put into educational activities, the use of

institutional resources, and creative faculty teaching and learning approaches led Chickering and Gamson (1987) to write the "Seven Principles of Good Practice in Undergraduate Education" emphasizing pedagogies of engagement. The seven principles of good practice synthesized research from the American Association for Higher Education, the Education Commission of the States, the Johnson Foundation, and many others. These principles included using active-learning techniques, encouraging cooperation among students, giving prompt feedback to students, communicating high expectations, maintaining contact between faculty and students, respecting diverse ways of learning, and keeping a time-on-task focus (Chickering & Gamson, 1987). The seven principles were developed to identify practices, policies, institutional conditions, and faculty-teaching behaviors as well as to provide a set of research-based principles to improve undergraduate education (Chickering & Gamson, 1999; Gamson, 1991; Sorcinelli, 1991).

Educators' enthusiasm regarding Chickering and Gamson's (1987) seven principles led to the development of instruments and inventories, which incorporated examples and indicators of each of the principles to facilitate student assessments and research (Chickering et al., 1989; Chickering & Gamson, 1999; Gamson, 1991; Hatfield, 1995). Kuh, Pace, and Vesper (1997) built on the Chickering and Gamson's (1987) seven principles by empirically testing these principles as process indicators of baccalaureate student performance. The process indicators measured behaviors associated with desired outcomes of college and estimated the level of students' engagement in activities. In addition, these researchers developed the College Student Experiences Questionnaire containing indicators to measure the seven principles. Findings revealed that educational practices of active learning and cooperation among students were "the best predictors of gains from both women and men" in college (Kuh et al., 1997, p. 446).

Pace's (1980) concept of quality student effort, Astin's (1984) theory of student involvement, and Chickering and Gamson's (1987) seven principles of good practice

contributed to the development by Kuh and a team of researchers of the National Survey of Student Engagement (NSSE). The NSSE annual survey, well known to colleges and universities, was designed to assess the extent to which students actively engage in good educational practices and what they gain from their college experience (Kuh, 2001, 2003). The NSSE instrument offers institutions data regarding institutional performance based on five benchmarks related to student engagement. These benchmarks address the areas of academic challenge, active and collaborative learning, student-faculty interaction, enriching educational experiences, and supportive campus environments (National Survey of Student Engagement Annual Report, 2006). Administrators and educators have used the NSSE results to examine patterns of student educational behaviors and student-faculty interactions at their institutions to improve student learning.

Kuh (2004) emphasized engagement and good educational practices to help focus faculty and students on activities that are associated with higher levels of learning. The more students' study and practice writing, analyzing, and problem solving, the more skillful they become (Kuh, 2003). Implementing good educational practices into the curriculum encourages students to "put forth more effort…which will result in great gains in such areas as critical thinking, problem solving, effective communication, and responsible citizenship" (Kuh, 2004, p. 1).

Implementing institutional policies and practices and encouraging faculty to create student-centered learning environments are essential to engagement (Kuh et al., 2007). Institutional practices contribute to student engagement such as practices that focus on active learning (Chickering, 1991; Kuh et al., 2005; Kuh et al., 2007; Pascarella & Terenzini, 2005). Chickering and Gamson's (1987) "Seven Principles of Good Practice in Undergraduate Education" are known to be the best set of engagement indicators (Nelson Laird et al., 2008).

To better understand student engagement in learning, the following sections review and analyze the concepts and research associated with each of Chickering and Gamson's (1987) pivotal seven principles of good practice as well as related teaching-learning approaches that promote student success.

Active Learning

Active learning means becoming involved in learning. Chickering and Gamson (1987) argued that students' active learning is encouraged by faculty in the classroom through use of thought-provoking discussions and interactive team projects.

> Learning is not a spectator sport. Students do not learn much just by sitting in classes listening to teachers, memorizing pre-packed assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, apply it to their daily lives. They must make what they learn part of themselves. (Chickering & Gamson, 1987, p. 5)

Institutions that support active-learning educational practices report higher student grades and student self reported educational gains (Kuh et al., 2007; National Survey of Student Engagement, 2006; Pascarella & Terenzini, 2005). Nelson Laird and colleague's (2008) research on student engagement and faculty practices revealed that faculty implementation of active-learning teaching strategies in the classroom, such as activities requiring higher-order thinking skills, led to higher student success and persistence rates at the institution. Faculty-initiated active-learning teaching strategies involve students' doing and thinking (Bonwell & Eison, 1991). Opportunities that enhance active learning include analysis, synthesis, evaluation, collaboration, problem solving, and creative work group experiences (Chickering, 2003; Chickering & Kytle, 1999; Chickering & Stamm, 2002;). Transforming students from passive to active learners is important because critical thinking skills increase and significant learning begins with learners' active engagement with real world problems (Bean, 1996).

Students and faculty need to be open to active learning. "Students need to come into a college or university with an attitude of becoming an active part of the intellectual

community….Faculty need to examine their assumptions to create active-learning communities in their classes" (Brown & Ellison, 1995, p. 42). In order to maximize active-learning interactions, students need thorough class preparation and willingness to share ideas to learn from each other (Chickering, 2000). Students learn more when they are involved in their education, actively thinking about and applying what they are learning, as well as asking questions in class and contributing to class discussions (Carini, Kuh, & Klein, 2006). According to Pascarella and Terenzini, (2005), research on the impact of knowledge acquisition and a student's level of academic effort suggests that "the more the student is psychologically engaged in activities and tasks that reinforce and extend the formal academic experience, the more he or she will learn" (p. 119). The more students are engaged in purposeful learning activities, the more successful they are at college.

Active-learning teaching strategies focus on students and their thinking about the subject matter (McKeachie & Svinicki, 2006). When faculty create learning environments and teaching strategies that place students at the center of learning, they create independent, autonomous, and enthusiastic learners who assume responsibility for their own learning. Classroom activities need to focus on actively building students' knowledge rather than allowing them to be passive recipients of information. Learning is more than memorizing facts; it is about understanding the content and developing knowledge (Weimer, 2002). The goal is to help students grow in their learning, which occurs when students relate new information to what they already know and work to organize the learning content. Active learning is typically more effective because students learn by being involved in their learning (Kuh et al., 2005).

McKeachie and Svinicki (2006) supported active-learning teaching strategies that focused on developing deeper learning by encouraging student communication such as student focused discussions, posing complex problems, and working in small groups. Additional active-learning strategies include case studies, writing (journals, application

papers, and essays), debate, discussion, and peer teaching (Brown & Ellison, 1995). Kuh and colleagues (2005) discovered that when faculty encourage students to analyze readings out loud during class, students learn the importance of critical thinking and examining arguments from multiple perspectives. The more students are engaged in a course, the more they learn.

Many health care educators are moving away from passive learning to active-learning teaching strategies. In the classroom, problem-based learning strategies are common for developing critical thinking skills (Ertmer & Russel, 1995; Thomas et al., 2001). Students work together in small groups analyzing a case while the faculty member serves as a facilitator of learning (Svinicki, 1999). Through active learning, students develop comprehensive thinking skills and integrate theoretical content related to professional practice (Thomas et al., 2001).

Instructional technology stimulates students' active learning and encompasses a wide variety of strategies such as instructional software used inside and outside the classroom, web-based assignments, online educational tutorials, and online courses (Kuh et al., 2007). Health care educators incorporate simulation instructional technology to mimic patients in the hospital environment (Seropian et al., 2004). High-fidelity simulation involves advanced technology of a large life-like computerized mannequin that replicates human responses such as eye blinking, chest movement with breathing, and audible heart sounds. The programmed mannequin is very realistic in simulating a patient. Students are able to apply knowledge by performing procedures, making clinical decisions, and critically thinking through a patient-care scenario in a safe setting (DeYoung, 2003; Billings & Halstead, 2005; Seropian et al., 2004). High-fidelity simulation helps prepare students for real life patient care.

Nursing education incorporates active learning in the classroom, laboratory, and clinical settings. The classroom offers many opportunities for active learning such as students telling personal stories of patient care or the use of case-based learning that

relates to theory. The laboratory setting allows students to practice assessments and clinical nursing skills under the guidance of faculty in a mock hospital environment. High-fidelity simulation takes active learning in the lab a step further to replicate life-like patient care experiences. The hospital or community clinical setting is where students "put it all together" in making connections between theory and practice by caring for real patients. All three settings facilitate active learning by helping students critically think about nursing care.

Collaboration

Chickering and Gamson (1987) encouraged collaboration and cooperation among students because working with others increases involvement in learning, "sharpens thinking and deepens learning" through the team effort and collaboration (p. 4). Engagement involves faculty "encouraging cooperation among students, creating strategies that provoke active learning, helping students set high expectations, and responding effectively to all our students" (Chickering, 1991, p. 55). Gamson (1994) explored the evolution of collaborative learning from its inception during late 1960s to the early 1990s. She described cooperative and collaborative learning as faculty implementing important interactive teaching strategies that encourage students to work together to advance learning.

Barkley, Cross, and Major (2005) differentiated cooperative and collaborative learning. Cooperative learning involves the use of small groups, which allow students to work together to maximize learning. The primary goal is for students to support one another in sharing information and finding solutions. "In cooperative learning, the teacher retains the traditional dual role of subject matter expert and authority in the classroom" (Barkley et al., 2005, p. 5). Collaborative learning involves students and faculty working together to build knowledge. The goal is to develop students' independent thinking. "The teacher's responsibility is to become a member, along with students, of a community in search of knowledge" (p. 6). Two essential components of collaborative learning in

higher education include all students actively engaging and working together toward the learning objectives and meaningful student learning, which increases their depth of understanding (Barkley et al., 2005).

The role of faculty is crucial in creating and maintaining cooperative learning environments. “Promoting cooperation involves more planning, more attention to individual learning needs, more emphasis on the instructor as a resource person than would be the case in more traditional lecture courses” (Hatfield & Hatfield, 1995, p. 25). Research has shown that faculty members who structure in-class assignments that encourage students to actively collaborate with other students increases engagement and leads to higher student success and persistence rates at the institution (Nelson Laird et al., 2008). Additional examples of collaboration include faculty encouraging students to work with classmates to prepare assignments, projects and presentations, and discussing ideas from reading outside of class (Carini et al., 2006).

Kuh and colleagues (2005) studied colleges and universities using active and collaborative learning to engage students and found that arranging students into small discussion groups allowed students to critically analyze their own work and the work of their peers, which placed them at the center of their learning experience. Students’ positive correlation between academic and social involvement as well as exposure to collaborative teaching strategies contributes to students’ personal development and positive outcomes (Kuh et al., 2007; Pascarella &Terenzini, 1991, 2005; Pace, 1980). Educators should not underestimate the value of students helping their peers to learn.

Astin’s (1993) longitudinal study, surveying more than 4,000 students in four-year colleges and universities (in 1985 and 1989), revealed that student-to-student interactions, such as discussing course content and working on group projects for classes, had positive correlations with knowledge of a field, analytical and problem-solving skills, and critical thinking skills. Interestingly, the positive impact of peer involvement persists even when controlling for students’ level of academic effort. Astin (1993) also asserted

that peer groups strongly impact student growth and development during the college years.

Nursing education centers on collaboration. Collaborative learning strategies in nursing education promote students' critical thinking skills (Billings & Halstead, 2005). Nursing students commonly work together in the classroom, laboratory, and clinical settings with the common goal of integrating theory and practice. These active-learning environments allow students and faculty to collaborate in discussions, problem solving, and critical thinking to build knowledge related to comprehensive nursing care. Students and faculty learn from each other, solving clinical problems and critiquing each other's thinking.

Feedback

The classroom provides students with frequent opportunities to share their thinking and receive prompt feedback from professors, which validates what students know and do not know and enhances learning (Chickering & Gamson, 1987). Prompt verbal and written feedback from faculty throughout a course allows students to benefit from the information and leads to higher student achievement and satisfaction (Johnson, Johnson, & Smith, 1990).

Faculty feedback to students commonly occurs through written comments on paper assignments. In a qualitative study, Dohrer (1991) interviewed students about faculty comments on written papers. Students revealed the importance of understanding the goal of the writing assignment and that faculty comments should focus on assisting them to meet the writing goal. Faculty comments need to offer specific suggestions to improve the paper rather than broad comments such as "reword" or "rewrite." Benson and colleagues' (1995) work also supported research findings that students learn more when feedback provides specific examples on how to improve.

Educators use feedback as a way of providing students with additional teaching moments and to excite them about learning. According to Kuh and colleagues (2005),

prompt feedback improves learning by providing students with guidance and information to ensure that their learning is on track. Feedback also motivates students to do their best and not just meet minimum requirements, which is accomplished through encouraging and constructive feedback.

Feedback from other students promotes learning. “By having students provide feedback on each others’ work, students sharpened their own critical thinking skills, as well as their ability to articulate feedback in an appropriate manner” (Benson, Mattson, & Adler, p. 58). The authors also stated that students learn to revaluate their own work by providing feedback to others.

Student learning is enhanced by timely and descriptive faculty feedback (Billson & Tiberius, 1991) as well as by providing positive and negative feedback (Brinko, 1993). In nursing education, written and verbal feedback is given to students in the classroom, laboratory, and clinical setting to help them integrate theory and practice. Educators provide feedback to validate students’ thinking regarding nursing care. When students provide thoughtful answers regarding a question, immediate feedback confirms their thinking and learning.

High Expectations

Communicating high expectations for classroom preparation enhances students’ interactions and critical thinking (Chickering & Gamson, 1987; Diekelmann, 2001). Kuh and colleagues (2005) reported that institutional high expectations for academic excellence provides the foundation for creating a campus that values and rewards academic achievement. “When faculty members expect students to perform at high levels and support their efforts to meet their high standards, students generally strive to rise to the occasion” (p. 178). Creating high expectations, intellectually challenging academic assignments, and then holding students accountable for learning enhances student success (Kuh et al., 2007).

High expectations from faculty include expecting students to exert extra effort. When students are expected to work hard, academic achievement and responsibility levels increase (Kuh et al., 2007; Pascarella & Terenzini, 2005). High expectations need to be accompanied by faculty providing steps to help students achieve. Scott and Tobe (1995) stated:

> While the most important step is the creation of a classroom climate that encourages success, essential steps include the articulation of clear expectations of student performance, allowing assignments to be tailored to meet specific needs and interests, modeling excellent work, providing feedback on works in progress, accepting mistakes, and celebrating successes. All of these steps contribute to the achievement of high expectations by all students, while at the same time encouraging cooperation, fostering motivation, and respecting the diverse talents of the classmates. (p. 81)

Clear communication of expectations, assignments, and learning activities can motivate students to strive for academic excellence (Lowman, 1995). The more that is expected of students, the higher they perform (Chickering, 1991; Chickering & Gamson, 1987). Yet high expectations alone will not necessarily result in high student achievement. Students' talent, motivation, and experience must also be present for achievement (Scott & Tobe, 1995).

In nursing education, faculty communicate high standards and expectations to students at the beginning of the course through their course syllabi, objectives, and assignments (DeYoung, 2003). Faculty also use active-learning teaching strategies in the classroom, laboratory, and clinical setting to enhance students' critical thinking. Realistic case examples help students apply theory learned in the classroom to care of patients in the clinical setting.

Student-Faculty Interactions

Maintaining contact between faculty and students engages students. Chickering and Gamson (1987) stated that student interaction with faculty in the classroom (and outside the classroom) is important in motivating and involving students, which improves learning and intellectual commitment. According to Sturnick and Conners (1995),

institutions play an important role in student-faculty interactions by structuring buildings that accommodate lounge areas, offices with space for additional chairs, and dining areas open to faculty and students. Institutions can create environments that support academic and co-curricular activities outside the classroom to enhance student-faculty interactions (Kuh et al., 2007).

Numerous researchers have confirmed the benefits of student learning that occurs from student-faculty interaction (Astin, 1993; Bean, 1996; Kuh, 2001, 2003, 2006; Pascarella, 1985; Pascarella & Terenzini, 2005). Kuh and colleague's (2005) study found meaningful interactions between student and faculty essential to high-quality learning experiences such as discussing readings, assignments, grades, research projects, and career plans. Informal student-faculty interaction, such as collaborating on a research project with a faculty member, working together outside of the classroom, or interacting with faculty on committees, positively impacted student learning (Astin, 1993; Kuh, 2003; Kuh & Hu, 2001).

Increased student-faculty interactions outside of the classroom contribute to higher academic achievement (Pascarella, 1980), especially interaction with an intellectual or substantive focus (Kuh & Hu, 2001; Pascarella &Terenzini, 1991, 2005). Student-faculty interactions involve faculty members being responsive to students' educational needs and career interests and helping them "develop as independent thinkers and problem solvers" (Kuh et al., 2005, p. 207). Other essential components of successful student-faculty interaction include open dialogue and communication of mutual respect and responsibility (Billings & Halstead, 2005; Billson & Tiberius, 1991).

Astin's (1993) study revealed that overall student-faculty interaction has strong positive correlations with quality of instruction, satisfaction with faculty, college GPA, degree attainment, and self-reported intellectual and personal growth. In addition Kuh and colleagues (2007) stated:

> Student-faculty interaction is important because it encourages students to devote greater effort to other educationally purposeful activities… Perhaps meeting and talking with faculty members empowers students to do more than they think they can and helps validate them as full members of the campus community, which in turn legitimates their presence and makes them more comfortable to reach out and become engaged in a variety of activities. (p. 57)

Kuh and Hu's (2001) study of 55,000 full-time undergraduates, who completed the College Student Experiences Questionnaire between 1990 and 1997, found that (a) student-faculty interaction increased from first year through senior year and (b) these interactions had positive effects on the quality of students' efforts and engagement. The study also reported that students who spent more time studying and were well prepared had more interaction with faculty. In a recent study, effective teaching and interaction with faculty had a significant positive effect on critical thinking skills, reading comprehension, openness to diversity and challenge, and academic success (Cruce, Wolniak, Seifert, & Pascarella, 2006). Student-faculty interaction promotes powerful mechanisms to involve students and improve their academic performance (Astin, 1999).

Research also has shown that students are more likely to persist in college when student-faculty interactions occur. Bean's (1980) research revealed that students who participated in campus activities and interacted with faculty were more apt to stay at the institution. Student-faculty interactions improve confidence in learning. According to Upcraft (1996), many college students appear to lack confidence in their ability to learn, but faculty encouragement turns students' self-doubt into academic success.

Developing students' ability to think is improved through student-faculty interactions. Student-faculty interactions are enhanced when faculty engage and challenge students to use "higher-order thinking in real-world application" (Chism, 2002, p. 144). Higher-order thinking occurs through the use of critical questioning, decision-making exercises, and creative activities. Student thinking grows when faculty share their thinking process. Clinchy (2000) stated:

> Faculty are needed who are willing to share the *process* as well as the product of their thinking, teachers who are not afraid to think out loud and change their

> minds in public, teachers who ask 'real questions' that invite students to say what they think rather than demonstrate what they know. (p. 33)

Students value student-faculty interactions. These interactions are enhanced when faculty members are knowledgeable and enthusiastic and encourage students to express their views (McKeachie & Svinicki, 2006; Pascarella, 1980; Sternick & Conner, 1995). Lowman (1995) examined student ratings to determine what constitutes masterful teaching and uncovered the importance of student-faculty interactions. Student ratings reflect the quality of interpersonal relationships between faculty and students. The degree to which faculty develop rapport with students and demonstrate concern about their learning positively influences students' ratings of faculty. Student-faculty interactions are enhanced when faculty display a strong sense of presence, energy, and enthusiasm towards students' learning. Students respond well to faculty who stimulate their intellectual activity and aid their understanding of abstract concepts by linking relevance to their life. Faculty's' ability to acknowledge students' feelings regarding class assignments and to encourage expression of their feelings and personal viewpoints increases interpersonal rapport (Lowman, 1995).

The results of these studies reinforce the importance of student-faculty interaction for students' high-quality learning experiences, academic achievement, course satisfaction, personal growth, persistence in college, and improved higher-order thinking in learning. Students benefit from feeling connected with faculty. Nursing students' connected feelings with faculty are equally as important. Nursing education promotes student-faculty interaction through individual and small group discussions in the classroom, laboratory, and clinical setting, which focus on developing students' critical thinking skills related to providing patient care.

Diverse Learning

Faculty accommodate diverse styles of learning by tailoring learning activities that build on students' individual knowledge and skill (Chickering, 2006). "People bring different talents and style of learning to college" (Chickering & Gamson, 1987, p. 6).

Institutions can support diverse learning through institutional goals that nurture diverse talents and ways of learning (Kuh et al., 2007). The organizational culture and characteristics of faculty and staff need to reflect diversity. “The effective institution purposefully seeks out a diverse student body, faculty, and staff” (Lidman, Smith, & Purce, 1995, p. 97). Diverse learning occurs from creative academic programming that nurtures a variety of experiences and allows students to display their knowledge in a variety of ways.

Kuh and colleagues (2005) reported that active and collaborative learning approaches, such as projects and portfolios, allow students to demonstrate what they know and can do in creative ways. Incorporating diverse learning styles encourages students to use their prior knowledge and empowers them as learners. “Valuing students’ prior knowledge is a bridge to connecting students to the curriculum and to help them make meaning of their educational experience” (Kuh et al., 2005, p. 205).

Diversity among students includes age, gender, social economic status, race, ethnicity, religion, and cultural background (Chism, 2002). Student diversity and generational influences impact learning. McGlynn (2007) described students from the Millennial generation (1982-2002) as being technologically savvy, accustomed to getting what they want, preferring group activities, believing that “doing” is important, expecting service around the clock with no tolerance for delays, and able to multitask when balancing school, work, and personal life. The wide variety of student characteristics are challenging to educators. Teaching styles need to incorporate an array of active-learning strategies to meet diverse students’ needs.

Students are also diverse in their styles of learning. Diverse perspectives in the classroom using interactive teaching strategies such as small-group discussions and role playing helps to meet different learning styles (Kuh et al., 2007). Some students may learn best visually, kinesthetically, or by auditory mechanisms. Richardson (2005) described the importance of faculty awareness of students’ learning styles to assist in

developing a variety of teaching strategies to meet students' needs. Nursing education offers a variety of active-learning teaching strategies such as case studies, simulation, and sharing of stories related to patient care that incorporate a variety of styles to facilitate learning (DeYoung, 2003).

Time on Task

Chickering and Gamson (1987) maintained that keeping a time-on-task focus is important to learning because it encourages individuals to use their time well and learn effective time management skills. Astin's (1993) research found that hours spent studying are positively related to academic development, self-reported increases in cognitive and affective skills, personal characteristics of scholarship, and graduating. He stated, "Studying and doing homework has stronger and more widespread positive effects than almost any other involvement measure" (p. 376). From the teaching perspective, Kuh and colleagues (2005) recommended that to foster students' success, faculty must make time to facilitate learning.

Faculty play a key role in assisting students with time management. Students need guidance in learning to allocate realistic amounts of time to increase efficiency and eliminate wasting valuable time. One way to do this is by helping students see the relevance of the course content and providing clear goals to be accomplished during class. Students also need guidance with study skills. Vorkink (1995) stated:

> To promote optimal use of time on task outside the classroom, instructors should provide suggestions on the best way to study the material, identify resources which might be of assistance, be specific in terms of what should be accomplished by the next class meeting, and break down large projects into smaller tasks with intermediate deadlines which are perceived by students as being more manageable. (p. 69)

Students encounter many barriers to time management such as involvement with families, work, and other social activities. According to DeYoung (2003), faculty can assist students in budgeting their time by providing a syllabus, course calendar, and clear directions on assignments to help define expectations. Nursing educators' value helping

students with efficient use of time because of the demanding nature of nursing curriculums. Nursing students must be able to think critically and provide competent patient care upon graduation. Thus, according to Chickering's (1991) philosophy, time plus energy equal learning fits well in nursing education. Active learners, who spend more time on assignments and readings, experience higher levels of learning.

Summary of Engagement

In summary, education scholars have reinforced the importance of engagement theory. Engaged students learn more and are more likely to succeed in college (Astin, 1984, 1993, 1999; Kuh, 2001, 2003, 2004, 2006; Kuh & Hu, 2001; Kuh et al., 1997; Pace, 1980). Students' time and effort towards academic pursuits are crucial to learning. Institutions also play a fundamental role in using resources and supporting faculty to create pedagogical practices that encourage students' active participation in educationally productive opportunities (Kuh et al., 2007; Pascarella & Terenzini, 2005). Faculty members creatively implement teaching and learning approaches that incorporate active learning and classroom-based problem solving to engage students in learning (Kuh et al., 2005; Nelson Laird et al., 2008; Pascarella & Terenzini, 2005). Student behaviors and institutional conditions envelop student engagement (see Figure 1).

Figure 1. Student Engagement

Student Behaviors • Study Habits • Peer Involvement • Interaction with Faculty • Time on Task	Student Engagement	Institutional conditions • First Year Experience • Academic Support • Campus Environment • Peer Support • Faculty Teaching & Learning Approaches

Adapted from "Piecing Together the Student Success Puzzle: Research, Propositions, and Recommendations," by Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C., 2007, *ASHE Higher Education Report, 32*(5), p. 44.

Student engagement includes actively pursuing new and useful sources for learning, collaborating with peers in learning activities, initiating interactions with faculty members, obtaining feedback, communicating high expectations, embracing diverse ways of learning, and engaging in time-on-task study skills (Chickering & Gamson, 1987). Chickering and Gamson's principles of good practice mesh well with nursing education. Nursing educators seek active-learning teaching strategies to engage students. The complex health care environment reinforces the need for nursing students to be able to critically think and be ready to provide nursing care to acutely ill patients upon graduation. The more students engage in active learning, the more they learn. Engagement theory and active learning provide the foundation for the active-learning teaching strategies of case-based learning, simulation, and simulation using narrative pedagogy that are used in this study.

Independent Variables

The purpose of this study was to determine if there were differences in active-learning teaching strategies (case-based learning, simulation with narrative pedagogy and simulation) on the outcomes of nursing student performance of intervention activities, performance retention of intervention activities, student satisfaction, self-confidence, and educational practice perceptions.

Case-Based Learning Teaching Strategy

Case-based instruction is a teaching strategy in which students engage in classroom learning and actively solve complex problems similar to those confronted in the clinical practice world of health care professionals (Ertmer & Russel, 1995). According to Svinicki (1999), problem-based learners are required "to solve problems that are similar in nature and complexity to the real thing" (p. 15). The problems are multifaceted and require knowledge to develop solutions. The main focus is on students' thinking and problem-solving processes (Svinicki, 1999). Students work collaboratively in groups analyzing the case while faculty members serve as facilitators of learning. The

focus is to help students develop critical thinking and integrate theoretical content related to professional practice (Ertmer & Russel, 1995; Svinicki, 1999; Thomas et al., 2001).

According to DeYoung (2003), case-based learning in nursing education begins with students reading a complex healthcare case scenario followed by students answering a series of open-ended critical thinking questions. Students analyze important assessment data from the scenario. They draw from prior nursing and science theories related to the subject matter of the case in order to integrate and synthesize the information into meaningful data and gain an understanding of the problem. Analysis of a case provides opportunities for students to examine the interrelationships of multiple phenomena and develop creative approaches to solving patient care dilemmas. Faculty members provide constructive feedback to students regarding discussions. Classroom strategies vary from all students working together to students working in smaller subset groups of three or four for a specified time, and then returning to the large group for the remaining time. Ertmer and Russel (1995) stated that the advantage of this teaching strategy is the opportunity for students to perform in-depth analysis and apply critical thinking skills related to realistic complex patient care situations in a safe environment.

Nursing studies on case-based teaching strategy have revealed multiple learning benefits. Thomas and colleagues (2001) found that case-based learning contributed to improved organization of information, increased clinical reasoning skills, and enhanced student confidence of advanced practice psychiatric nursing students. DeMarco, Hayward, and Lynch's (2002) qualitative study evaluated the experiences of senior-level nursing students using case-based learning. Six thematic groupings emerged from student experiences using case-based instruction: in-depth information processing, working collaboratively, learning, knowledge development, self-reflection, and achieving greater cognitive gain by working together.

Case-based learning is also a common teaching strategy in medical school. Ferguson (2006) implemented case-based learning by presenting details of a patient's

condition. Students openly discussed pertinent physical findings and laboratory results related to the condition. Students also wrote a one-page handwritten essay on how to respond to the patient in the scenario regarding the medical condition, results of tests, treatment plan, and what to expect in the next 5 years living with the illness. Students rated the case-based teaching strategy as favorable in the end-of-course evaluations. In a separate study, a group of medical students using case-based learning sessions experienced improved preparation and highly rated the teaching strategy compared to students in the traditional teaching strategy of independently reading the required course book (Waydhas, Taeger, Zettl, Oberbeck, & Nast-Kolb, 2004).

In summary, case-based learning is a common teaching strategy used in health care and nursing education that engages students in active classroom learning. This teaching strategy is well-grounded in engagement theory of learning and incorporates all of Chickering and Gamson's (1987) seven principles of active learning, collaboration with peers, obtaining feedback on discussions, high expectations of learning the content, student-faculty interactions, diverse learning style, and time on task of focusing on quality learning discussions. Nursing educators use case-based learning to help build nursing knowledge and prepare students for real life practice in complex health care environments. It is imperative that nursing students be able to critically think and be ready to provide nursing care to acutely ill patients upon graduation. Case-based learning is one of the three active-learning teaching strategies in this study.

Narrative Pedagogy Teaching Strategy

Narrative pedagogy, developed by Nancy Diekelmann, is a teaching strategy used in nursing education that centers on the shared experiences of students, teachers, and clinicians (Diekelmann, 1993, 2001). According to Diekelmann, this pedagogical approach was derived from interpretive pedagogies (i.e., feminist, critical, postmodern, and phenomenological) and encourages a shift from content and fact-based teaching to learning as a process of thinking and listening through mutual interaction of students and

faculty. “Interpretive pedagogies focus on exploring, deconstructing, and critiquing experiences” as well as empowering students to construct new knowledge (Billings & Halstead, 2005, p. 216).

Narrative pedagogy evolved as a teaching strategy from interpretive phenomenology research methods. Diekelmann (1993, 2001) interviewed teachers and students, then used interpretive phenomenology to analyze their experiences to identify recurring themes, and discovered that students and teachers were more alike than different in learning from experiences. Learning occurred from sharing, analyzing, and interpreting stories related to nursing care experiences.

Narrative pedagogy allows students and teachers to explore the meaning and significance of their common experiences. This teaching strategy focuses on converging conversations that are unending and self-reflective in exploring and interpreting narratives (stories) on experiences in nursing practice and nursing education. Students actively engage in the learning process through sharing stories about their lived experiences or patients’ lived experiences (Diekelmann, 1993, 2001; Diekelmann & Diekelmann, 2002).

The use of narratives helps build an understanding of phenomena and offers many perspectives to examine problems related to the care of patients and families, which helps prepare students for real-life patient interactions. Using narrative pedagogy in the classroom involves a “shift to critiquing, examining, exploring, and deconstructing the experiences experienced by students for their meanings and learning” (Diekelmann, 2001, p. 54). Students play an active role in the classroom through telling stories and determining meaning from the information. Faculty members synthesize difficult information, provide learning examples, and use open-ended and probing questions to help students integrate themes from the stories and explore alternative approaches to examine problems to gain more in-depth understanding. The role of nursing education is not to facilitate memorization of facts but to help students think about the meaning of

nursing phenomenon and experiences in nursing practice (Diekelmann, 1993, 2001, 2003).

Nursing research on narrative pedagogy using interpretive phenomenology methods has described the common experiences and shared meanings of teachers and students (Andrews et al., 2001; Diekelmann, 1993, 2001; Ironside, 2003a, 2003b, 2006; Scheckel & Ironside, 2006). Thematic analysis of student interviews has explored the meaning and significance of their common learning experiences. Researchers have discovered that students persistently question the meaning and significance of learning experiences (Andrews et al., 2001; Diekelmann, 1993, 2001; Ironside, 2003a, 2003b, 2006; Scheckel & Ironside, 2006) as well as develop interpretive thinking through sharing analytical, reflective, multi-perspective, and contextual thinking related to nursing care experiences (Ironside, 2003a, 2006; Scheckel & Ironside, 2006). Students' thinking was reported to be open to new perspectives, and they explored the unknown when thinking was uncertain (Diekelmann, 1993, 2001; Ironside, 2003a, 2006; Scheckel & Ironside, 2006),

Researchers' thematic analysis of teacher interviews has explored the meaning and significance of their common experiences using narrative pedagogy. Teachers using narrative pedagogy as a teaching strategy have perceived educational differences compared to the traditional lecture teaching strategy. Diekelmann and colleagues discovered that teachers shifted the course structure from teacher centered to student centered and assisted students with becoming adept at thinking from multiple perspectives and to challenge their own assumptions. Teachers focused less on content and more on the process of thinking and created a comfortable environment conducive to learning and student participation (Andrews et al., 2001; Diekelmann, 1993, 2001; Ironside, 2003a, 2003b, 2006; Scheckel & Ironside, 2006). Teachers constructed open discussion, encouraged gathering information from stories, promoted persistent questioning, and facilitated students' interpretation and open mindedness to unlearning

and making new connections in uncovering the meaning of experiences (Andrews et al., 2001; Diekelmann, 2001; Ironside, 2006). Teachers using narrative pedagogy also engaged students in cultivating interpretive thinking to develop analytical, reflective, multi-perspective, and contextual thinking skills (Ironside, 2003a, 2006; Scheckel & Ironside, 2006).

To summarize, narrative pedagogy, similar to case-based learning, is consistent with an engagement theory of learning and incorporates all of Chickering and Gamson's (1987) seven principles of active learning, collaboration with peers, obtaining feedback on discussions, high expectations of learning the content, student-faculty interactions, diverse learning style, and time on task of focusing on quality learning discussions. Case-based learning focuses on a case scenario topic and on students answering pre-written open-ended critical thinking questions, whereas narrative pedagogy focuses on students sharing personal stories about their lived experiences or patients' lived experiences related to a specific topic. Teachers using narrative pedagogy use unscripted probing questions based on the story to help students think from multiple perspectives and gain an in-depth understanding of the topic. Narrative pedagogy focuses on perpetual conversation and self-reflection of students in exploring experiences to build critical thinking skills related to nursing care. Simulation combined with the narrative pedagogy teaching strategy is one of the three active-learning strategies in this study. Currently, there are no published studies incorporating narrative pedagogy and high-fidelity simulation.

Simulation Teaching Strategy

Simulation is an example of an active-learning teaching strategy used in nursing education for many years. It is defined as activities that mimic a clinical environment in which students have the opportunity to apply nursing knowledge by performing procedures, making clinical decisions, and critically thinking through a patient-care scenario in a safe setting (DeYoung, 2003; Billings & Halstead, 2005). Students

commonly use static mannequins to practice multiple skills. Technological advances in the last 10 years have transformed simulation of clinical practice to an entirely new arena. High-fidelity simulation mannequins use very realistic materials and equipment to represent elements of a clinical situation and life-like patient care experience.

High-fidelity simulation scenarios are highly engaging, involving student interactions with life-sized computerized mannequins that replicate human responses. The instructor-programmed mannequin displays signs and symptoms such as abnormal heart and lung sounds heard with a stethoscope. The monitoring screen connected to the mannequin displays abnormal electrocardiograph wave forms, heart rate, blood pressure, respiratory rate, and oxygen saturation readings. The instructor can quickly change these settings in response to the nursing interventions implemented by the student. The auditory and visual displays on the mannequin provide students with opportunities to assess life-like responses in a simulated experience. A connecting microphone allows the instructor to be the voice of the patient with sound resonating from the mannequin's mouth.

Until recently, most high-fidelity simulation nursing education literature has been anecdotal, with educators sharing strategies on designing and implementing simulation (Alinier, 2003; Bearnson & Wiker, 2005; Day, 2007; Feingold et al., 2004; Haskvitz & Koop, 2004; Medley, 2005; Rauen, 2004, Ravert, 2002; Rhodes & Curran, 2005; Rystedt & Lindstrom, 2001; Seropian et al., 2004). Because of the growing popularity of high fidelity simulation, the National League for Nursing in partnership with the Laerdal Corporation (NLN/Laerdal) developed a simulation teaching-learning framework to guide their collaborative multi-method, multi-site research project and future simulation research (Jeffries & Rizzolo, 2006). This framework is highly consistent with an engagement theory of learning, emerged from an extensive review of related empirical and theoretical literature, and incorporates Chickering and Gamson's (1987) seven principles of good practice (Jeffries, 2005).

In critically analyzing nursing research on high-fidelity simulation, this section of the literature review begins with a detailed description of the NLN/Laerdal simulation teaching-learning framework (Jeffries, 2005) followed by research incorporating this framework. Next, simulation literature on design characteristics and student outcomes of knowledge, critical thinking, skill performance, learner satisfaction, and self-confidence is presented.

Simulation Teaching-Learning Framework

The simulation teaching-learning framework builds on engagement theory and consists of overlapping relationships between the teacher, student, and educational practices. Educational practices are incorporated into the high-fidelity simulation teaching strategy and simulation design, which influences student outcomes of learning (knowledge), skill performance, critical thinking, learner satisfaction, and self-confidence (Jeffries, 2005).

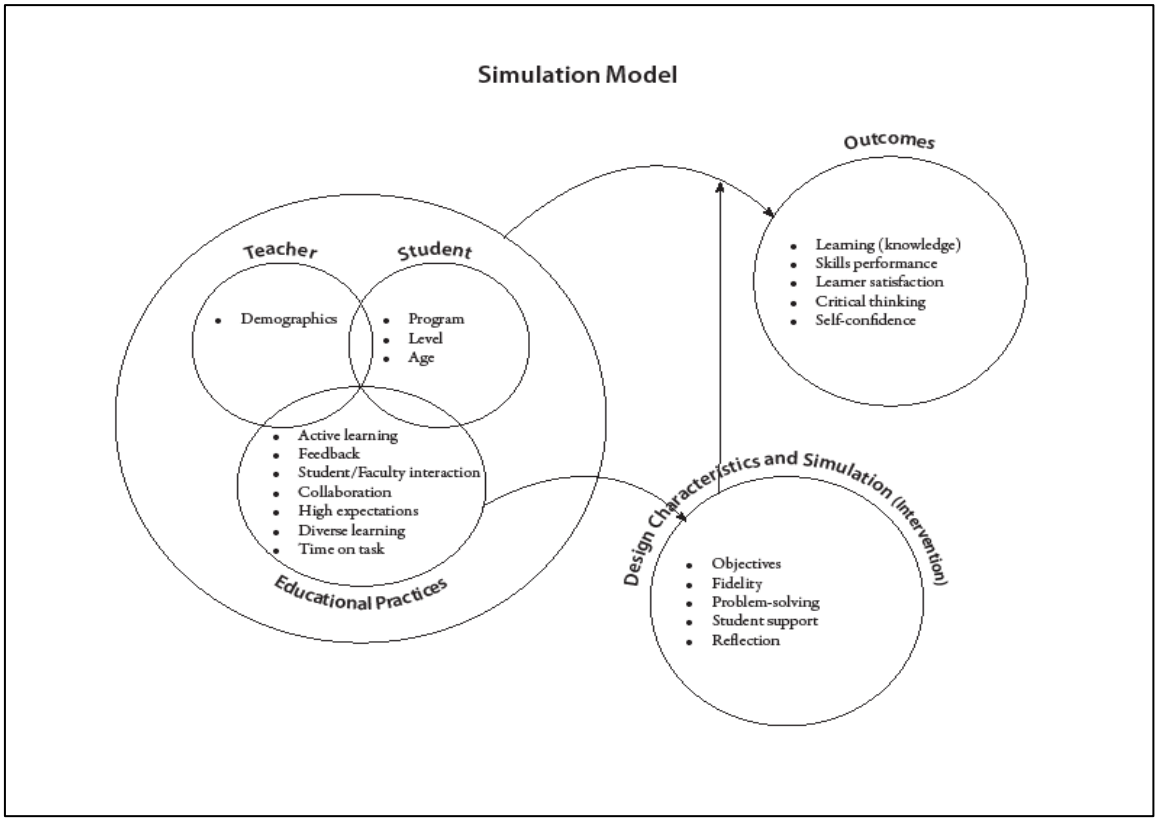
> The outcomes presented in the framework are proposed to be influenced by the degree to which best practices in education are incorporated in the design and implementation of the simulations. Effective teaching and learning using simulations are dependent on teacher and student interactions, expectations, and roles of each during these experiences. Thus, two components of the model are teacher factors and student factors. Successful learning from the use of simulation requires proper simulation design and the appropriate organization of students in the simulation. The final component of the model, which serves as the intervention in teaching-learning practices, is the simulation itself. (Jeffries, 2005, pp. 97-98)

Jeffries' (2005) teacher factors focus on student-centered instruction and playing the role of facilitator in the student's learning process. The teacher provides support to students throughout the simulation teaching strategy and reflection session. Student factors include active participation, self-direction and motivation during the simulation, and taking responsibility for their own learning (Jeffries, 2005).

The educational practices are based on Chickering and Gamson's (1987) seven principles of active learning, prompt feedback, student-faculty interaction, collaborative learning, high expectations, allowing diverse styles for learning, and time on task. The

use of high-fidelity simulation as a teaching strategy supports complex active learning by encouraging students to think critically and engage in the learning process (Jeffries, 2005).

Figure 2. Simulation Model



Adapted from "A Framework for Designing, Implementing, and Evaluating Simulations Used as Teaching Strategies in Nursing" by Jeffries, P. R., 2005, *Nursing Education Perspectives*, *26*(2), p. 97.

According to Jeffries (2005), simulation design characteristics include objectives, fidelity, problem solving, student support, and reflection. Clearly written *objectives* for the simulation experience help guide students' learning. The objectives need to match the students' knowledge and experience level. *Fidelity* or realism of the clinical simulation mimics reality to promote better learning outcomes. For example a programmed high-

fidelity simulation mannequin can mimic human physiological responses such as elevated heart rate and blood pressure in response to a heart attack. The *problem solving* and complexity of the simulation depends on the level of the student. Students early in the nursing program begin with simple simulation scenarios, which become more complex as their knowledge level advances. *Student support* occurs through use of *cues* to provide students with information on the next step or a suggestion on an appropriate clinical judgment in the simulation scenario. Students commonly need a hint to keep them from becoming "stranded" during the scenario. *Reflection* is "a valuable tool" that occurs at the end of the simulation scenario and encourages students to think in depth on the learning activity. The instructor helps students critically think through the scenario and link theory to practice. Positive aspects of the simulation and relevant teaching points are discussed during this time (Jeffries, 2005).

The final component of the NLN/Laerdal framework is student outcomes, which include knowledge, skill performance, critical thinking, learner satisfaction, and self-confidence (Jeffries, 2005). The aim of high-fidelity simulation research in nursing education is to show that greater *knowledge* is gained from simulation compared to other teaching strategies. Student's *skill performance* is an essential component of providing patient care. The use of high-fidelity simulation offers students an opportunity to develop performance skills without the risk of harming patients. Students' *critical thinking* is used in every patient care experience, such as integrating the patient's diagnosis with abnormal laboratory values and vital nursing cares. Learner *satisfaction* and *self-confidence* are also important outcomes. The simulation setting allows students to become comfortable with life-like patient situations and technology through repeated exposure and skill practice.

In summary, the NLN/Laerdal simulation teaching-learning framework provides a valuable empirically supported model to guide nursing research on the design, implementation, and evaluation of simulation teaching strategies. The model incorporates the teacher, student, educational practices, simulation teaching strategy, and student

outcomes, which are all important to conducting simulation research in an organized and systematic manner (Jeffries, 2005). Engagement theory and the NLN/Laerdal framework guide this study.

Research Incorporating the Simulation Teaching-Learning Framework

National League for Nursing in collaboration with the Laerdal Corporation implemented a 3-year collaborative multi-method, multi-site, national study to explore the use of high-fidelity simulation as a teaching strategy in nursing education (Jeffries & Rizzolo, 2006). Eight participating schools of nursing served as project sites during the four phases. During Phases I and II, eight Project Coordinators and one Project Director reviewed the simulation literature and developed the research design, identifying current best practices of teaching medical-surgical content. The researchers implemented simulation studies at the project sites to obtain reliability and validity data on the Educational Practices Questionnaire and the Simulation Design Scale constructed to measure the concepts in the simulation teaching-learning framework (Jeffries & Rizzolo, 2006).

During Phase III, Part 1, Year 2, the study focused on refining the research design. A total of 395 students at five sites "participated in the collection of baseline data regarding student satisfaction with the traditional (case study) teaching method, the educational practices used in the traditional classroom setting, and selected outcomes" (Jeffries & Rizzolo, 2006, p. 5). Students completed a 12-item multiple-choice pretest, followed by a 38-minute videotaped post-operative care lecture and simulation demonstration of care to a post-operative patient by an experienced teacher. After the videotaped lecture and demonstration, students completed a parallel form posttest on post-operative care content, Educational Practices Questionnaire, Satisfaction Scale (regarding the instructional format), and Self-Confidence Scale (perception of confidence in caring for a post-operative patient). Results revealed a significant gain in knowledge in

the traditional learning environment from pretest to posttest using a paired t-test ($p < .0001$). "High expectations" of learning was the educational practice that received the highest rating by students on the Educational Practices Questionnaire. Students rated the traditional teaching method as satisfying, and they identified confidence in their ability to provide care for a post-operative patient (Jeffries & Rizzolo, 2006).

Childs and Sepples (2006) implemented a study in conjunction with the NLN/Laerdal research project to test the reliability and validity of two instruments: Educational Practice Scale for Simulation (EPSS) and Simulation Design Scale (SDS). The EPSS used a 5-point scale in which students indicated the presence and importance of educational practices such as active learning, collaboration, diverse ways of learning, and high expectations that are present in learning activities. The SDS also used a 5-point scale and measured five design features including objectives, fidelity, problem solving, support, and feedback. Students completed the instruments after attending a cardiac arrhythmia lecture and participating in critical care scenarios using high-fidelity simulation followed by a reflection session. Results on the SDS revealed that students felt the objectives at the beginning of the simulation and feedback during the reflection session were the most important features in the simulations, followed closely by the level of problem solving complexity and fidelity. Feedback was also rated as most important on the EPSS instrument, followed closely by collaboration, active learning, high expectations, and diverse learning opportunities.

Childs and Sepples (2006) found the two instruments to be reliable and valid. The reliability and validity information was reported in the NLN/Laerdal summary report. Ten content experts established content validity for both instruments. EPSS reliability testing revealed a Cronbach's alpha of 0.86 for the presence of specific practices and 0.91 for the importance of specific practices. Cronbach's alpha reliability testing for the SDS was found to be 0.92 for presence of features and 0.96 for the importance of features

(Jeffries & Rizzolo, 2006). Reliable and valid instruments increased the strength of the NLN/Laerdal research studies.

During Phase III, Part 2 of the NLN/Laerdal study, researchers implemented a quasi-experimental design involving 357 students enrolled in their first medical-surgical course at six project sites. Students were randomly assigned to one of three groups: paper-pencil case study, static mannequin, and high-fidelity simulation mannequin. Students completed a pre-test, viewed a videotaped lecture, and then participated in their assigned teaching strategy group and reflection session. Students completed the following instruments: Posttest on post-operative care content, SDS, EPSS, Satisfaction and Self-Confidence Scale, and Performance Rating Scale.

Jeffries and Rizzolo (2006) reported no significant differences in pretest and posttest knowledge gain and perceived performance ratings among the three groups. The SDS results revealed that the high-fidelity simulation mannequin group felt a higher degree of fidelity in the simulation than the other two groups. The case study group perceived receiving less feedback and problem-solving features than the other two groups. Analysis of EPSS data showed that the high-fidelity simulation group experienced more diverse ways of learning and rated diverse ways of learning as more important than the other two groups. The high-fidelity simulation group also perceived the presence of active learning to be more important and perceived higher levels of satisfaction with the teaching strategy and self-confidence in their ability to perform care.

Researchers want evidence to show that using high-fidelity simulation as a teaching strategy produces greater learning outcomes than traditional strategies. Yet the challenge is determining outcomes to measures. In regards to this measurement dilemma Jeffries and Rizzolo (2006) stated:

> The simulations were designed to give them [students] an opportunity to apply their knowledge. The focus of the learning with simulation should be directed toward synthesis and application of knowledge, rather than on new knowledge development, and new instruments need to be constructed to test application of knowledge (p. 7).

Researches continue to be challenged on how to construct tests to measure application of knowledge.

To date, no studies have compared to the rigor of Jeffries and Rizzolo's (2006) NLN/Laerdal 3-year multi-method, multi-site study, which contributed significantly to the exploration, implementation, and evaluation of using high-fidelity simulation as a teaching strategy in nursing education. Using the simulation teaching-learning framework to guide the 3-year study, refining the simulation case scenarios, and establishing instrument reliability and validity strengthened the study.

Howard (2007) implemented a study based on the NLN/Laerdal simulation teaching-learning framework. Howard used a quasi-experimental two-group pretest and posttest design to determine the effects of high-fidelity simulation teaching strategy on nursing student knowledge and critical thinking abilities related to medical-surgical content. A convenience sample of 49 senior-level traditional and second degree accelerated nursing students from a baccalaureate nursing program and a diploma program participated in the study. All students from both schools were required to participate in the Human Patient Simulator (HPS) educational intervention, including the videotaping, as part of the course. The aspect of the study involved students agreeing to complete the pretest and posttest developed by Health Education Systems, Incorporated (HESI). Students were randomly assigned to the control or the experimental group. The control group participated in an interactive case study and the experimental group in a high-fidelity simulation teaching strategy. Students in both groups took the pretest, then reviewed similar case scenarios and participated in their randomly assigned teaching strategy. Students in each group participated in a reflection session followed by the posttest HESI computer-based exam and group-specific survey (Simulation Evaluation Survey or Case Study Evaluation Survey).

According to Howard (2007), analysis of covariance (ANCOVA) revealed a significant difference with respect to knowledge gain using the HESI Conversion Score

(p =. 018) and HESI Scores (p =. 037), and a significant difference with respect to critical thinking ability using the Critical Thinking sub score (p =. 051), with the HPS group scoring significantly higher on the posttest. Students in the HPS experience were also significantly more positive when compared to the case study group with respect to the stimulation of critical thinking abilities (p =. 070), perceived value (p =. 001), the ability to transfer learning to the clinical setting (p =. 059), and understanding of concepts (p =. 010).

Howard's study was strengthened by the large sample size and random assignment of students to the control or the experimental groups. She incorporated rigor of expert review and pilot testing both the high-fidelity simulation and case study scenarios. Reliability was established on the parallel pretest and posttest developed by HESI to measure knowledge gain and critical thinking. The average difficulty level and reliability level was 0.70 and 0.93, respectively, for the pretest and 0.71 and 0.94, respectively, for the posttest (Howard, 2007).

In summary, the simulation teaching-learning framework guided Jeffries and Rizzolo's (2006) and Howard's (2007) studies. Howard (2007) is the first nurse researcher to find significant knowledge gain in nursing students using high-fidelity simulation. This study is significant because prior quasi-experimental research has not demonstrated knowledge gain from using high-fidelity simulation teaching strategies compared to traditional teaching strategies (Engum et al., 2003; Griggs, 2002; Jeffries et al., 2003; Jeffries & Rizzolo, 2006; Ravert, 2004; Scherer et al., 2007). Continued research is needed to provide evidence that using high-fidelity simulation as a teaching strategy produces greater learning outcomes than traditional strategies. Jeffries and Rizzolo (2006) emphasized the importance of developing new instruments to test application of knowledge because simulation is designed to give students an opportunity to apply their knowledge. In response to these issues and recommendations, the focus of this dissertation is to use a rubric to measure students' performance of nursing

interventions. Measuring student performance is an attempt to measure application of knowledge.

Design Characteristics and Simulation

Implementing high-fidelity simulation as a teaching strategy is very complex, requiring careful design (Cioffi, 2001; Childs & Sepples, 2006; Jeffries, 2005; Jeffries & Rizzolo, 2006). Jeffries' (2005) simulation teaching-learning framework incorporates important simulation design characteristics based on extensive review of empirical and theoretical literature. As previously described, the NLN/Laerdal researchers developed a Simulation Design Scale specifically to measure the presence and importance of simulation design characteristics, which include objectives, fidelity, problem-solving, student support, and reflection (Jeffries & Rizzolo, 2006). This section reviews literature that relates to the support of the use of each of the simulation design characteristics.

Objectives

Clearly written objectives help to guide students' learning through the simulation experience (Jeffries, 2005). "Objectives of the simulation must reflect the intended outcomes of the experience, specify expected learner behaviors, and include sufficient detail to allow the learner to participate in the simulation effectively" (Jeffries & Rogers, 2007, p. 27).

Closely tied to learning objectives is the creation of simulation scenarios in which both are linked to students' level of learning. Johnson and colleagues' (1999) research centered on developing simulation scenarios role-played by students in a clinical laboratory setting. Fifty-one senior nursing students in their final clinical course participated in a live-videotaped simulation experience and a separate telephone simulation. Students worked in groups of four: one student played the role of the patient, one student played the nurse, other students played any additional roles and were in charge of videotaping or observed the simulation. The student playing the role of "nurse" was expected to act on cues provided by the "patient" (voice of the faculty member).

Actions could include seeking additional information from the patient and performing physical assessment based on the patient's condition. The student nurse role-played calling the physician, performing nursing actions, and collaborating with another nurse or supervisor. After completion of the simulation, students switched roles and repeated the exercise with a different simulation scenario. A nursing faculty member was available to offer the student cues on what to do next if needed or reassuringly prompting the student to continue in the scenario. A debriefing session was held at the end of the scenarios emphasizing student learning. The faculty member asked students what they thought they had done well, and then asked what they would have done differently. The faculty member helped the students focus on the positive aspects of the their actions and reinforced concepts and principles related to the simulation scenarios (Johnson et al., 1999).

According to Johnson and colleagues (1999), student results from a six-point Likert scale questionnaire revealed that the simulation scenario provided them opportunities "to think on your feet" (M = 5.53; SD = 0.91), "to use critical thinking" (M = 5.47; SD = 0.94), "to use focused communication" (M = 5.39; SD = 0.96), "to identify appropriate therapeutic interventions" (M = 5.47; SD = 0.94), and "to reinforce prior learning" (M = 5.39; SD = 0.94) (p. 40).

Johnson and colleague's (1999) research guided educators in designing simulation scenarios such as four students per group, assigning student roles in providing patient care, realism of simulating a clinical experience, faculty role of providing cues, and debriefing at the end of the scenario. Other researchers used similar design features in their simulation scenarios (Childs & Sepples, 2006; Howard, 2007; Jeffries & Rizzolo, 2006; Ravert, 2004).

Fidelity (Realism)

Fidelity or realism of the high-fidelity simulation scenario, mimics real life patient care situations (Jeffries, 2005). Studies using high-fidelity simulation reveal a common

design theme of realism, with simulation laboratories resembling a hospital room, equipped with cardiac monitors, oxygen, intravenous solutions, and medications (Cioffi, 2001; Childs & Sepples, 2006; Howard, 2007; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Nehring et al., 2001; Nehring, Lashley, & Ellis, 2002; Ravert, 2004; Scherer et al., 2007). These studies convey that the programmable life-size high-fidelity simulation mannequins offer realism in outward appearance and reacting in realistic ways such as breathing, blinking, palpable pulses, lung sounds, heart sounds, and hemodynamic displays of cardiac rhythm, blood pressure, and oxygen saturation.

Cioffi's (2001) research focused on realism within the simulation scenarios. She used a conceptual approach in developing and validating two sets of simulation scenarios related to childbirth and triage assessments. The process of developing realistic simulation scenarios involved identifying important assessment situations, reviewing medical records of patients to confirm assessments, and developing a series of patient questions and responses to be used to elicit information during simulation scenarios. In order to establish content validity, the scenarios were reviewed and evaluated by a panel of 10 expert midwives. The scenarios also underwent construct validity using the "known groups" technique, which identified analysis differences between the performance of 10 experienced and 10 less experienced midwife practitioners. Cioffi's rigor of developing realistic simulation scenarios enhanced student learning. Other researchers agree on the importance of developing authentic simulation scenarios based on real patient situations (Johnson et al., 1999; Reilly & Spratt, 2007; Seropian, et al., 2004).

Problem Solving

The intensity of *problem solving* or *complexity* of the high-fidelity simulation scenario depends on the student learning level, for example, students' progress from simple to more complex simulation scenarios as they gain more nursing knowledge (Jeffries, 2005). Beginning-level students need more concrete information in the scenario because of their lack of experience in applying theory to practice. As students gain more

experience, the scenario requires less information to foster more in-depth assessments. Cioffi (2001) shared that as students progress in using simulation, the clinical assessment situations in the scenario need to incorporate varying degrees of uncertainty and differing levels of relevant information to increase diagnostic reasoning and critical thinking. With more advanced students, the scenario should begin with relatively little information to encourage them to investigate freely through assessments and questioning to gain more information (Cioffi, 2001).

Student Support

According to Jeffries (2005), *student support* occurs during high-fidelity simulation scenarios through the use of cues. Faculty members provide *cues* or information to students about the next step in the scenario by suggesting an appropriate clinical action to keep the flow of the scenario running smoothly (Cioffi, 2001; Johnson et al., 1999). Students also receive support from other students by working in groups of four and collaborating as they provide care to the patient in the simulation scenario (Childs & Sepples, 2006; Howard, 2007; Jeffries & Rizzolo, 2006; Ravert, 2004). Qualitative data from Lasater's (2007) research revealed the importance of students' connections with others during high-fidelity simulation scenarios.

Reflection

Reflection or *debriefing* occurs at the end of the simulation scenario and encourages students' careful thought on the learning activity. The instructor helps students critically think through the scenario and link essential learning points (Jeffries, 2005). During Lasater's (2007) qualitative focus group sessions, students shared the value of the reflection sessions in order to receive faculty feedback about their performance and recommendations on how to improve. Students also appreciated hearing other students' ideas and priorities related to the simulation scenario. Other researchers confirmed positive student learning benefits from debriefing at the end of the simulation

scenario (Childs & Sepples, 2006; Howard, 2007; Jeffries & Rizzolo, 2006; Ravert, 2004).

Conclusion

In summary, incorporating simulation design characteristics such as objectives, fidelity, problem solving, student support, and reflection enhance the effectiveness of simulation teaching strategies. Students rely on objectives to guide their learning (Jeffries, 2005), while the fidelity or realism of the scenario engages them in learning process of providing nursing care (Cioffi, 2001; Childs & Sepples, 2006; Howard, 2007; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Nehring et al., 2001; Nehring et al., 2002; Ravert, 2004; Scherer et al., 2007). Student support of working in groups of four, combined with faculty support of providing cues has proven to be extremely valuable in helping students learn (Childs & Sepples, 2006; Cioffi, 2001; Howard, 2007; Jeffries & Rizzolo, 2006; Johnson et al., 1999). The final step includes the reflection session, which helps students tie together essential learning points from the hands-on learning experience with the high-fidelity simulation mannequin (Childs & Sepples, 2006; Howard, 2007; Jeffries & Rizzolo, 2006; Johnson et al., 1999; Ravert, 2004). This literature is very important for the present study, because the literature review serves as the foundation for the incorporation of all of these design characteristics in the simulation teaching strategies used in this study.

Student Outcomes and Simulation

Research on student outcomes comprises a large portion of the nursing high-fidelity simulation literature. The NLN/Laerdal framework of student outcomes on knowledge (learning), critical thinking, skill performance, learner satisfaction, and self-confidence (Jeffries, 2005) guides this section of the simulation literature review.

Knowledge Outcomes

Nurse researchers exploring high-fidelity simulation are seeking evidence of greater *knowledge* gain from simulation compared to traditional teaching strategies. A variety of research methods measure knowledge outcomes

Nehring and Lashley (2004) performed an international survey of 34 nursing schools and six simulation centers using high-fidelity human patient simulators (HPS). One purpose of the international survey was to examine how simulation is implemented in courses and used to evaluate learning. Nehring and Lashley designed the 37-item closed and open-ended survey. They established content validity by comparing the items with medical and nursing literature on HPS and asking area advanced practice nurse faculty with expertise in HPS to review. The authors sent the international survey to 66 nursing programs and 150 simulation centers including hospitals and higher education institutions. Thirty-four nursing schools (33 in the United States, one in Japan) and six simulation centers (Australia, England, New Zealand, Texas, and two in Germany) responded within the allotted 2 months. A majority (82%) of the responding nursing programs were public institutions and the others private. The programs offered degrees such as baccalaureate and graduate degrees (35%), associate degrees (32%), as well as a few practical nursing, RN to BSN, and nurse-anesthesia programs.

Nehring and Lashley (2004) found that nursing programs commonly used HPS for teaching physical assessment, implementing medical-surgical scenarios, and evaluating students' knowledge levels, technical skills, and performance of nursing care in the undergraduate curriculum. Nursing faculty reported positive aspects of HPS such as helping students at all levels with critical thinking, clinical reasoning skills, synthesis of knowledge, and confidence in practicing life-like situations. University nursing programs commonly use HPS to teach high-level skills, such as airway management, crisis interventions, and physiological concepts, as well to evaluate students' performance of nursing care compared to community colleges' limited use in these areas. The

international survey return rate was 52% for nursing schools and 4% for simulation centers. Thirty-three of the 34 nursing schools were located in the United States, which limits insight to international simulation programs. No generalizations can be made regarding simulation centers.

Nehring and colleagues (2001) implemented a pretest-posttest one-group design to measure knowledge gain of an Advanced Medical-Surgical simulation module covering the topics of airway obstruction, congestive heart failure, pulseless electrical activity, and hypovolemic shock. The researchers used a convenience sample of 42 senior nursing students. The study began with a lecture on each of the topics, followed by students completing a pretest. Next the students participated in three case scenarios in which the high-fidelity simulation mannequin experienced the critical health events covered in the lectures. Students worked in groups of five or six to assess, plan, intervene, and evaluate their nursing care during the critical health event scenario. After the scenarios, students completed the first posttest, and a second posttest was completed 5 to 7 days later. Data were analyzed using the Wilcoxon signed ranks test for the two related samples. A significant difference existed between the pretest and the first posttest scores ($Z= -5.84$, $p< .05$). No differences were found between the two posttests to indicate retention of the learning. A limitation of this study is the use of one group of students with no control group comparison.

Griggs (2002) implemented a pretest-posttest quasi-experimental non-equivalent control group design. A convenience sample of 27 senior nursing students in their final medical-surgical rotation participated in the study. The four existing clinical groups (six to eight students per group) were assigned to an experimental or control group. The instruments (multiple choice exam and survey) were written by four experienced medical-surgical nursing educators and reviewed for content validity by two additional medical surgical experts. Griggs conducted a pilot test of the instruments to establish reliability and validity.

All students completed a 55-question multiple-choice pretest on nursing knowledge and a 40-question four-point Likert scale survey on nursing clinical education to test anxiety, perceptions of competence, and perceptions of decision-making ability on the first day of the clinical course. The experimental group received 4 hours of instruction with the human patient simulator (HPS) during the second week of the clinical course before actually caring for patients at the assigned clinical site. On the day the experimental groups took part in the HPS scenario, the control group of students cared for patients at the assigned clinical sites. After completing the same number of clinical hours during the seventh week of the clinical course, all the students participating in the study completed posttests using the Nursing Clinical Examination and Nursing Clinical Education Survey (Griggs, 2002).

The research results showed no statistically significant differences in pretest scores of the control and experimental groups, demonstrating comparable groups. In analysis of posttest score (t-test: $t=-2.27$, $p = 0.03$) and the pretest and posttest score difference ($t= -2.67$, $p = 0.01$), the control group scored significantly higher than the experimental group in both instances. In further analyzing this unexpected difference of the control group scoring higher, the researcher found three students in the experimental group that had posttest scores lower than the pretest scores and experiencing difficulty in the course overall. When the researcher removed the three low scoring students, no significant differences were found between groups. There were also no significant differences in pretest and posttest scores between groups for the following areas: anxiety, competency in performing procedure, competency with diagnoses, and decision making (Griggs, 2002). Limitations of this research include the use of a small sample size and convenience sampling of existing groups (lack of randomization).

Jeffries and colleagues (2003) implemented a simulation study using a randomized pretest-posttest experimental design to compare knowledge gain on the effectiveness of an interactive, multimedia CD-ROM with traditional methods of

teaching the skill of performing a 12-lead ECG. Seventy-seven baccalaureate nursing students in a senior-level critical-care nursing course participated in the study. The traditional method included a self-study module, a 15-minute lecture, demonstration by an instructor, and hands-on experience using a plastic mannequin and a real 12-lead ECG machine in the learning laboratory. The technology method included the same self-study module and covered similar teaching content using an interactive, multimedia CD-ROM embedded with virtual reality. Two experienced critical care nurse educators who teach in the critical care course confirmed equivalency of the content delivered in the two teaching methods. Clinical groups of 8 to 10 students were randomized into a traditional learning laboratory group or technology group. Groups, rather than individuals, were randomized for reasons related to course scheduling, required lab time, and instructor availability. Students completed a knowledge pretest prior to the instruction methods and a posttest 1 week later.

Results revealed no significant group differences in knowledge gains of the 27-item multiple-choice pretest-posttest exam. Groups were statistically similar on students' satisfaction with their learning method (five-item subscale), perception of self-efficacy in performing the skill (eight-item subscale), and simulated patient's rating of students' interpersonal sills (informativeness, professionalism, anxiety, warmth, and friendliness). Students showed considerable knowledge gains and skill acquisition with both instructional methods (Jeffries et al., 2003). Limitations of the study include randomizing groups rather than individuals.

Scherer and colleagues (2007) performed a quasi-experimental study to compare the effects of using a high-fidelity simulation mannequin and case study teaching strategies on the knowledge of nurse practitioner students in managing a cardiac event. Twenty-three students were randomly assigned to the experimental (simulation) or control (case study) group, 13 and 10 respectively. All students took a pretest on knowledge, received the same rapid atrial fibrillation scenario, participated in their

assigned teaching strategy, participated in posttesting on knowledge, and completed an evaluation of the experience. The atrial fibrillation scenario was developed by faculty and reviewed for content and face validity by an Acute Care Nurse Practitioner expert in cardiology. In the experimental group, students participated in the simulation exercise individually. Students were expected to interact with the programmed simulation mannequin and conduct a physical assessment, interpret the rhythm on the cardiac monitor, order appropriate treatments (oxygen, laboratory values, 12-lead EKG) and implement protocols to treat atrial fibrillation. The programmed scenario with the simulation mannequin took 20 minutes, followed by a group reflection session of all students later in the day. Students in the control group participated in a 1-hour, faculty-led case study discussion. The same atrial fibrillation case scenario was presented orally to the students and an atrial fibrillation strip was shared with the students for interpretation. The objectives of the control groups' students were similar to those for the experimental groups' students, except for being accomplished through oral description. The control group students openly discussed their assessments and plan for managing care of the patient. Faculty facilitated discussions by reflecting on pertinent points but did not guide student management of the case (Scherer et al., 2007).

Scherer and colleagues (2007) found no statistically significant differences in knowledge test scores between groups. Both groups rated their experience as valuable. The simulation and case study presentation had similar outcomes. In evaluation of the simulation experience, students in the simulation group shared the benefit of problem solving and critically thinking about a serious event without the stress of a real patient, and the experience of dealing with a real life and death situation in a controlled and realistic patient situation and environment. Students in the case study group evaluated their experience positively and benefited from the "good group discussion involving critical thinking" (p. 11). A critique of the study design is that students' participated in the simulation experience individually and then later in the day attended a group

reflection session in which qualitative data were collected to evaluate the simulation experience. Qualitative data based on one-on-one interviews would have strengthened this study. The researchers also acknowledged their instruments lacked psychometric testing (Scherer et al., 2007).

Reilly and Spratt (2007) performed a qualitative study on the perceptions of experiences of second-year undergraduate nursing students and the perceptions of academic teachers using high-fidelity simulation as a teaching strategy for clinical practice preparation. Twenty-one students with no prior experience using high-fidelity simulation participated in two simulation scenarios of patients with cardiac and respiratory disorders, and then took part in two focus group interviews (at Day 3 and Week 8) to gather data on students' perceptions of participating in the simulation. The focus groups were audiotaped, transcribed, and analyzed for themes (Reilly & Spratt, 2007). The following student themes were reported: authentic scenarios, active learning by doing, appreciation of engagement in active learning opportunities, preference for interactive learning (vs. didactic teaching), sense of purpose and achievement, safe environment to practice, confidence and competence building, and facilitation of learning in the clinical setting with patients. Faculty shared the following perceptions of using simulation: helped students focus on intellectual components of nursing skill, promoted active student learning and building on learning, improved student critical thinking, and provided an avenue to link theory to practice to help students gain a deeper understanding of patient conditions.

In summary, research methods on knowledge outcomes for high-fidelity simulation include surveys (Nehring & Lashley, 2004), pretest-posttest one group designs (Nehring et al., 2001), pretest-posttest (quasi) experimental designs (Engum et al., 2003; Griggs, 2002; Howard, 2007, Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Ravert, 2004; Scherer et al., 2007), and qualitative approaches (Reilly & Spratt, 2007). Findings from these studies revealed that students in the simulation group had no significant group

differences in knowledge gain (Engum et al., 2003; Griggs, 2002; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Ravert, 2004; Scherer et al., 2007). To date only Howard (2007) has found significant difference with respect to knowledge gain in experimental groups. Nurse educators and students are interested in using high-fidelity simulation as a teaching strategy. However, in regard to the high cost of simulation equipment and training faculty, educators and administrators want empirical evidence of the benefits such as improving students' knowledge and critical thinking. Researchers are continuing to work on capturing the advantages of high-fidelity simulation. Examining students' ability to perform nursing interventions, which is the focus of this dissertation study, may capture students' application of knowledge.

Critical Thinking Outcomes

Critical thinking is an outcome variable measured in high-fidelity simulation research in nursing education. Ravert (2004) implemented a pretest-posttest quasi-experimental design to determine the effects of using a human patient simulator (HPS) on nursing students' critical thinking and self-efficacy of being able to perform basic nursing skills. A convenience sample of 5 nursing students in their third semester at a private university participated in the study. Students were sorted into four groups according to the results of the Learning Style Inventory. Individuals were then randomly assigned to one of two enrichment activity groups to ensure that each learning style was equally represented. The students were stratified by learning style and randomly assigned to one of two enrichment activity groups using the same patient scenarios. Group 1 participated in five weekly 90-minute enrichment case study activities in the classroom setting. Group 2 also participated in five weekly 90-minute enrichment activities using a similar format except that students used the HPS with the patient scenarios. Quantitative data were collected at the beginning and end of the instructional development project using the following instruments: California Critical Thinking Disposition Inventory, California Critical Thinking Skills Test (half of students Version A the other half Version B on

pretest and reversed on posttest), Learning Style Inventory, Self-Efficacy for Nursing Skills Evaluation (using a 5-point Likert scale developed for the study), and Demographic Survey. The first three instruments have strong reliability and validity data. Qualitative data included an analysis of the audiotaped final group interviews at the end of the project.

Ravert (2004) used a general linear model procedure in which there were two factors, group and learning style quadrant, with the pretest score included as a covariate to compare the two groups. The researcher did not find a significant differences in critical thinking disposition scores for the two groups. However, significant critical thinking total gain scores, $F(8, 16) = 20.74$, $p = .000$, and self-efficacy total gain scores, $F(8, 16) = 4.58$, $p = .01$, were noted for Groups 1 and 2. Learning style or group did not predict the gains. Both enrichment groups showed increased critical thinking skills and self-efficacy scores. Qualitative data collected on students in the HPS groups revealed an increase in critical thinking, collaboration, organizational skills, ability to prioritize, confidence in working with patient and physicians, and knowledge about medications. The HPS student group also reported being more enthused about learning, expressed a desire for further sessions, and appreciated the realism of the HPS scenario.

Literature previously described incorporated students' perceptions of critical thinking. Johnson and colleague's (1999) exploratory study on the telephone simulation scenarios role-played by students in a clinical laboratory setting revealed enhanced critical thinking. Students' results from a six-point Likert scale questionnaire showed the simulation experiences provided opportunities "to think on your feet" ($M = 5.53$; $SD = 0.91$), and "to use critical thinking" ($M = 5.47$; $SD = 0.94$). At the end of Scherer and colleague's (2007) quasi-experimental study on high-fidelity simulation, the researchers asked students to evaluate the simulation experience. Students in the simulation group shared the benefit of problem solving and critical thinking on realistic acute patient care

events. Additional studies confirm students' perception of improved thinking as a result of participating in simulation scenarios (Cioffi, 2001; Jeffries et al., 2003)

Reilly and Spratt's (2007) qualitative study on high-fidelity simulation reported faculty perceptions of the effects of using high-fidelity simulation on student learning. Faculty shared that simulation helped students focus on intellectual components of nursing skill, promoted active student learning, improved student critical thinking, and provided an avenue to link theory to practice to help students gain a deeper understanding of patient conditions.

In summary, a quasi-experimental pretest-posttest design study on simulation did not find significant difference in critical thinking (Ravert, 2004), yet qualitative simulation data from students and faculty supported positive critical thinking (Cioffi, 2001; Jeffries et al., 2003; Johnson et al., 1999; Reilly & Spratt, 2007; Scherer et al., 2007).

Skill Performance Outcomes

Students' skill performance is challenging to measure but may be an essential outcome in nursing simulation research. Engum and colleagues (2003) used a randomized experimental design with a knowledge pretest and performance posttest. The study examined the effectiveness of an interactive, multimedia, virtual reality computer intravenous (IV) catheter simulator compared to a traditional laboratory experience of teaching IV venipuncture skills to 70 baccalaureate nursing and 93 third-year medical students. Students in the control group were taught in the traditional laboratory method of instruction using a self-study module that involved a 10-minute videotape on IV catheterization, instructor demonstration, and hands-on practice using plastic mannequin arms (90 minutes total). Students in the experimental group were given a comprehensive self-study module on intravenous administration and then independently used an interactive multimedia, commercially made catheter simulator program incorporating virtual reality (90 minutes total) without an instructor present. Both groups completed a

20-item pretest prior to instructional methods, and were allowed one week of practice using their respective teaching methods. Both groups completed a 21-item performance posttest incorporating (a) a competency checklist for placement of an intravenous catheter, (b) a satisfaction questionnaire on the teaching method, (c) a self-efficacy/self-reliance questionnaire, and (d) written qualitative feedback on the instructional method. The simulated patient (a real person who received the IV venipuncture) also completed a questionnaire after the procedure to rate the student's overall performance.

Engum and colleagues (2003) found that the medical and nursing students in the control and experimental groups were similar in their ability to perform the skill of intravenous catheter placement correctly. Students in the traditional group were rated as more informative in explaining the procedure and friendlier than students in the simulator group. Medical and nursing students in the traditional laboratory group had significantly higher satisfaction scores ($p < 0.0001$) and perceived their method of instruction as more useful than peers in the computer catheter simulator group. Nursing students in the traditional laboratory had significantly higher self-efficacy/self-reliance scores and higher posttest and improvement scores. The researchers concluded that one reason for significant findings for the traditional laboratory group may be tied to the computer catheter simulator students' negative feedback regarding the computer catheter simulator's lack of realism, problems stabilizing the arm, lack of familiarity with the equipment, and no instructor present during the training session (Engum et al., 2003).

Jeffries and colleague's (2003) experimental design simulation study described earlier also focused on student skill performance. The study compared the effectiveness of an interactive, multimedia CD-ROM with traditional methods of teaching the skill of performing a 12-lead ECG. The researchers found no significant group differences in 12-lead ECG skill performance. Both groups were satisfied with their instructional method and were similar in their ability to demonstrate the skill correctly on a live, simulated

patient. Students showed considerable skill acquisition in both instructional methods (Jeffries et al., 2003).

In summary, there is limited research on students' skill performance. Two studies in the nursing literature used performance as an outcome variable and found no significant difference in the control and experimental groups (virtual reality computer intravenous catheter simulator and 12 lead ECG interactive, multimedia CD-ROM) in students' ability to perform the skill correctly (Engum et al., 2003; Jeffries et al., 2003). Similarly, research on students' perception of ability to perform the skill revealed no significant group differences (Griggs, 2002; Jeffries et al., 2003). Additional research is needed on skill performance. In response, the present study examines nursing students' ability to perform nursing interventions measured by a Student Performance Rubric.

Satisfaction and Self-confidence Outcomes

Many nursing studies have collected data on student perceptions of satisfaction with their learning experience and found them to be satisfied with their simulation learning experiences (Childs & Sepples, 2006; Cioffi, 2001; Johnson et al., 1999; Ravert, 2004). Quasi-experimental research design studies reveal differing results on satisfaction between traditional and simulation groups. According to Jeffries and Rizzolo (2006), students in the high-fidelity simulation group perceived higher levels of satisfaction with the teaching strategy than the case study group, whereas Jeffries and colleague's (2003) study on the effectiveness of an interactive, multimedia CD-ROM with traditional methods of teaching the skill of performing a 12-lead ECG discovered both groups were statistically similar on students' satisfaction with their learning method. Engum and colleagues' (2003) study found that the students in the traditional laboratory group had significantly higher satisfaction scores than students in virtual reality computer IV catheter simulator group. The researchers contributed this finding to the lack of realism, lack of familiarity, and technical difficulty with the equipment, and having no instructor present during the computerized IV catheter simulation training session.

Self-confidence is another common variable analyzed in nursing simulation research. Anecdotal data on students' perceptions reveal increased self-confidence from simulation learning experiences (Cioffi, 2001; Johnson et al., 1999; Ravert, 2004; Reilly & Spratt, 2007). Quasi-experimental research design studies also reveal differing results on student self-confidence between traditional and simulation groups. In Jeffries and Rizzolo's (2006) quasi-experimental study, students in the high-fidelity simulation group perceived higher levels of self-confidence in their ability to perform care, whereas Scherer and colleagues (2007) found posttest confidence scores improved in both groups, although the control group scored significantly higher on posttest confidence. They attributed this finding to the control group having support and input from the whole group, whereas those in the simulation group had to individually problem solve and manage the patient scenario (Scherer et al., 2007).

In summary, the varied results of students' satisfaction and self-confidence with high-fidelity simulation warrants continued nursing research.

Conclusion

Analytical Summary

Much of the nursing literature on the teaching strategy of high-fidelity simulation is anecdotal (Alinier, 2003; Bearnson & Wiker, 2005; Day, 2007; Feingold et al., 2004; Haskvitz & Koop, 2004; Medley, 2005; Rauen, 2004, Ravert, 2002; Rhodes & Curran, 2005; Rystedt & Lindstrom, 2001; Seropian et al., 2004). More empirical evidence for simulation has been reported in the last 10 years using the following research methodologies: survey (Nehring & Lashley, 2004), qualitative (Reilly & Spratt 2007), descriptive (exploratory) (Childs & Sepples, 2006; Johnson et al., 1999; Lasater, 2007), and (quasi) experimental designs (Engum et al., 2003; Griggs, 2002; Howard, 2007; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Nehring et al., 2001; Ravert, 2004; Scherer et al., 2007).

The rigor of experimental designs has contributed significantly to learning the positive effects of high-fidelity simulation on students perceptions such as enhanced critical thinking (Howard, 2007; Jeffries et al., 2003; Ravert, 2004), increased self-confidence (Jeffries & Rizzolo, 2006), greater satisfaction and enthusiasm with the learning experience (Childs & Sepples, 2006; Engum et al., 2003; Howard, 2007; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Ravert, 2004), promotion of active learning (Childs & Sepples, 2006; Jeffries & Rizzolo, 2006), benefits of collaboration from peers and faculty (Childs & Sepples, 2006), perceived value and ability to transfer learning to the clinical setting (Howard, 2007), and importance of the debriefing discussion and feedback after the simulation experience (Childs & Sepples, 2006; Jeffries & Rizzolo, 2006). It is important to note that these results focus on students' perceptions of the simulation experience.

Regarding experimental design research, Howard (2007) discovered significant knowledge gain for the high-fidelity simulation group, while the remaining studies found no significant differences between high-fidelity simulation and traditional case study groups (Engum et al., 2003; Griggs, 2002; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Ravert, 2004; Scherer et al., 2007). Significant knowledge gain on only one study out of many warrants additional research. The present study uses an experimental design to examine knowledge gains.

Analytical Review of Knowledge Gain Gap

A significant gap in the nursing research simulation literature relates to findings on knowledge gain outcomes. The NLN/Laerdal study contributed significantly to simulation research by developing the simulation teaching-learning framework and implementing a 3-year multi-method, multi-site research project to explore high-fidelity simulation as a teaching strategy (Jeffries, 2005; Jeffries & Rizzolo, 2006). Yet the NLN/Laerdal study did not find significant differences in pretest-posttest knowledge gain

among three teaching strategy groups (paper-pencil case study, static mannequin, and high-fidelity simulation mannequin).

As described earlier, Howard's (2007) research used the NLN/Laerdal framework as a guide to explore the effects of high-fidelity simulation and found significant difference in knowledge gain and critical thinking between traditional case study and high-fidelity simulation groups. Using a model to guide nursing simulation research may be significant to research outcomes.

Challenges of capturing knowledge gain in nursing simulation research relates to small sample sizes (Griggs, 2002; Ravert, 2004; Scherer et al., 2007) and random assignment of clinical groups rather than random assignment of individuals to control and experimental groups (Griggs, 2002; Jeffries et al., 2003). One important reason for lack of significant findings on high-fidelity simulation appears to relate to the pretest-posttest approach to measurement of knowledge gains. Students' interactions during high-fidelity simulation scenarios are focused on synthesizing and applying knowledge as they perform necessary nursing interventions; thus, outcome measures should focus on the application of knowledge (Jeffries & Rizzolo, 2006). Given that the current method of measuring pretest-posttest knowledge is not capturing this application of knowledge, new instrumentation needs to be developed.

This study intends to fill the knowledge gain gap by using new instrumentation: the Student Performance Demonstration Rubric developed by nurse researchers at the University of Iowa College of Nursing. The rubric measures students' performance of nursing interventions during a high-fidelity simulation scenario and yields a numeric score based on elements of performance observed by the researcher upon reviewing the student's digitally recorded simulation performance demonstration. Students' ability to perform nursing interventions demonstrates their application of nursing knowledge.

In summary, Jeffries and Rizzolo (2006) and Howard (2007) paved the way by testing a simulation teaching-learning framework to guide future research in nursing

education based on an engagement theory of learning. The present experimental study was closely modeled after Jeffries and Rizzolo's (2006) NLN/Laerdal study, yet differs by using new instrumentation in an attempt to capture the growth and application of knowledge by measuring student performance. To date, no studies in the nursing literature have examined the effect of high-fidelity simulation teaching strategy on nursing students' performance of nursing interventions. Focusing on performance of nursing interventions may provide the needed evidence that high-fidelity simulation teaching strategies help to build students' application of knowledge in providing patient care.

Preview of Subsequent Chapter

The next chapter elaborates on research methodology including the research design, research questions, population and sample, instruments, data collection procedures, data analysis procedures, and limitations.

CHAPTER 3

METHODS

Introduction

Nurse educators are confronted with challenges on how to best prepare nursing students to care for patients in an increasingly complex healthcare environment. The purpose of this experimental research study was to determine if there were differences in the effects of three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on the outcomes of student performance of nursing intervention activities, performance retention of intervention activities, student satisfaction, student self-confidence and educational practice preferences. The use of high-fidelity simulation is costly in terms of purchasing equipment and training faculty, so it is important to determine whether simulation is effective in preparing students compared to traditional active-learning teaching strategies. Nurse educators want to know if simulation enhances student preparation for performing nursing interventions.

Because of the complexity of the research, I worked collaboratively with a simulation research team at the University of Iowa College of Nursing in designing and implementing this study. This chapter describes the research methodology including the research design, research questions, population and sample, instruments and testing, methods and procedures, and data analysis.

Overall Research Approach

The study used an experimental posttest-only design incorporating two posttests (first performance and retention performance). Three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) were evaluated on the defined outcomes of student performance of nursing intervention activities, retention of performing intervention activities, student satisfaction, self-confidence, and educational practice preferences.

A 10-question cardiac knowledge test was given to students prior to the teaching strategy. The test served as a covariate to control for any differences in knowledge level of the three groups. Posttest measures focused on student responses to the active-learning teaching strategies. The instruments included the Student Satisfaction and Self-Confidence in Learning Instrument and the Educational Practices Questionnaire. The Student Performance Demonstration Rubric was another posttest measure developed by nurse experts from the simulation research team at the University of Iowa College of Nursing. Students' performances of nursing intervention activities on a high-fidelity simulation mannequin were scored using this rubric (see Table 1: Experimental Posttest Only Design).

Research Questions

1. What is the difference in *performance of nursing intervention activities* among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?
2. What is the difference in *retention of performing nursing intervention activities* among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?
3. What is the difference in *student satisfaction and self-confidence* among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?
4. What is the difference in *educational practice preferences* among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

Table 1. Experimental Posttest-Only Design

Random assignment to Treatment: Teaching Strategy (IV) group	Cardiac Know-ledge Test (Covariate)	Teaching Strategy Posttests (DV): -Satisfaction and Self-Confidence -Educational Practices -Demo-graphics	First Performance Demonstration Posttest (DV): -Student Performance Demonstration Rubric	Retention Performance Demonstration Posttests (DV): -Student Performance Demonstration Rubric - Follow-up Information Questionnaire
Case-based learning (control group)	X	X	X	X
Simulation	X	X	X	X
Simulation with narrative pedagogy	X	X	X	X

Note. IV = Independent variable; DV = Dependent Variable

Population and Sample

A convenience sample of nursing students at the University of Iowa College of Nursing enrolled in the course 96:135, Complex Concepts of Nursing Care (a second-semester nursing course), were asked to participate in this experimental study. The research team presented the research study and an invitation to participate (see Appendix A. Informed Consent). Students were informed of the following: (a) the time commitment for participation, (b) level of risk with participation, (c) participation would have no impact on their 96:135 course grade, (d) benefits of participation, (e) payment for participation ($5 gift card to Java House), and (f) the request for confidentiality of their performance. The consent forms and envelopes were distributed.

The student request for confidentiality was implemented to help minimize the internal validity threat of diffusion of treatment because students were in the same nursing course and could share information regarding the different teaching strategy sessions. Students were asked to sign a confidentiality statement at the beginning of the

teaching strategy session in an attempt to reduce this threat (see Appendix B. Confidentiality Agreement).

After the initial presentation of the study, the research team returned to the next class to answer questions. A midweek e-mail was sent to remind students that forms needed to be returned a week after the initial presentation by 5:00 p.m. Forms were returned in the enclosed envelope to the Student Services office in room 37 Nursing Building.

Sampling Design/Plan

Students were randomly assigned to groups by the simulation research team member, Teri Boese (96:135 Laboratory course coordinator). The individual student names on the class list were placed in a box; names were randomly drawn and assigned to clinical laboratory groups. Then the clinical laboratory groups were randomly assigned to one of the three treatment active-learning teaching strategy groups: Group 1, case-based learning; Group 2, simulation, and Group 3, simulation with narrative pedagogy. Each student was assigned a nonidentifying code number. The code numbers were placed on study instruments and personally distributed to students during the teaching strategy session and two individual performance demonstrations. I implemented all three teaching strategy and reflective thinking sessions and was the voice of the patient in the two individual performance demonstrations.

Independent Variables: Three Active-Learning Teaching Strategies

Case-based learning teaching strategy was defined as the use of a written case and questions on a patient with cardiovascular disease (myocardial infarction) to facilitate students' ability to identify assessment data and immediate nursing interventions. Students read the case and then interacted with members of their small group to apply theory to the case followed by a guided reflective thinking session.

Simulation teaching strategy was defined as the use of a high-fidelity mannequin to mimic a patient with cardiovascular disease (myocardial infarction) in which students demonstrated assessments and implementation of immediate nursing intervention activities followed by a guided reflective thinking session.

Simulation with narrative pedagogy teaching strategy was defined as the use of a high-fidelity mannequin to mimic a patient with cardiovascular disease (myocardial infarction) in which students demonstrated assessments and implementation of immediate nursing intervention activities with the use of mutual dialogue among students and teacher throughout the experience followed by a guided reflective thinking session.

Measurement of Dependent Variables and Reliability and Validity Data

The Cardiac Knowledge Test included 10 questions on knowledge of cardiovascular disease given to students prior to the teaching strategy to test cardiac knowledge and assess similarity of groups. Three expert cardiac nurses from the simulation research team at the University of Iowa College of Nursing established content validity. The test was based on information from the American Heart Association guidelines for care of patients with myocardial infarction.

The Demographic Questionnaire was a seven-item instrument given to students after the teaching strategy to collect information on prior health care work experience, length of employment, and selected demographic information. The simulation research team at the University of Iowa College of Nursing created the demographic questionnaire.

The Educational Practices Questionnaire was a 16-item instrument given to students after the teaching strategy. Students used the 5-point scale to indicate the presence and importance of the educational practices of active learning, collaboration, diverse ways of learning, and high expectations that are present in the learning activities (case-based learning, simulation, or simulation with narrative pedagogy). Expert nurse

researchers collaborating on a multi-method, multi-site research project established content validity. The researchers created the instrument based on extensive review of empirical and theoretical literature, and incorporated Chickering and Gamson's (1987) seven principles of good practice. Reliability was tested in a 3-year multi-method, multi-site, national study using Cronbach's alpha (presence of specific practices = 0.86 and importance of specific practices = 0.92) (http://www.nln.org/research/nln_laerdal/instruments.htm).

The Student Satisfaction and Self-Confidence in Learning Instrument was a 13-item instrument designed to measure student satisfaction (5 items) with the learning activity and self-confidence in learning (8 items) using a 5-point scale. Students completed this instrument after the teaching strategy. Expert nurse researchers collaborating on a multi-method, multi-site research project established content validity. The researchers created the instrument based on extensive review of empirical and theoretical literature. Reliability was tested in a three-year multi-method, multi-site, national study using Cronbach's alpha (satisfaction = 0.94 and self-confidence = 0.87) (http://www.nln.org/research/nln_laerdal/instruments.htm).

The Student Performance Demonstration Rubric was a multi-item instrument constructed for the purposes of this study to measure the students' two digitally recorded individual performances of nursing intervention activities on a high-fidelity simulation mannequin at Weeks 3 and 8 of the study. The rubric consisted of a checklist of 120 essential care items for a patient scenario on cardiovascular disease (myocardial infarction) using a 0-1 scale. A zero indicated inaccurate performance and a 1 indicated accurate performance of essential care. The summed item scores provided a total score for the student's performance of nursing intervention activities. The simulation research team at the University of Iowa College of Nursing created the rubric based on the American Heart Association guidelines for care of patients with myocardial infarction. Five expert nursing educators from the team established content validity. Total rubric

score rater agreement was .93 and was assessed using data from a summer 2008 pilot study (*N*=28).

The Follow-up Information Questionnaire was a five-item instrument given to students at Week 8 of the study to collect additional demographic information about the students' experiences caring for patients with cardiovascular disease since the completion of the teaching strategy session (Week 1 of the study). The simulation research team at the University of Iowa College of Nursing created the follow-up information questionnaire. (See Appendix B. Instruments.)

Measurement/Coding of Variables

Students' responses to items on both the Student Satisfaction and Self-Confidence in Learning Instrument and the Educational Practices Questionnaire (presence) were reported on a Likert scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). The Educational Practices Questionnaire (importance) incorporated another Likert scale that ranged from 1 (*not important*) to 5 (*very important*). The Likert scales on the instruments were coded 1=1; 2=2; 3=3; 4=4; 5=5.

Total scores were obtained from the cardiac knowledge test and the Student Performance Demonstration Rubric. The 10-question cardiac test score reflected the total number of correct answers. The Student Performance Demonstration Rubric incorporated a scale from 0-1 based on students' performance of essential care elements. Each essential care item on the rubric was summed to provide a total score for students' performance of care (nursing intervention activities). One research team member scored the rubric while viewing the students' digitally recorded individual performance demonstration and observing for specific desired nursing intervention activities. A second researcher scored the rubric on every fifth digital recording. Comparison of the two evaluators' rubric scores were conducted to establish rater agreement. The same two researchers who scored the summer and fall study rubrics scored the rubrics in this study.

Table 2. Coding of Demographic Questionnaire

Question	Code	Question	Code
1. Have you ever been employed in health care?		4. Indicate your ethnic background.	
Yes	1	Caucasian	1
No	2	Asian	2
1.A. Which of the following best describes your employment?		Hispanic	3
Nursing Assistant Hospital	1	African American	4
Nursing Assistant Long Term Care	2	Native American	5
Nursing Assistant Home Health Care	3	Multiracial	6
Nursing Assistant Hospital & Long Term Care	4	5. Indicate the range that includes your age.	
Nursing Assistant Long Term Care & Home Health Care	5	Under 21	1
Nursing Assistant Hospital, Long Term Care & Home Health Care	6	21-24	2
Hospital Clerk	7	25-29	3
Cardiac Rehabilitation Exercise Assistant	8	30-39	4
Research Assistant	9	6. Indicate your marital status.	
Central Sterilization	10	Married	1
1B. What is the total length of your employment experience in health care?		Partnered	2
Less than 6 months	1	Single	3
6 months to 1 year	2	Divorced	4
More than 1 year and up to 3 years	3	Separated	5
More than 3 years	4	7. Indicate your level of education completed.	
1C. In your health care employment, rate the frequency of contact with patients whose primary health problem is cardiovascular disease.		High School	1
Always	5	College Degree	2
Most of the time	4	7A. If you have a college degree, indicate the degree level you earned.	
Sometimes	3	1 year degree	1
Rarely	2	2 year degree	2
Never	1	3 year degree	3
2. In your clinical rotation(s), rate the frequency of contact you have with patients whose primary health problem is cardiovascular disease.		4 year degree	4
Always	5	Masters	5
Most of the time	4	Doctorate	6
Sometimes	3		
Rarely	2		
Never	1		
3. Indicate your gender.			
Female	1		
Male	2		

Table 3. Coding of Follow-up Information Questionnaire

Question	Code	Question	Code
1. During the last 8 weeks of your clinical rotation(s), rate the frequency of contact you have had with patients whose primary health problem was cardiovascular disease (CVD)?		4. Have you had a family member/friend experience CVD?	
Always	5	Yes	1
Most of the time	4	No	2
Sometimes	3	If Yes: Describe family member/friend experience.	
Rarely	2	G'pa CVD	1
Never	1	Dad CVD	2
2. Since your teaching strategy session (8 weeks ago), have you had work experience providing care to a patient with CVD?		G'pa & Dad CVD	3
Yes	1	G'pa & G'ma CVD	4
No	2	G'ma CVD	5
If Yes: Describe work experience.		Uncle CVD	6
Clinical	1	Family friend CVD	7
Congestive Heart Failure	2	5. Which of the following best describes your level of preparation for the simulation experience today? (Check all that apply)	
Patient history of MI	3	No preparation	1
Actual MI	4	Reviewed notes from the teaching strategy session	2
Question	Code	Question	Code
Cardiovascular Disease	5	Listened to the 96:135 cardiac perfusion lecture audio file	3
Atrial Fibrillation	6	Reviewed your 96:135 cardiac perfusion lecture notes	4
Viewed Cardiac Catheterization	7	Reviewed assigned 96:135 cardiac perfusion readings	5
Patient post CABG	8	Read additional cardiovascular readings	6
Research Assistant-Cardiomyopathy Clinic	9	Discussed cardiovascular content with faculty	7
3. Have you personally experienced CVD?		Discussed cardiovascular content with peers	8
Yes	1	Returned to lab for additional practice	9
No	2	Read self-reflection	10
If Yes: Describe personal experience.		Discussed with RN	11
Supraventricular tachycardia	1		
Stress related angina	2		

The summer 2008 pilot study yielded a rater agreement of 0.93 (N=28) for three researchers' ratings, and the fall 2008 data yielded a rater agreement of 0.92 (N=70) for two researchers' ratings. If rater agreement for this study would have dropped below 0.90, the two researchers planned to meet to discuss and review the items on the rubric leading to the disagreement.

The Demographic Questionnaire and the Follow-up Information Questionnaire included nominal data, and codes were assigned to each variable as shown in Table 2 (Coding of Demographic Questionnaire) and Table 3 (Coding of Follow-up Information Questionnaire).

Treatment of Missing Values

During data analysis, I searched for missing values and determined the distribution and patterns of the data. The statistical program (SPSS) determined the extent of omitted data by counting the number of missing values for each subject. No data were missing on the dependent variable instruments: Student Performance Demonstration Rubric, Student Satisfaction and Self-Confidence in Learning Instrument, and Educational Practices Questionnaire. Analyses of missing data were applied as necessary to determine if there were possible differences between students who skipped items and those that did not on important variables. I planned to use listwise deletion method of analysis for missing data if subjects were missing information on important dependent variables. Allison (2002) reported that listwise deletion method deals with missing values in the data set by eliminating subjects with missing data, then continues statistical analysis with complete data sets. If the data are missing completely at random, listwise deleted data sets are unbiased if the estimates are unbiased with a full data set, not missing data. Standard errors are larger in the listwise deleted data set because the results are based on less information. This method decreases the concern of making inferential errors by trying to predict values for subjects with missing data (Allison, 2002).

Overview of Data Collection Procedures

The study began with students attending the 96:135 course cardiac lecture that focused on the care of patients experiencing a myocardial infarction. The cardiac lecture was a part of the study protocol and was a required class lecture for all students. The three active-learning teaching strategies related to the care of a myocardial infarction patient were integrated into students' scheduled laboratory sessions to reinforce essential assessments and nursing interventions from the cardiac lecture. All three teaching strategies received the same cardiac case scenario and covered the same essential content on the care of a patient experiencing a myocardial infarction. Students completed a detailed cardiac study guide prior to participating in the teaching strategy, which was typical preparation for the laboratory session. Students were randomly assigned to one of three active-learning teaching strategies: case-based learning, simulation, and simulation with narrative pedagogy.

I was responsible for implementing all three active-learning teaching strategies in order to provide consistency throughout the study. Students took a 10-item cardiac knowledge test at the beginning of the teaching strategy session. Immediately following the teaching strategy, students participating in the study completed three questionnaires: the Demographic Questionnaire, the Student Satisfaction and Self-Confidence in Learning Instrument, and the Educational Practices Questionnaire. All teaching strategies were completed within 2 weeks of the lecture.

During Week 3 of the study, after the teaching strategy sessions and after the cardiovascular unit exam, students participated in a digitally recorded individual performance demonstration. Students implemented nursing intervention activities in response to a new cardiac (myocardial infarction) scenario interacting with a high-fidelity mannequin. During Week 8 of the study, students participated in another digitally recorded individual (retention) performance demonstration using a similar format and different cardiac (myocardial infarction) case scenario.

As a way of evaluating students' laboratory learning, they are routinely required to participate in digitally recorded individual performance demonstrations using the high-fidelity simulation mannequin in the Nursing Clinical Education Center (NCEC). Thus, the students' two digitally recorded individual performance demonstrations at Week 3 and Week 8 of the study were integrated into students' scheduled laboratory sessions. Students consenting to participate in the study were granting approval to have their digital recordings reviewed by the research team. Immediately following the retention performance demonstration (Week 8 of the study), students received a 10-minute debriefing session on their performance by an instructor and completed the Follow-up Information Questionnaire.

Table 4. Overview of Data Collection Procedures

Week 1 - Students enrolled in 96:135 Complex Concepts of Nursing Care course attended their regularly scheduled lecture on cardiovascular nursing care and completed a detailed cardiac study guide. Implementation of the three active-learning teaching strategies started after presentation of the lecture content.		
Week 1	Week 3	Week 8
Implemented Teaching Strategies	First Student Performance Demonstration	Student Retention Performance Demonstration
10 minutes: Cardiac knowledge test 10 minutes: Reviewed cardiac case scenario (Leo Brooker) 30 minutes: Participated in one of three randomly assigned small group teaching strategy sessions (3-4 students per group) 30 minutes: Participated in reflection session	15 minutes: Reviewed cardiac case scenario (Maria Sanchez) 30 minutes: Participated in an individual performance demonstration with the researcher using a high-fidelity simulation mannequin (digitally recorded)	15 minutes: Reviewed cardiac case scenario (Herman Morris) 30 minutes: Participated in an individual retention performance demonstration with the researcher using a high-fidelity simulation mannequin (digitally recorded) 10 minutes: Debriefing session on performance of nursing care.
Completed 3 questionnaires (after the teaching strategy) (10 minutes)		Completed a short questionnaire (5 minutes)
Total time: 1½ hours	Total time: 45 minutes	Total time: 1 hour

E-mail communication was used to inform students of study participation times and room locations in the NCEC. I e-mailed students the specific times of their group teaching strategy sessions within 1 week of their consenting to participate in the study. Students were also e-mailed 1 week in advance of the specific time of their first and second individual performance demonstrations. (See Table 4: Overview of Data Collection Procedures.)

Procedures

Implementation of Three Active-Learning Teaching Strategies (Independent Variables)

I implemented all three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) to ensure consistency. I held four 90-minute teaching strategy sessions a day consisting of three or four students per group. It took six separate days dispersed over a 2-week period to accommodate the 86 students enrolled in the course. The following section describes the *similarities* of the three teaching strategy groups.

Students in all three groups experienced intense and highly focused learning during their small group teaching strategy sessions, which concentrated on nursing care of a patient experiencing a myocardial infarction. Including only three or four students per group session enhanced the intensity and focus of the small group teaching strategy sessions. An essential component of student learning began with a cardiac lecture, followed by students' independent work on a detailed cardiac study guide. Students' foundational cardiac knowledge allowed them to take their thinking to a higher level and apply specific assessments and nursing interventions necessary to provide care for a myocardial infarction patient during the teaching strategy session. Students' later participation in a first performance demonstration and retention performance demonstration objectively measured students' performance of nursing care. The

intentions of the teaching strategy sessions were to strengthen students' cardiac knowledge to perform nursing care.

Each teaching strategy session began with students reading through the teaching strategy instructions, which described how class time would be spent. There were two versions of student instructions, one for the case-based learning teaching strategy and another for the two simulation teaching strategies (see Appendix C. Case-Based Learning Teaching Strategy Instructions, and Simulation Teaching Strategy Instructions). Next, all students signed the confidentiality agreement form to not share information regarding the study with other 96:135 students and took a cardiac knowledge test (see Appendix B. Confidentiality Agreement and Cardiac Test.) All students reviewed the same teaching strategy case scenario (Leo Brooker) of a patient experiencing a myocardial infarction (see Appendix D. Student Teaching Strategy Scenario-Leo Brooker). I used a separate teaching 'strategy' script for each of the three teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy), and I used an identical teaching 'content' script for students in all three groups, which consisted of essential teaching content based on the American Heart Association standards of care for a patient experiencing a myocardial infarction (see Appendix D. Case-Based Learning Questions; Script: Simulation Teaching Strategies-Leo Brooker; and Script: Teaching Strategy Essential Content). The instructions, scenario and scripts in Appendix D provide essential details on the procedures and what was said during each of the three teaching strategies.

A 30-minute reflection session followed each teaching strategy session and included a discussion of appropriate care decisions in the teaching strategy, care decisions that would have been more appropriate, and care decisions that were omitted or incorrect (see Appendix D. Script: Teaching Strategy Reflection Session). During the reflection session, the white board was used to summarize students' discussion on essential elements of care, and students were encouraged to take notes. Students took home the teaching strategy case scenario. A more detailed explanation of the reflection

session follows the description of the teaching strategies below. The following section describes the *differences* in the three teaching strategy groups.

Group 1: Case-Based Learning (Control Group)

Students in the case-based learning group discussed the cardiac case scenario (Leo Brooker) among themselves, specifically addressing seven questions relevant to the case. I used the case-based learning questions as my script by reading each question to the group and facilitating student discussion in answering the questions. (See Appendix D. Case-Based Learning Questions.) I responded to the case-based dialogue using the "Script: Teaching Strategy Essential Content" (Appendix D), which helped students identify the essential elements of care for a patient experiencing a myocardial infarction. I provided cues and critical thinking questions to help students think about essential content while discussing the case questions. The 30-minute case-based teaching strategy was followed by a 30-minute reflection session.

Group 2: Simulation (Experimental Group)

Students in the simulation group worked through the cardiac case scenario (Leo Brooker) using simulation, which involved a high-fidelity mannequin attached to state-of-the-art monitoring equipment. Prior to entering the simulation room, I instructed students that the scenario was in real time and to "think out loud" as they participated in providing care in the simulation laboratory. Students were told that during the simulation scenario, my role was to play the voice of the patient, doctor, and unit secretary while running the computerized mannequin hidden behind a screen, and that I could not answer any questions about nursing care. Students were expected to respond to the cues of the patient experiencing a myocardial infarction. During the simulation, I responded as the voice of the patient regarding nursing care provided by students in a scripted manner, which focused on the essential elements of care integrated into the "Script: Simulation Teaching Strategies-Leo Brooker" (Appendix D). I did not cue students on the myocardial infarction signs and symptoms. When students' asked the patient about each

specific sign and symptom, I provided the answer as described in the script. Students independently provided nursing care as a group, with no teaching assistance. The 30-minute simulation teaching strategy was followed by a 30-minute reflection session.

Group 3: Simulation with Narrative Pedagogy

(Experimental Group)

Students in the simulation with narrative pedagogy group worked through the cardiac case scenario (Leo Brooker) using simulation, which involved a high-fidelity mannequin attached to state-of-the-art monitoring equipment. Two researchers were involved in this teaching strategy. I played the role of teacher standing near the bedside in order to implement the narrative pedagogy teaching strategy. The other researcher played the voice of the patient, doctor, and unit secretary while running the computerized mannequin hidden behind a screen to help me focus on the teacher role of interacting with students.

Prior to entering the simulation room, students were instructed on the following: The scenario was in real time, "think out loud" while providing care in the simulation laboratory, and I (the teacher) would call a few brief "time out" periods throughout the scenario to help them think about their nursing care. Students were expected to react to the patient cues and provide nursing care based on the patient experiencing a myocardial infarction.

During the simulation, the researcher playing the voice of the patient responded to nursing care provided by students in a scripted manner, which focused on the essential elements of care for a patient experiencing a myocardial infarction in the "Script: Simulation Teaching Strategies-Leo Brooker" (Appendix D). The researcher did not cue students on the myocardial infarction signs and symptoms. When students' asked the patient about each specific sign and symptom, the researcher provided the answer as described in the script: Leo Brooker simulation teaching strategy.

As the teacher at the bedside calling brief time outs, I responded to whether students considered the best choice of nursing care or whether there were more appropriate assessments and interventions to implement based on the "Script: Teaching Strategy Essential Content" (Appendix D). A few examples of my critical thinking questions to students included: What are your priority assessments in providing care to Leo Brooker, based on his symptoms? Are there other priority assessments that need to be done?; and What additional independent nursing interventions can you perform before calling the doctor? Students worked together in answering each questions, then resumed providing care to Leo Brooker. During the next time out, I helped students focus on important information to communicate to the physician regarding Leo Brooker's condition. The final time out I guided student thinking about prioritizing interventions based on the physician's orders. The brief time outs allowed me to give students immediate feedback on their performance and decision-making based on essential elements of care for a patient experiencing a myocardial infarction. After each short discussion, students resumed providing care to Leo Brooker. The 30-minute simulation with narrative pedagogy teaching strategy was followed by a 30-minute reflection session.

Reflection Sessions

Based on the review of the literature, the reflection session is a valuable component to the learning process when using high-fidelity simulation as a teaching strategy (Childs & Sepples, 2006; Howard, 2007; Jeffries & Rizzolo, 2006; Lasater, 2007; Ravert, 2004). A 30-minute reflection session followed each teaching strategy (case-based learning, simulation, and simulation with narrative pedagogy). The session helped students to think in-depth regarding aspects of learning from the teaching strategy and more specifically to analyze the process and application of information in caring for a patient experiencing a myocardial infarction. I asked students in the reflection session to share their thoughts regarding learning that occurred during the teaching strategy and to

discuss the standards of care for a patient experiencing a myocardial infarction. The dialog with students began with questions. How do you think the session went? What went well regarding your learning in the session? Give examples of where you prioritized assessments and nursing interventions effectively? What could you have improved upon? What care decisions would have been more appropriate? What care decisions were omitted? And what were the important standards of care in providing care to the patient, Leo Brooker, who was experiencing a myocardial infarction? (See Appendix D. Script: Teaching Strategy Reflection Session.) At the beginning of the reflection session, I wrote the following four broad categories on the white board: Priority nursing assessments, priority independent nursing interventions, information to share with the physician regarding the patient's condition, and additional nursing interventions to implement. These broad categories helped organize students' thoughts according to how nurses think. As students answered the questions regarding how they approached the care of Leo Brooker, I wrote their responses on the board under the appropriate broad category heading. Students were encouraged to take notes during the reflection session.

Students were also given positive feedback about their performance (simulation and simulation with narrative pedagogy groups) and thinking (case-based learning group) as well as recommendations on how to improve the care of a patient experiencing a myocardial infarction. At the end of the reflection session, I asked students to summarize the main points of what they learned from the session. The reflection session helped students critically think through the scenario and link theory (learned from the cardiac lecture) to practice of caring for a patient experiencing a myocardial infarction. Students benefited from hearing instructor feedback as well as hearing other students' ideas and nursing care priorities. The same teaching strategy scenario, Leo Brooker, was used for all three teaching strategies; thus, the content covered in the reflection session was similar for each group. Although students from all three groups had a 30-minute reflection session, the students had learned from different teaching strategy sessions; therefore, the

learning experiences and features of the teaching strategy sessions on which they could reflect were also different. More specifically, the essential difference between the groups' reflection sessions was that while students' reflections in the simulation and simulation with narrative pedagogy groups focused on their *actual* performance of care for the high-fidelity simulated patient, students' reflections in the case-based learning group focused on their thinking about how they *would* approach care for the patient in the case scenario if it were possible.

Measurement of Dependent Variables

During Week 1 of the study, at the beginning of each active-learning teaching strategy session, students took a test on cardiac knowledge. Immediately following participation in the teaching strategy, students completed three questionnaires: the Demographic Questionnaire, the Student Satisfaction and Self-Confidence in Learning Instrument, and the Educational Practices Questionnaire (see Appendix B. Instruments).

During Week 3 of the study (2 weeks after the teaching strategy), students returned to the NCEC to participate in a digitally recorded individual performance demonstration using a high-fidelity mannequin and a new cardiac case scenario of a patient experiencing a myocardial infarction (see Appendix E. Student Performance Scenario-Maria Sanchez). Three researchers were involved. One researcher greeted the student and reviewed the instructions for the individual performance demonstration (see Appendix E. Individual Performance Demonstration Instructions). Then she took the student to a quiet room for 15 minutes to prepare for the new cardiac case scenario of a patient experiencing a myocardial infarction. I was the second researcher, playing the voice of the patient, doctor, and unit secretary from the audio-video control room. The third researcher ran the computerized mannequin hidden behind a screen in the simulation room.

The student spent 30 minutes performing nursing care based on information provided in the case scenario using a high-fidelity mannequin. Prior to entering the

simulation room, the greeter (researcher) reiterated important instructions: the scenario was in "real time," remember to "think out loud" while performing care, and the mannequin computer operator would not be able to answer questions during the scenario. The scenario started when the student entered the simulation room. I played the voice of the patient (from the audio-video control room) and responded to nursing care provided by the student in a scripted manner. I did not cue the student on the myocardial infarction signs and symptoms. When the student asked the patient about each specific sign and symptom, I provided the answer as described in the script. The student was asked to return the performance scenario at the end of session and write a self-reflection of his or her performance demonstration. The self-reflection was submitted electronically to the 96:135 Iowa Courses Online site by 11:00 p.m. that evening (see Appendix E. Script: Performance Scenario-Maria Sanchez, and Written Self-Reflection of First Performance Demonstration).

One research team member scored all the digitally recorded individual performance demonstrations using the Student Performance Demonstration Rubric (see Appendix B. Instruments). A second researcher using the rubric also independently scored every fifth digital recording. Comparison of the two evaluators' rubric scores were conducted to establish rater agreement. If rater agreement had ever dropped below 0.90, the researchers would have discussed and reviewed the items on the rubric leading to the disagreement. However, rater agreement always exceeded the 0.90 level.

During Week 8 of the study (7 weeks after the teaching strategy), students repeated a digitally recorded individual retention performance demonstration using a similar format but a different cardiac case scenario for the high-fidelity mannequin. The new cardiac case scenario involved a patient experiencing a myocardial infarction, but the patient characteristics differed from those in the teaching strategy session and first performance demonstration (see Appendix F. Student Retention Performance Scenario-Herman Morris).

The retention performance demonstration involved four researchers. One researcher greeted the students and reviewed the instructions (see Appendix F. Second Individual Performance Demonstration Instructions). She took the student to a quiet room for 15 minutes to prepare for the scenario. I was the second researcher, playing the voice of the patient, doctor, and unit secretary from the audio-video control room. The third and fourth researchers alternated controlling the computerized mannequin and scoring students' performances using the Performance Demonstration Rubric in order to provide students with feedback during a debriefing session immediately following their performance.

The student spent 30 minutes performing nursing care based on information provided in the case scenario using a high-fidelity mannequin. Prior to entering the simulation room, the greeter (researcher) reminded the student that the scenario was in "real time," to "think out loud," and to not talk to the mannequin computer operator. The scenario started when the student entered the simulation room. I played the voice of the patient (from the audio-video control room), responded to nursing care provided by students in a scripted manner, and did not cue students on the signs and symptoms of myocardial infarction as described above (see Appendix F. Script: Retention Performance Scenario-Herman Morris). The instructions, scenarios, and scripts in the Appendix provide essential details on the procedures and what was said during students' digitally recorded individual performance demonstrations at Week 3 and Week 8.

At the end of the retention performance demonstration, students' received a 10-minute debriefing session by the researcher who scored their performance. Students were given verbal feedback on their performance. Students received information on aspects of nursing care they performed well and aspects of nursing care that needed improvement based on the Performance Demonstration Rubric.

Students completed the Follow-up Questionnaire after the completion of the retention performance demonstration and debriefing session. The Follow-up Information

Questionnaire collected information about students' experiences caring for patients with cardiovascular disease since the teaching strategy session (see Appendix B. Instruments). Students returned the performance scenario prior to leaving.

One research team member scored all the digitally recorded individual performance demonstrations using the Student Performance Demonstration Rubric, and a second researcher scored every fifth digital recording to establish rater agreement as previously described.

Pilot Study

The simulation research team at the University of Iowa College of Nursing implemented two pilot studies, Spring 2008 and Summer 2008, to refine the study procedures and improve student participation. Six nursing students out of 75 volunteered to participate in the Spring 2008 study, and 32 out of 37 participated in the Summer 2008 study. The increase in student participation was due to the research team integrating the teaching strategy and two performance demonstrations into students' scheduled 96:135 classroom laboratory sessions. Nursing simulation literature revealed that a majority of the experimental design studies built the teaching strategies into a required laboratory classroom (Childs & Sepples, 2006; Griggs, 2002; Howard, 2007; Jeffries & Rizzolo, 2006; Lasater, 2007). The research team decided to build the cardiac knowledge test, teaching strategy, and two performance demonstrations into the course because the cardiovascular teaching strategy scenario integrates important learning content. Students who consented to participate in the study completed four questionnaires and allowed the researchers access to their cardiac knowledge test scores and digitally recorded performance demonstrations.

The pilot studies were extremely beneficial in helping the research team refine and standardize the study teaching strategies, scenarios, scripts, individual performance demonstration procedures, and Student Performance Demonstration Rubric. These

revisions strengthened the study by increasing consistency and minimizing extraneous variables. The following section describes some of the revisions and rationales.

Revising the Teaching Strategy and Performance Demonstration Scenarios

A goal of the teaching strategy and individual student performance demonstrations was to help students think independently about nursing care for a patient experiencing a myocardial infarction. The pilot study revealed that the teaching strategy scenario needed revision in order to facilitate students' independent thinking. In this scenario, the patient (Leo Brooker) was originally on oxygen 2 liters per nasal cannula. The research team decided to delete oxygen from the scenario for students to independently identify the need to apply oxygen to the patient in the scenario. The three teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) used the same teaching strategy scenario.

The first performance demonstration scenario (Maria Sanchez) was revised. The research team removed a nausea medication (Ondansetron 4mg intravenous) that was not significant to the scenario. The beginning-level nursing students lost valuable demonstration time in administering this medication. The researchers also removed a built in medication error (incorrect dose of nitroglycerin). During the first performance demonstration testing, half of the students did not identify the medication error, which ethically required the researcher to perform a short debriefing session to bring the error to their attention. Eliminating the medication error eliminated the need for debriefing.

Revising the Teaching Strategy Essential Content Script

The pilot studies helped the research team identify content to add to the standardized teaching strategy essential content script to ensure consistency of the same cardiac content for the three teaching strategy sessions (case-based learning, simulation, and simulation with narrative pedagogy). The following section describes a few examples of script revisions.

The essential content script description of the "five rights" of medication administration was refined and made clearer. The standard nursing procedure of the five rights of medication administration prevents medication errors and ensures students are checking the right medication, right dose, right route, right time, and right patient before administering a medication. For example, the student should state, "I have nitroglycerin 0.4 mg to be given sublingually now to Mrs. Sanchez which compares with the physician orders." Students need to check the five rights of medication with the medication orders three times: when medications are taken out of the medication drawer, at the medication counter, and again at the bedside. Students also have patients state their name while they check the arm identification band.

The revised essential content script emphasizes the need for students to talk out loud about assessment data and the five rights of medication administration. The Spring 2008 pilot study revealed that it was difficult to score the Performance Demonstration Rubric when students did not say out loud what they were thinking and doing. If assessments were not stated out loud, the two researchers scoring the rubric did not know what was being assessed or done. The other scripts for the teaching strategy and performance demonstrations were edited to remind students to think out loud. Thinking out loud was not new to students because it was emphasized in their weekly simulation laboratory sessions.

Revising the Teaching Strategy and Performance Demonstration Scripts

The study contained multiple scripts to ensure consistency in research procedures. I used the specific scripts for the simulation teaching strategies and the two individual performance demonstrations, which involved using the high-fidelity simulator. Significant changes were made to these scripts. I discovered the importance of not cuing the student on the myocardial infarction signs and symptoms when playing the voice of the patient. Students needed to independently identify and develop the patient's signs and

symptoms of myocardial infarction in the scenario. During the Spring 2008 pilot study, I started the scenario by describing very specific signs and symptoms of chest pain in the script (i.e., "It feels like I have an elephant on my chest. I'm having a hard time catching my breath, and my stomach feels lousy"). Because I initially stated the signs and symptoms, students did not have the opportunity to ask questions to independently develop the patient's symptoms. This problem was identified during the scoring of the physical assessment section of the Performance Demonstration Rubric. The remedy involved revising the teaching strategy and performance demonstration scripts after which I offered a general statement in the script, "I'm feeling terrible." I did not offer other signs and symptoms until the student asked about each specific symptom. Instituting the script changes improved the accuracy of scoring students' digitally recorded individual performance demonstrations using the Performance Demonstration Rubric.

The Spring 2008 pilot study performance demonstrations revealed that students were not giving treatment recommendations to the physician, which was a standard component of nurse-physician communication. In this section of the study, the student (playing the role of the nurse) was on the phone with the physician providing detailed information regarding the patient's chest pain. Based on the information provided in the scenario, the student should state, "I recommend morphine, oxygen, nitroglycerin, and aspirin for this patient." In order to emphasize this point, the research team revised the teaching strategy script for the physician to state, "Tell me what you recommend." The two performance demonstration scripts were modified, "Is there any other information?" This provided students an opportunity to communicate recommendations before I continued with the next section of the script. The importance of giving treatment recommendations was also emphasized in the reflection session following the teaching strategy.

Another problem identified from reviewing students' performance demonstrations during the Spring 2008 pilot study was the omission of a script cue for students to communicate the patient's 12-lead electrocardiogram and arterial blood gas results to the physician as described in the scenario. The original script included a cue for the student to call the unit secretary to order a 12-lead electrocardiogram and arterial blood gas and to call the physician with an update on the patient condition after administering the prescribed orders. The remedy for this omission included handing the student results of the patient's 12-lead electrocardiogram and arterial blood gas after administering the third nitroglycerin. The script was revised for the researcher controlling the computer to state, "Here are your patient's results of the 12-lead electrocardiogram and arterial blood gas that you ordered earlier from the unit secretary." This gave the student necessary information to provide the physician a comprehensive patient condition report near the end of the scenario (see Appendix D. Scripts: Simulation Teaching Strategies-Leo Brooker; Appendix E. Script: Performance Scenario-Maria Sanchez; Appendix F. Script: Retention Performance Scenario-Herman Morris).

Standardizing Teaching Strategy and Performance Demonstration Sessions

The research team discovered the importance of explaining that the teaching strategy and performance demonstration sessions in the simulation room were in "real time" during the Spring pilot study. It was common practice during weekly simulation laboratory sessions that students could "fast forward time." For example, when students administered intravenous pain medication, they commonly stated, "Fifteen minutes has passed, and now it is time to assess the patient's response to the pain medication." Using real time was essential for accurately scoring the Performance Demonstration Rubric. Many of the rubric items are based on time; for example, students are expected to assess the patient's heart rate within the first 5 minutes of entering the patient's room, and nitroglycerin tables are to be administered 5 minutes apart.

During the Spring 2008 pilot study, I discovered that students verbally interacted with me personally for help while I played the voice of the patient and ran the high-fidelity simulation computer during the first performance demonstration. I was hidden behind a large white screen while the student performed nursing care based on the scenario. When a student was unsure of what to do next in the performance demonstration, he or she would peek around the screen and ask me questions. Students' were comfortable with me because I implemented the teaching strategy sessions. The remedy involved adding more researchers. I now played the voice of the patient from a nearby audio-video control room, and another researcher run the computer from behind the white screen in the simulation room. Instructions to the student stated that the computer controller was not able to answer questions during the performance demonstration.

Feedback to Students After Performance Demonstrations

Students' medication errors in the first individual performance demonstration (Week 3) during the Spring 2009 pilot study caused the research team to become concerned about no debriefing session to provide verbal feedback following their performance. The research team deliberated about adding a debriefing session but determined it would change the study design in regard to the retention performance demonstration at Week 8. The researchers decided to have students complete a written self-reflection on their first individual performance demonstration. In writing their self-reflection, students were asked to refer back to their notes from the teaching strategy session. The written self- reflection would assist students to think in depth about their individual performance demonstration of providing nursing care. Nursing literature has revealed that students' self-reflection is as an effective method to help them review essential aspects of nursing care (Billings & Halstead 2005; DeYoung, 2003; Jeffries, 2005; Weimer, 2002).

At the end of students' retention performance demonstration (Week 8), the research team added a debriefing session in which students were given verbal feedback on both performance demonstrations. The researchers wanted students to have formal feedback on their performance demonstrations of providing nursing care. Students received information on aspects of nursing care they performed well and aspects of nursing care in need of improvement related to the essential elements of care for a patient experiencing a myocardial infarction.

Student Performance Demonstration Rubric

The Student Performance Demonstration Rubric developed by the research team was extensively revised as a result of the Spring 2008 pilot study. The rubric was constructed to measure students' digitally recorded individual performance of care (nursing intervention activities) on a high-fidelity simulation mannequin. The original rubric contained 11 broad items on essential elements related to the care of a patient experiencing a myocardial infarction. Each broad item was scored on a 0 to 3 scale and summed to provide a total score. Despite extensive training on scoring students' digitally recorded individual performance demonstrations using the rubric, the three researchers' rater agreement scores were not acceptable in terms of the research team's standards. Each item of the original rubric was worded too broadly, making it difficult to score.

After extensive discussions, the research team's revised rubric contained 120 items in which one behavior was identified per item line and was scored on a 0 to 1 scale. Zero indicated that students did not perform the necessary element of care, and 1 indicated that students accurately performed care. The summed item scores provided a total score reflecting students' performance of care (nursing interventions). The rubric incorporated low-inference behaviors, meaning that each item addressed one separate and distinct behavior and little inference was required to identify and consistently rate students' specific performance behaviors during scoring. The Summer 2008 pilot study yielded a rater agreement of 0.93 (N=28) for three researchers ratings.

Because of the high rater agreement on the revised rubric, the research team decided to have one research team member score all of the students' digitally recorded performance demonstrations and a second researcher score every fifth digital recording. The same two researchers who scored the spring and summer pilot study rubrics scored the rubrics in this study.

Data Analysis Procedures

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 17.0. Demographic Questionnaires and Follow-up Information Questionnaires were analyzed using descriptive statistics: frequency counts, means, and standard deviations. When comparing demographic characteristics between the groups, Chi-Square analysis was conducted on nominal level data. The remaining plan for data analysis is presented for each research question.

1. What is the difference in performing nursing intervention activities among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?
2. What is the difference in the retention of performing nursing intervention activities among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

Student Performance Demonstration Rubric**.** One research team member scored all the students' digitally recorded individual performance demonstrations, observing for the specific nursing cares using a 120-item rubric checklist. Each item on the rubric was scored using a 0 to 1 scale based on students not providing or accurately providing essential elements of care. The summed item scores provided a total score for students' performance of nursing intervention activities. A two-way mixed analysis of variance (ANOVA) was conducted on Student Performance Demonstration Rubric scores. The independent variables included one between-group variable, teaching strategy treatment group, with three levels (case-based learning, simulation, and simulation with narrative

pedagogy) and one within-subject variable, time, with two levels (time one, first performance; and time two, retention performance). The dependent variable was students' performance demonstration scores. Therefore, if significant differences were found ($p < .05$) Tukey HSD post hoc procedures were applied as necessary to determine where the differences in the scores occurred for the three treatment groups. Tukey has good power and controls for type I error. Any additional exploratory analysis of first performance and retention performance using one-way ANOVAs may increase the risk of Type I error from repeated analysis.

A 10-question test on knowledge of cardiovascular disease was given to students prior to the teaching strategy. The cardiac test data served as a covariate to control for any differences in knowledge level of the three teaching strategy treatment groups. If differences on the cardiac test were found for the three teaching strategy groups based on one-way ANOVA, two-way mixed analysis of covariance (ANCOVA) were applied as necessary, with the independent variables being group and time (first performance and retention performance) to compare students' mean differences on students' first performance and retention performance scores for the three treatment groups while statistically controlling for the extraneous variance of knowledge measured by the cardiac test. The cardiac knowledge test was important because students' knowledge level could influence students' performance on nursing interventions, potentially confounding the results of the study by unexplained variance. ANCOVA controls for the effect of the covariate (cardiac knowledge test scores) on the dependent variable (rubric scores) and helps to reduce the within-groups error variance, which more accurately assesses the effect of the independent variable (three teaching strategy groups) (Field, 2005).

3. What is the difference in the satisfaction and self-confidence among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

The Satisfaction and Self-Confidence in Learning Instrument contained 13 items, using a 1 to 5 Likert scale, and was designed to measure student satisfaction (5 items) and self-confidence (8 items) with the teaching strategy. Students' total scores on each of the separate constructs—satisfaction and self-confidence—were calculated. Then, separate applications of ANOVA for students' total satisfaction scores and self-confidence scores (dependent variables) were completed for the three teaching strategy treatment groups (independent variable). If significant differences were found ($p < .05$), Tukey HSD post hoc procedures were applied as necessary to determine where the differences in the scores occurred for the three groups.

4. What is the difference in the educational practice preferences among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

The Educational Practices Questionnaire contained 16 items using a 1 to 5 Likert scale and was designed to measure students' perceptions regarding the *presence* and *importance* of four educational practices (active learning, collaboration, diverse ways of learning, and high expectations). Students' total scores on the *presence* of these educational practices and students' total scores on the *importance* of these educational practices were calculated. Then, two separate applications of ANOVA were performed, one for students' *presence*-of-practices scores and another for students *importance*-of-practices scores (dependent variables) were completed for the three teaching strategy treatment groups (independent variable). If significant differences were found ($p < .05$), Tukey HSD post hoc procedures were applied as necessary to determine where the differences in the scores occurred for the three groups.

Limitations

Several techniques were incorporated to reduce extraneous variance, minimizing threats to internal validity and strengthening the study design such as random assignment of students to groups and standardization of the teaching strategies, scenarios, scripts, and

individual performance demonstration procedures. I implemented all three active-learning teaching strategies using the same case scenario and standardized scripts to ensure consistency. Yet, there are many challenges when performing research in educational settings, resulting in limitations. This study used a nonprobability convenience sample, which can potentially threaten external validity and limit the generalizability of findings to similar-level students at a similar type of university (McMillan & Schumacher 2001). Despite random assignment of students to groups, there still may be selection threats to internal validity, such as differences between subjects in the groups (McMillan & Schumacher 2001). Therefore, the study used a cardiac knowledge test prior to implementing the teaching strategies to assess whether there were differences in the groups and to control for this type of variance.

The study attempted to minimize the internal validity threat of diffusion of treatment by having students sign a confidentiality statement to not share information regarding the study with others. Despite the confidentiality statement, some possibility of diffusion of treatment still existed because students were in the same nursing course and may have discussed the teaching strategies.

Another potential limitation of the study was the 90-minute teaching strategy sessions. The teaching strategy sessions included three or four students per group, allowing each student to have an intensive learning experience. Yet, was 90 minutes long enough to have an impact on student learning? Based on a review of the literature, high-fidelity simulation teaching strategies ranged from 30 minutes to 4 hours and four to eight students per group with no significant knowledge gain for the simulation groups compared to traditional teaching strategy groups (Engum et al., 2003; Griggs, 2002; Jeffries et al., 2003; Jeffries & Rizzolo, 2006; Ravert, 2004; Scherer et al., 2007).

Other possible threats to internal validity included extraneous variance from history and maturation. History or, more specifically, the time of day variance was a factor because the teaching strategies were being conducted from 8:00 a.m. to 5:00 p.m.

because of the numbers of participating students. The inability to hold the time of day constant for the study may have increased extraneous variance and constituted a potential threat to internal validity (McMillan & Schumacher, 2001). Maturation was also a potential factor, since the study was implemented over several weeks (Week 1, teaching strategy; Week 3, first performance demonstration; and Week 8, retention performance demonstration). Maturation occurs as students in a study change over time (McMillan & Schumacher 2001). Students' ability to learn how to perform nursing interventions can occur over time especially from individual clinical or hospital work experiences, which would make it difficult to determine if differences between groups were due to the teaching strategies or maturation over time. Comparison of data from the three teaching strategy groups provided some insight into the extraneous factor of maturation. However, in order to further assess the possibility of threats because of maturation, data from the Follow-up information questionnaire determined if students had clinical or work experiences caring for patients with cardiovascular disease since the completion of the teaching strategy session.

Quantitatively measuring students' performance of nursing intervention activities posed a potential limitation. The Student Performance Demonstration Rubric incorporated low-inference behaviors, meaning that each item addressed one separate and distinct behavior and required little inference by the researcher to identify and consistently rate students' specific performance behaviors during scoring. Although the reliability and validity of measurement for low-inference behaviors is high, some performance behaviors could still have been difficult for the researcher to score unless students stated out loud what they were doing in implementing nursing interventions.

Another possible limitation was that different people respond more effectively to various teaching strategies, and the students may have been randomly assigned to a strategy that did not build on their strengths. To help assess this possibility, data were

collected on the educational practice preferences of students to assess their tendency toward different teaching strategies.

Summary

This chapter described the research methodology to examine the effects of three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on the outcomes of nursing student performance of intervention activities, retention performance of intervention activities, student satisfaction and self-confidence, and educational practice preferences. Details of the chapter included the experimental research design, research questions, population and sample, the three active-learning teaching strategies (independent variables), instruments to measure the dependent variables, coding of variables, treatment of missing values, data collection procedures, pilot study, data analysis procedures, and limitations. The next chapter presents the results of the study.

CHAPTER 4

RESULTS

The purpose of this study was to determine if there were differences in the effects of three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on the outcomes of student performance of nursing intervention activities, performance retention of intervention activities, student satisfaction, student self-confidence, and educational practice preferences. The study used an experimental posttest-only design incorporating two posttests (first performance and retention performance) to evaluate the effects of the three teaching strategies on the specified outcomes. Data were collected from March to May 2009. Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 17.0. Statistical analyses included two-way mixed analysis of variance (ANOVA) and one-way ANOVA as well as descriptive statistics. This chapter presents the results of the study. The first section describes the sample using descriptive statistical analyses. Subsequent sections present and organize the results of the study according to each of the study's research questions.

Sample

Eighty-six undergraduate University of Iowa nursing students enrolled in a second-semester nursing course were eligible for the study, and 74 students consented to participate. There were 4 males and 70 females. The ethnic background of participants included 5 Asian, 1 Hispanic, and the remaining 68 Caucasian. Regarding age, there were 56 students under the age of 21 years; 16 students between the ages of 21-24 years; 1 student between the ages of 25-29 years; and 1 student between the ages of 30-39 years. The sample of students was a typical group for this population. There were 22 participants in the case-based learning group, 25 in the simulation group, and 27 in the simulation with narrative pedagogy group.

Descriptive statistics were used to analyze students' responses to the Demographic and Follow-up Information Questionnaires. Frequency counts across teaching strategy groups revealed that groups were similar with respect to gender, ethnic background, age, marital status, education level, contact with cardiovascular patients in the clinical setting, and contact with cardiovascular patients during the last 8 weeks in the clinical setting.

Table 5. Frequency Analysis: Gender

	Female	Male
Case-based learning	21	1
Simulation	23	2
Simulation with Narrative Pedagogy	26	1

Table 6. Frequency Analysis: Ethnic Background

	Caucasian	Asian	Hispanic
Case-based learning	21	1	0
Simulation	22	2	1
Simulation with Narrative Pedagogy	25	2	0

Table 7. Frequency Analysis: Age

	Under 21	21-24	25-29	30-39
Case-based learning	18	4	0	0
Simulation	15	9	0	1
Simulation with Narrative Pedagogy	23	3	1	0

Table 8. Frequency Analysis: Marital Status

	Single	Married	Partnered
Case-based learning	22	0	0
Simulation	22	0	3
Simulation with Narrative Pedagogy	23	1	3

Table 9. Frequency Analysis: Education Level

	High School	College Degree
Case-based learning	21	1
Simulation	25	0
Simulation with Narrative Pedagogy	25	2

Table 10. Frequency Analysis: Contact with Cardiovascular Patients in the Clinical Setting

	Always	Most of the time	Some-times	Rarely	Never
Case-based learning	3	2	6	6	5
Simulation	5	3	8	7	2
Simulation with Narrative Pedagogy	5	3	7	5	7

Table 11. Frequency Analysis: Contact with Cardiovascular Patients in the Last 8 Weeks in the Clinical Setting

	Always	Most of the time	Some-times	Rarely	Never
Case-based learning	4	2	4	8	4
Simulation	4	2	7	8	4
Simulation with Narrative Pedagogy	5	4	3	7	8

Chi-square analysis was used to test for significant differences across teaching strategy groups based on students' employment in health care and work experience with cardiovascular patients in the last 8 weeks from the Demographic and Follow-up Information Questionnaires respectively. The analysis revealed no significant differences across the groups.

Table 12. Chi-Square Analysis: Employment in Health Care by Type of Teaching Strategy

	No Employment in health care	Yes Employment in Health Care
Case-based learning	12	10
Simulation	17	8
Simulation with Narrative Pedagogy	14	13

Chi-Square (2) = 1.55, p = .46

Table 13. Chi-Square Analysis: Work Experience with Cardiovascular Patients in the Last 8 Weeks by Type of Teaching Strategy

	No	Yes
Case-based learning	11	11
Simulation	12	13
Simulation with Narrative Pedagogy	17	10

Chi Square (2) = 1.38, p = .50

A one-way ANOVA on the cardiac test revealed no significant differences across groups (F 2, 71 = .88, p = .42), which showed the students had similar levels of prior cardiac knowledge regardless of group assignment. As a result, no additional statistical analysis controlling for differences in prior knowledge of cardiac content was needed in this study.

Table 14. One-Way ANOVA: Cardiac Test

	N	Mean/SD
Case-based learning	22	7.40 (1.27)
Simulation	25	7.48 (1.22)
Simulation with Narrative Pedagogy	27	7.83 (1.23)
Total	74	7.59 (1.24)

F (2, 71) = .88, p = .42

Research Questions

The remaining data analysis and results are organized and presented according to each research question. Each section restates one or more of the study's central research questions and then presents the results of the analysis corresponding to the specified research question or questions.

Research Questions 1 and 2

What is the difference in performing nursing intervention activities among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

And what is the difference in the retention of performing nursing intervention activities among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

The Student Performance Demonstration Rubric measured students' performance of intervention activities at Time 1, first performance, and Time 2, retention performance. Two researchers had.90 and .94 rater agreement for students' first performance and retention performance scores, respectively. A two-way mixed analysis of variance (ANOVA) was conducted on Student Performance Demonstration Rubric scores. The independent variables included one between-group variable, teaching strategy group, with three levels (case-based learning, simulation, and simulation with narrative pedagogy), and one within-subject variable, time, with two levels (Time 1, first performance, and Time 2, retention performance).

There was a significant main effect (within-subjects effect) of time ($F\ 1, 71 = 7.98$, $p = .006$). Students rubric scores were significantly higher in Time 2 (retention performance) than Time 1 (first performance). (See Table 15 for means and standard deviations of first performance and retention performance rubric scores.) Students in all three teaching strategy groups improved in their performance of nursing interventions as the semester progressed. (See Table 16.)

There was no significant interaction effect (within-subjects) for time and teaching strategy groups (F 2, 71 = 1.61, p = .208). This implies that the pattern of means for the three groups at Time 1 were similar to patterns at Time 2 (see Figure 3).

Table 15. Means and Standard Deviations for First Performance and Retention Performance Rubric Scores

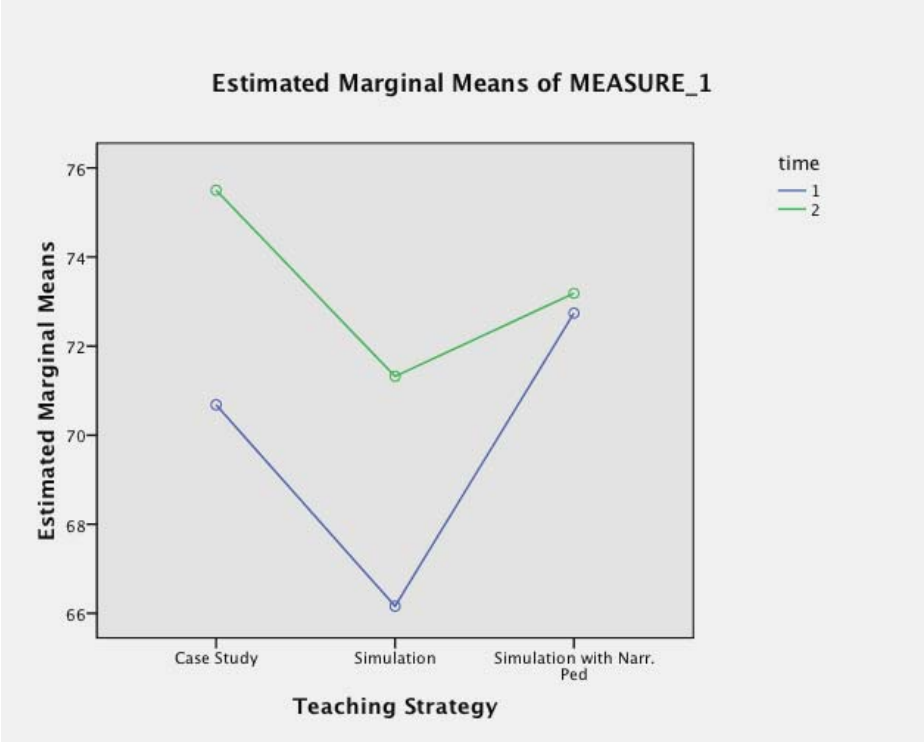
	Time one First Performance Mean/SD	Time two Retention Performance Mean/SD
Case-based learning	70.68 (9.51)	75.50 (8.67)
Simulation	66.16 (10.60)	71.32 (8.66)
Simulation with Narrative Pedagogy	72.74 (9.84)	73.19 (10.21)

Note: Means (and standard deviations) of rubric scores for the three teaching strategy groups at time one and time two.

Table 16. Two-Way Mixed ANOVA

Two-way mixed ANOVA (Repeated Measures) Tests of Within-Subjects Contrasts					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Time	443.42	1	443.42	7.98	.006
Time and Teaching Strategy	178.63	2	89.31	1.61	.208
Error (Time)	3945.65	71	55.57		
Tests of Between-Subjects Effects					
Intercept	753299.23	1	753299.23	5777.90	.000
Teaching Strategy	607.00	2	303.50	2.33	.105
Error	9256.68	71	130.38		

Figure 3. Estimated Marginal Means for First Performance and Retention Performance Rubric Scores



There was no significant main effect (between-subjects effect) of teaching strategy groups (F 2, 71 = 2.33, p = .105). Despite no significant differences, in further analyzing the group means, there was an interesting pattern in the means of students' first performance rubric scores (Time 1). The students' simulation group means were the lowest at 66.16, followed by the case-based learning group at 70.68, and the simulation with narrative pedagogy group had the highest mean at 72.74. (See Table 16.) These results led to further exploring Research Question 1, examining differences in students' first performance of nursing intervention activities. One-way ANOVA was completed on the first performance rubric scores and revealed results approaching significance for the three teaching strategy groups (F 2, 71 = 2.90, p = .06). (See Table 17.)

Table 17. One-Way ANOVA: First Performance Rubric Scores

	N	Mean/SD
Case-based learning	22	70.68 (9.51)
Simulation	25	66.16 (10.60)
Simulation with Narrative Pedagogy	27	72.74 (9.84)
Total	74	69.91 (10.27)

F (2, 71) = 2.90, p = .06

Analysis of students' retention performance rubric scores (Time 2) revealed simulation group means continued to be the lowest at 71.32, followed by the simulation with narrative pedagogy group at 73.19, and the case-based learning group having the highest mean at 75.50. In an attempt to further explore Research Question 2, examining differences in students' retention performance of nursing intervention activities, one-way ANOVA was completed on retention performance rubric scores. Analysis revealed no significant differences in the retention performance rubric scores across the three groups (F 2, 71 = 1.19, p = .31) (See Table 18.) Exploration of the data using one-way ANOVAs for first performance and retention performance may increase the risk of Type I error from repeated analysis.

Table 18. One-Way ANOVA: Retention Performance Rubric Scores

	N	Mean/SD
Case-based learning	22	75.50 (8.67)
Simulation	25	71.32 (8.66)
Simulation with Narrative Pedagogy	27	73.19 (10.21)
Total	74	73.24 (9.29)

F (2, 71) = 1.19, p = .31

The following summarizes the results of Research Questions 1 and 2. Research Question 1 examined differences in students' first performance of nursing intervention activities among the three groups. The results of students' first performance rubric scores using one-way ANOVA approached significance (F 2, 71 = 2.90, p = .06), yet was not

significant at the .05 level. The simulation with narrative pedagogy group had the highest mean (72.74), followed by the case-based learning group mean (70.68), and finally the simulation group scored the lowest mean (66.16).

Research Question 2 examined differences in students' retention performance of nursing intervention activities. A two-way mixed analysis of variance (ANOVA) was conducted on students' retention performance rubric scores. Analysis revealed a significant main effect (within-subjects effect) of time (F 1, 71 = 7.98, p = .006), meaning that students in all three teaching strategy groups improved as the semester progressed. There was no significant interaction effect (within-subjects) for time and teaching strategy groups, indicating that students in the three groups had a similar pattern of performance rubric scores at time one compared to time two. There was also no significant main effect (between-subjects effect) of teaching strategy groups, meaning that students' performance of nursing intervention activities was not significantly different across the three groups. Interestingly, the case-based learning group had the highest retention performance mean 75.50, followed by the simulation with narrative pedagogy group mean (73.19), and the simulation group had the lowest mean (71.32). The lack of significant interaction effect and main effect of teaching strategy groups may have been due to the small sample size and warrants additional research.

Research Question 3

What is the difference in satisfaction and self-confidence among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

The Satisfaction and Self-Confidence in Learning Instrument contained 13 items, using a 1 to 5 Likert scale. Students' total scores on each of the separate constructs, satisfaction and self-confidence, were calculated. Then, separate applications of one-way ANOVA for students' total satisfaction scores and self-confidence scores were conducted. The test revealed no significant differences across the groups in Satisfaction Total scores (F 2, 71 = .61, p = .55), and Self-Confidence Total scores (F 2, 71 = .28, p =

.76). Cronbach alphas for these two constructs were .89 for satisfaction and .85 for self-confidence.

Table 19. Means and Standard Deviations for Satisfaction Total Scores

	N	Mean/SD
Case-based learning	22	22.68 (4.44)
Simulation	25	23.36 (1.89)
Simulation with Narrative Pedagogy	27	23.56 (1.72)
Total	74	23.23 (2.84)

F (2, 71) = .61, p = .55

Table 20. Means and Standard Deviations for Self-Confidence Total Scores

	N	Mean/SD
Case-based learning	22	34.32 (6.54)
Simulation	25	35.24 (2.49)
Simulation with Narrative Pedagogy	27	34.78 (2.90)
Total	74	34.80 (4.18)

F (2, 71) = .28, p = .76

Research Question 4

What is the difference in educational practice preferences among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

The Educational Practices Questionnaire contained 16-items using a 1 to 5 Likert scale. Students' total scores on the presence of these educational practices and students' total scores on the importance of these educational practices were calculated. Then, two separate applications of one-way ANOVA were performed, one for students' presence-of-practices scores and another for students importance-of-practices scores. The test revealed no significant differences across the groups in presence total score (F 2, 71 = 1.61, p = .21) and importance total score (F 2, 71 = .32, p = .72). Cronbach alphas for

these two constructs were .85 for the presence of specific practices and .92 for the importance of specific practices.

Table 21. Means and Standard Deviations for Educational Practice Presence Total Scores

	N	Mean/SD
Case-based learning	22	72.55 (9.21)
Simulation	25	74.76 (4.61)
Simulation with Narrative Pedagogy	27	75.74 (4.43)
Total	74	74.46 (6.34)

F (2, 71) = 1.61, p = .21

Table 22. Means and Standard Deviations for Educational Practice Importance Total Scores

	N	Mean/SD
Case-based learning	22	70.86 (16.85)
Simulation	25	67.48 (17.75)
Simulation with Narrative Pedagogy	27	70.74 (15.72)
Total	74	69.68 (16.61)

F (2, 71) = .32, p = .72.

Table 23. One-Way ANOVA for Each Presence of Educational Practice Question

Presence of Educational Practice Question	One-Way ANOVA F (2, 71), Significance	Mean	
Work with peers	14.74, p = .000	CBL	4.32**
		S	4.96
		SNP	4.85
During learning activity worked with peers	7.77, p = .001	CBL	4.14**
		S	4.92
		SNP	4.85
Learning activity offered variety ways to learn	5.19, p = .008	CBL	3.76**
		S	4.44
		SNP	4.52
Chance to discuss objectives with instructor	6.48, p = .003	CBL	4.91
		S	4.36*
		SNP	4.74

Note. CBL - Case-based learning, S – Simulation, SNP - Simulation with Narrative Pedagogy; Tukey HSD test revealed significant differences

(* = p < .03, ** = p < .01)

Because of the research team's perception of the value of each of the individual educational practice questionnaire items, each item was analyzed using one-way ANOVA to determine differences in the teaching strategy groups. No significant differences among the groups were found on the individual questionnaire items for the importance of educational practices. The results revealed significant differences among the groups on some of the questions related to the presence of educational practices, more specifically the presence of collaboration (chance to work with peers) and presence of diverse ways of learning (the learning activity offered a variety of ways to learn the material). Post hoc comparison using the Tukey HSD test indicated that the mean item score for the case-based learning group was significantly different than the mean item scores for the simulation and simulation with narrative pedagogy groups. The simulation and simulation with narrative pedagogy had higher mean scores compared to the case-based learning group. (See Table 21.) A significant difference was found on the question related to the *presence* of student-faculty interaction (chance to discuss objectives with instructor). The Tukey HSD test indicated that the mean item score for the simulation group was significantly different than the mean item scores for the case-based learning and simulation with narrative pedagogy groups, which had the highest means. (See Table 21.) Exploration of each question using one-way ANOVA may increase the risk of Type I error from repeated analysis.

Summary

This research focused on active-learning teaching strategies to engage nursing students in learning. The purpose of this experimental research study was to determine if there were differences in the effects of three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on the outcomes of nursing student performance of intervention activities, performance retention of intervention activities, student satisfaction, self-confidence, and educational practice preferences. Two-way mixed analysis of variance (ANOVA) revealed a significant main

effect (within-subjects effect) of time, meaning that students in all three teaching strategy groups experienced improved performance of nursing interventions over time, from first performance to retention performance. No significant interaction effect (within-subjects) for time and teaching strategy groups were found. There was also no significant main effect (between-subjects effect) of teaching strategy groups ($F\ 2, 71 = 2.33$, $p = .105$). However, an exploratory one-way ANOVA on student's first performance rubric scores revealed results approaching significance for the three teaching strategy groups ($F\ 2, 71 = 2.90$, $p = .06$). The simulation with narrative pedagogy group had the highest first performance mean (72.74), followed by the case-based learning group mean (70.68), and finally the simulation group scored the lowest mean (66.16). One-way ANOVA revealed no significant differences across the groups for students' Satisfaction Total scores, Self-Confidence Total scores, and Presence and Importance of Educational Practices Total scores. One-way ANOVA for each educational practice questionnaire item revealed significant differences among the groups on the questions related to the presence of collaboration chance to work with peers and the presence of diverse ways of learning, with the simulation and simulation with narrative pedagogy reporting higher mean item scores compared to the case-based learning group. A significant difference was also found on the question related to the *presence* of student-faculty interaction (chance to discuss objectives with instructor). Students in the case-based learning and simulation with narrative pedagogy group reported higher mean item scores. These two groups of students received two sets of engaging student-teacher interactions, one from the teaching strategy session and another during the reflection session. Students in the simulation group had one set of engaging student-teacher interactions during the reflection session.

The next chapter elaborates on discussion and conclusions from the research findings.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

This study used an experimental posttest-only design incorporating two posttests (first performance and retention performance) to evaluate the effects of three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on the defined outcomes of nursing student performance of intervention activities, retention of performing intervention activities, student satisfaction, student self-confidence, and educational practice preferences. The previous chapter presented all the research findings from this study, and this chapter includes a discussion of the research findings, implications for nursing education, and recommendations for future research.

Discussion of Research Findings

Nurse educators strive to best prepare nursing students to care for patients in an increasingly complex healthcare environment. Educators are examining creative teaching strategies that focus on engaging nursing students in active learning. High-fidelity simulation is an active-learning teaching strategy gaining popularity in nursing education to help prepare students to problem solve and think critically while caring for patients with complex illnesses. Limited empirical evidence exists regarding the effectiveness of high-fidelity simulation compared to other active-learning teaching strategies. A main focus of this experimental study was to determine if there were differences in the effects of three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on nursing student performance and retention performance of nursing intervention activities. This study is unique in that it developed and used a Student Performance Demonstration Rubric to measure the effectiveness of the teaching strategies.

The Student Performance Demonstration Rubric provides a new approach to assess student performance. Students' ability to perform nursing interventions

demonstrates their ability to critically think and apply nursing knowledge. The rubric was developed to help fill a key deficiency in nursing high-fidelity simulation research, which is capturing students' knowledge growth related to using this technology. Multiple nursing studies measuring pretest-posttest knowledge gain found no significant differences between high-fidelity simulation and traditional case study groups (Engum et al., 2003; Griggs, 2002; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Ravert, 2004; Scherer et al., 2007). The lack of significant findings on pretest-posttest knowledge gain relates to the fact that students' interactions during high-fidelity simulation scenarios are focusing on synthesizing and applying knowledge as they perform necessary nursing interventions; thus, outcome measures should focus on the application of knowledge through performance (Jeffries & Rizzolo, 2006). The Student Performance Demonstration Rubric provides instrumentation that focuses on measuring the application of knowledge.

Nursing research has also focused on student perceptions of satisfaction and self-confidence (Childs & Sepples, 2006; Cioffi, 2001; Engum et al., 2003; Jeffries et al., 2003; Johnson et al., 1999; Ravert, 2004; Reilly & Spratt, 2007; Scherer et al., 2007) and educational practice preferences (Jeffries & Rizzolo, 2006) related to high-fidelity simulation learning. Therefore, a further purpose of this study was to contribute to nursing research on these variables, because varied results exist in the literature. The following sections discuss findings for each research question.

Research Questions 1 and 2

What is the difference in performing nursing intervention activities among students who participate in case-based learning, simulation, and simulation with narrative pedagogy? And what is the difference in the retention of performing nursing intervention activities among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

The significant main effect (within-subjects effect) of time from the two-way mixed ANOVA demonstrated that students' Performance Demonstration Rubric scores were significantly higher at the retention performance (Week 8) than at the first performance (Week 3) for novice-level students in their second-semester nursing course. Students in all three teaching strategy groups improved in their performance of nursing interventions as the semester progressed. The impact of the improved retention performance may be attributable to students' learning from the three teaching strategies as well as to continued laboratory interactions with the high-fidelity simulator and hospital clinical experiences from Week 3 to Week 8 in the semester. Another potential factor includes the "testing effect," meaning that students performed better during the "re-test" retention performance because of growing in knowledge and skill from the experience of the first performance test. The first performance and retention performance demonstration scenarios were similarly based on the care of a patient experiencing a myocardial infarction. When measuring retention, there are multiple intervening variables that make it difficult to identify the precise impact of the teaching strategies themselves on the outcome of student performance. Analysis of the follow-up information questionnaire showed no significant group differences in students' clinical and work experiences caring for patients with cardiovascular disease since the completion of the teaching strategy sessions. There was also no significant interaction effect (within-subjects) for time and teaching strategy groups, meaning that students in the three groups had a similar pattern of performance rubric scores at Time 1 compared to Time 2.

There was no significant main effect (between-subjects effect) of teaching strategy groups, yet an encouraging and noteworthy pattern existed for students' First Performance Rubric scores across the three teaching strategy groups. The pattern of means showed that the simulation with narrative pedagogy group had the highest mean at 72.74, compared to the case-based learning and simulation groups with lower means of 70.68 and 66.16, respectively (See Chapter 4, Table 15.) For exploratory purposes, one-

way ANOVA was completed on students' first performance rubric scores and revealed results approaching significance for the three teaching strategy groups ($F\ 2, 71 = 2.90$, $p = .06$). The higher First Performance Rubric means in the simulation with narrative pedagogy group may be due to the fact that the teaching strategy provided two sets of engaging student-teacher interactions, one from the teaching strategy session and another during the reflection session, compared to students in the simulation group who had only one set of engaging teacher-student interactions during in the reflection session.

The simulation group independently provided nursing care with no teaching assistance or student-teacher interaction and then students participated in an engaging teacher-guided reflection session. During the simulation with narrative pedagogy teaching strategy, the researcher/teacher called two or three brief "time outs" to engage in interactions with the students. The purpose of the time outs was to help the students to think about their performance and decision-making based on essential elements of care for a patient experiencing a myocardial infarction. The teacher asked, "Tell me about your thinking related to the priority nursing caring for this patient?" The teacher provided guidance to help students think about the best choice of nursing care and whether there were more appropriate assessments and interventions to implement. If students were on the wrong track with their thinking, the teacher provided a cue to get the students back on the right track. In addition, immediate feedback from the teacher gave students opportunities to repeat priority-nursing interventions correctly. Engaging teacher-student interaction also occurred during the reflection session, which followed all teaching strategy sessions. The teacher guided students' discussion regarding their thinking related to appropriate myocardial infarction nursing care decisions.

The case-based learning group mean (70.68) closely followed the simulation with narrative pedagogy group mean (72.74). The case-based learning group also had two engaging teacher-student interactions, one from the teaching strategy session in which the

teacher guided students' discussion of case study questions and another during the reflections session.

The pattern of students' Retention Performance Demonstration Rubric scores warrants additional discussion. The case-based learning and simulation with narrative pedagogy groups had higher retention performance means at 75.50 and 73.19, respectively, and once again the simulation group had the lowest mean of 71.32. The case-based learning and simulation groups experienced the most growth from first performance to retention performance whereas the simulation with narrative pedagogy group minimally improved. (See Chapter 4, Table 15.) One reason for this difference in growth may be that students in the simulation with narrative pedagogy group had the highest first performance scores; thus, the increase between first performance scores and retention performance scores was less dramatic for that group.

The between-group differences in students' Performance Rubric scores were smaller at retention performance than at first performance. (See Chapter 4, Table 15.) The following discussion explores additional explanations for the lack of significant differences in retention performance scores. Students in all three teaching strategy groups were encouraged to take notes during the 30-minute reflection session that followed each of the teaching strategy sessions. The researcher/teacher outlined on the board students' discussion of important aspects of care for a patient experiencing a myocardial infarction, such as priority assessment, independent nursing interventions, information to communicate to the physician, and implementation of additional interventions. The follow-up questionnaire results revealed that all students reviewed their notes from the teaching strategy session (Week 1) to prepare for the retention performance testing (Week 8). Also the students' two performance demonstration scenarios at Time 1 (Week 3) and Time 2 (Week 8) were very similar to the teaching strategy session scenario (Week 1). Thus, the students' detailed notes and the similarity of the teaching strategy scenario to the two performance demonstration scenarios may have contributed to

improved retention performance for all students, thus leading to the lack of significant differences between groups.

The researchers suspected students were talking to each other throughout the 2-week period of retention performance demonstration testing. Students were told the scenario would be based on a patient experiencing a cardiac event, but they were not told anything about the specific cardiac problem. The retention performance demonstration scenario included a patient statement, "I'm feeling terrible." Some students entered the patient room stating, "I hear you are having chest pain." The quick identification of chest pain without questioning the patient was a clue that students were talking.

The 90-minute teaching sessions may not have been robust enough to capture and sustain significant differences among the groups, especially through the full 2 months until retention performance was assessed. The nursing curriculum fostered student growth with continued high-fidelity simulation mannequin interactions and participation in weekly patient care clinical experiences throughout the semester. Despite lack of significant group difference on the follow-up questionnaire regarding students' cardiovascular clinical experiences and work experiences in the last 6 weeks, additional intervening variables were likely present.

The lack of significant interaction effect for time and teaching strategy groups and lack of significant main effect of teaching strategy groups may also be attributable to the rubric measuring low-inference behaviors. Low-inference behaviors mean that each item addresses one separate and distinct behavior, requiring little judgment to consistently rate behaviors. Although the reliability and validity of measurement for low-inference behaviors is high, some performance behaviors could still have been difficult for the researcher to score unless students stated out loud what they were doing in implementing nursing interventions. Novice-level students early in a nursing program may have difficulty talking out loud while performing nursing interventions.

In summary, the Student Performance Demonstration Rubric provides a new approach to assess student performance. The research results revealed that all students' Performance Demonstration Rubric score means were significantly higher at the retention performance compared to first performance. The rubric captured students' growth in performance over time. The pattern of means for performance showed the teaching strategies with more engaging teacher-student interactions, such as the simulation with narrative pedagogy group and case-based learning group, had higher means than the simulation group.

Research Question 3

What is the difference in satisfaction and self-confidence among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

In this study, students' responses to the Satisfaction and Self-Confidence in Learning Instrument revealed no significant differences across the three teaching strategy groups. One possible reason for lack of significant findings may have been tied to a new teacher from another nursing college. The teaching strategies and debriefing sessions were taught with equal enthusiasm, standardized scripts, and procedures. Students' satisfaction and self-confidence scores were high in all three teaching strategies. They verbally commented on liking the outlining and summarizing of important content on the board during the debriefing session, which was different from their typical laboratory debriefing sessions.

Findings from previous studies vary in regard to students' satisfaction and self-confidence with high-fidelity simulation. In the NLN/Laerdal 3-year collaborative multi-method, multi-site, national study, students in the high-fidelity simulation group perceived higher levels of satisfaction and self-confidence in their ability to perform care compared to the case study group (Jeffries & Rizzolo, 2006). Regarding satisfaction, in Jeffries and colleagues' (2003) study on the effectiveness of an interactive, multimedia CD-ROM with traditional methods of teaching the skill of performing a 12-lead ECG, the

researchers discovered that both groups were statistically similar on students' satisfaction with their learning method. Whereas Engum and colleagues' (2003) study found that the students in the traditional laboratory group had significantly higher satisfaction scores than students in the simulation group learning to insert intravenous catheters using virtual reality. On the topic of self-confidence, Scherer and colleagues' (2007) research found that posttest confidence scores improved in both groups, although the control group scored significantly higher on posttest confidence. In summary, the varied results of students' satisfaction and self-confidence with high-fidelity simulation warrants continued nursing research.

Research Question 4

What is the difference in educational practice preferences among students who participate in case-based learning, simulation, and simulation with narrative pedagogy?

Students' total scores on the Educational Practices Questionnaire revealed no significant differences across the three teaching strategy groups. Yet analysis of each item on the questionnaire revealed significant differences ($p < .05$) in students' perceptions of the presence of several practices, with students in the simulation and simulation with narrative pedagogy teaching strategy groups having higher mean scores on the questions related to the presence of collaboration (chance to work with peers) and diverse ways of learning (the learning activity offered a variety of ways to learn the material). Jeffries and Rizzolo's (2006) NLN/Laerdal study reported similar results on the Educational Practices Questionnaire, with the high-fidelity simulation group experiencing more diverse ways of learning, active learning, and rating diverse ways of learning as more important than the other two groups (case study and static mannequin). This study, along with the NLN/Laerdal research, confirms that the high-fidelity simulation teaching strategy supports educational practices to engage students in learning through collaborating with peers and providing diverse ways of learning. In addition, this study found that the presence of student-teacher interaction (chance to discuss objectives with

instructor) was higher for both the case-based learning and simulation with narrative pedagogy groups than for the simulation only group. As described earlier, these two groups received two sets of engaging student-teacher interactions, one from the teaching strategy session and another during the reflection session, compared to students in the simulation group, who had only one set of engaging student-teacher interactions during the reflection session.

Implications for Nursing Education

Nurse educators are challenged on how to best equip nursing students to care for patients in an increasingly complex healthcare environment. This challenge is exacerbated by the shortage of nursing faculty, increasing severity of patient illnesses, and rapid technological changes in the health care setting. Nurse educators are seeking creative teaching strategies to engage nursing students in active learning of theoretical and practical content in the classroom, clinical laboratory, and clinical patient care settings.

Educators need to broadly focus on engaging teaching strategies. Faculty create engaging learning environments by actively involving students in learning. Active-learning teaching strategies require that students put forth time and effort toward learning, and places students at the center of learning. Classroom activities need to focus on actively building students' knowledge rather than allowing them to be passive recipients of information (Kuh et al., 2005; Weimer, 2002). Institutions also play an important role in engagement by creating policies and programs, as well as providing resources that support engaging faculty-teaching and student-learning behaviors (Kuh et al., 2007). The broad focus on engagement theory will help educators concentrate on important constructs necessary for implementing specific active-learning teaching strategies.

The teaching strategies described in this study are examples of specific engaging active-learning teaching strategies. Students learn best from engaging teacher-student

interactions (Kuh et al., 2005; Kuh et al., 2007; Nelson Laird et al., 2008; Pascarella & Terenzini, 2005). Case-based learning has been used in nursing education for many years and requires students analyze a complex healthcare scenario and answer open-ended critical thinking questions. Students draw from prior nursing knowledge and use problem solving and critical thinking skills, while integrating and synthesizing information into meaningful data to gain an understanding of the problem. Empirical research supports case-based learning as an effective active-learning teaching strategy to engage students (DeMarco et al., 2002; Ertmer & Russel, 1995; Ferguson, 2006; Thomas et al., 2001). This study revealed students in the case-based learning group- first performance rubric score mean (70.68) was close to the simulation with narrative pedagogy group- first performance rubric score mean (72.74). The case-based learning group retention performance rubric score mean was the highest (75.50) of the three teaching strategy groups. The case-based learning group rubric score means were attributed to the engaging teacher-student interaction. Students in the case-based learning group and the simulation with narrative pedagogy group received two sets of engaging student-teacher interactions, whereas students in the simulation group received one set of engaging interactions. Consistent with this, item analysis of the Educational Practices Questionnaire revealed that students in the case-based learning and simulation with narrative pedagogy groups perceived the *presence* of student-teacher interaction (chance to discuss objectives with instructor), as higher than students in the simulation only group. Engaging teacher-student interaction facilitates student learning. Comparing new innovative teaching strategies to case-based learning may assist in evaluating the effectiveness of new strategies.

High-fidelity simulation is another highly engaging active-learning teaching strategy to help prepare students to problem solve and critically think about nursing care. It requires students analyze a complex healthcare scenario by interacting with a life-sized computerized mannequin to perform nursing interventions, and make clinical decisions.

Students have an opportunity to work collaboratively with other students and provide nursing care for simulated patients with acute illnesses such as a myocardial infarction that they might not encounter in the clinical setting. Students learn from lifelike simulated patient care experiences and teacher feedback on their performance. Simulation allows students to practice hands on nursing care, critical thinking, and clinical decision making without jeopardizing patient safety.

Educators need to continue to define best practices in how to use high-fidelity simulation most effectively for student learning. The level of the learner and the amount of teacher interaction are important considerations when developing simulation-teaching strategies. Students early in nursing programs are learning quickly and have knowledge base gaps, thus may benefit from instructor-guided interactions such as using simulation with narrative pedagogy where the teacher interacts with students during selected "time out" periods. Educators need to examine the amount of meaningful instruction with students during high-fidelity simulation scenarios. Novice students may benefit from more teacher guidance using simulation with narrative pedagogy versus senior level student may benefit from current practice of simulation where there is less teacher interaction.

Educators are becoming increasingly aware of the importance of reflection/debriefing sessions following high-fidelity simulation. Reflection sessions commonly follow high-fidelity simulation teaching strategies and consist of engaging teacher-student interactions. The teacher guides students' discussion on appropriate care decisions in the teaching strategy, care decisions that would have been more appropriate, and care decisions that were omitted or incorrect. The reflection session helps students to think in-depth regarding aspects of learning from the high-fidelity teaching strategy and to analyze the process and application of information in caring for patients. Educators need to continue to refine how to implement reflection sessions most effectively for student learning. For example, in this study the first performance rubric scores for the

simulation with narrative pedagogy teaching strategy group and the case-based learning teaching strategy groups yielded the highest means at 72.74 and 70.68, respectively, compared to the simulation-only group at only 66.16 (See Chapter 4 Table 15). The higher first performance rubric means in the simulation with narrative pedagogy and the case-based learning groups may be due to the fact that these two teaching strategy provided two sets of engaging student-teacher interactions, once from the teaching strategy session and another during the reflection session, while the simulation group provided only one set of engaging teacher-student interactions -- in the reflection session. The teacher guided questions and students' reflective thinking that occurs during the reflection sessions reinforces learning content from the teaching strategy.

Implications for Nursing Research

Additional research is needed on engaging teacher-student interactions. High-fidelity simulation has gained popularity in nursing curriculums in the last ten years, yet little is known about how its effectiveness compares to other active-learning teaching strategies. Despite increasing popularity of high-fidelity simulation, challenges continue on how to quantify the benefits. Multiple nursing studies have failed to show significant differences in knowledge gain for the simulation group compared to the control group (Engum et al., 2003; Griggs, 2002; Jeffries & Rizzolo, 2006; Jeffries et al., 2003; Ravert, 2004; Scherer et al., 2007). Significant findings for this study revealed that all students' performance of nursing interventions improved over time, from first performance to retention performance. No significant differences were found among the teaching strategy groups, yet the simulation with narrative pedagogy group had the highest first performance rubric scores, which may be attributed to the engaging teacher-student interaction.

Continued research on high-fidelity simulation teaching strategies is imperative. The NLN/Laerdal simulation teaching-learning framework (Jeffries, 2005) guided this study. The framework builds on engagement theory and consists of overlapping

relationships between the teacher, student and educational practices. Educational practices are incorporated into the high-fidelity simulation teaching strategy and simulation design, which influences student outcomes of learning (knowledge), skill performance, learner satisfaction, and self-confidence (Jefferies, 2005). The framework provides a valuable empirically supported model for designing, implementing, and evaluating simulation research. Additional reliability testing is needed for the Satisfaction and Self-Confidence in Learning Instrument and Educational Practices Questionnaire developed by the NLN/Laerdal researchers (Jeffries & Rizzolo, 2006).

In addition, the development of the rubric was unique to this project and others should be encouraged to use this tool or formats similar to it in their research. The rubric shows promise in evaluating students' performance growth and application of knowledge. Replication of this study with diverse sample populations and a larger sample size may help validate the use of Student Performance Demonstration Rubrics as an effective measure of simulation teaching strategies. In addition, the scenario and rubric for this study focused on myocardial infarction and were developed using the American Heart Association guidelines. Different topic scenarios and rubrics need to be developed using approved health care standards.

The Student Performance Demonstration Rubric needs additional reliability and validity testing. As described earlier, this rubric incorporates low-inference behaviors meaning that each item addresses one separate and distinct behavior such as one behavior is identified per item line and scored on a 0-1 scale. In an attempt to obtain reliable measures in developing the rubric, the researchers decided to incorporate low-inference behaviors, which require little inference or judgment to identify and consistently rate students' specific performance behaviors during scoring. The researcher observing each student's digitally recorded DVD sees and hears specific behaviors to score the rubric. As with any instrument, it is challenging to measure all aspects of a variable, the same is true for the Student Performance Demonstration Rubric. Some behaviors were difficult for the

researcher to score unless students stated out loud what they were doing in implementing nursing interventions. The rubric offers one way to measure performance, yet additional instruments are needed to measure performance. Another option in measuring performance is to creatively combine low-inference behaviors with high-inference behaviors. High-inference behaviors require the observer to make judgments based on the observed behaviors, which may capture students' nonverbal behaviors. Reliable and valid measurements of students' performance will help evaluate the effectiveness of high-fidelity simulation.

Further research is needed to examine narrative pedagogical simulation-teaching strategies, which involves the teacher interacting with students throughout simulation. Questions exist on how much interaction teachers should have with students during the simulation scenario. What are the benefits of interacting with students? Closely tied to the amount of interaction, is the level of the student. Do novice level students early in a nursing program benefit from teacher interaction during the simulation? Does it help to redirect/guide novice students when they are off track during simulation? Or do they learn more from their struggle and mistakes? On the other end of the spectrum, what simulation teaching strategies work best for senior level nursing students?

Simulation research should explore the length of the simulation teaching strategies that would be optimal in sufficiently capturing students' learning such as knowledge and performance gains. A challenge with experimental research is to know whether or not the teaching strategy will be robust enough to impact the outcome measures. The literature review revealed high-fidelity simulation research teaching strategies ranged from thirty minutes to four hours (Engum et al., 2003; Griggs, 2002; Jeffries et al., 2003; Jeffries & Rizzolo, 2006; Scherer et al., 2007). Another question is the ideal number of students to include in simulation teaching strategies. The researchers cited above included four to eight students per group in their simulation teaching strategy sessions, while the present study includes three to four students per group. The question

of what constitutes the optimal size of teaching strategy groups remains unanswered and requires further study.

Simulation research on students' retention of learning offers many challenges. Multiple extraneous variables exist when measuring retention, which make it difficult to identify the impact of the teaching strategy on the outcome of student performance. Students' ability to learn how to perform nursing interventions occurs over time especially from hospital clinical experiences, which make it difficult to determine if differences between groups are due to the teaching strategies or maturation or other time-varying factors. Important research questions regarding students' retention exist. Does simulation help students retain what they have learned? Does simulation ease students' transition to clinical settings and enhance students' clinical learning? What simulation strategies help students' transition from the simulation laboratory to real life clinical practice?

Educators commonly incorporate a reflection/debriefing session after the simulation teaching strategies. Research needs to examine teaching strategies to incorporate into reflection sessions. What teaching strategies work best during reflection? What types of questions help students reflect on their simulation learning experience? Does summarizing important reflection content on the board help students retain information? What is the ideal length of reflection sessions? And are student assignments requiring written self-reflection effective in student learning.

Conclusion

Nurse educators need to continue to seek creative teaching strategies to engage nursing students in active learning to prepare them to provide nursing care in the increasingly complex healthcare environment. A main focus of this study was to determine if there were differences in the effects of three active-learning teaching strategies (case-based learning, simulation, and simulation with narrative pedagogy) on student performance and retention performance of nursing intervention activities. The

Student Performance Demonstration Rubric provides a promising new instrument to measure the effectiveness of high-fidelity simulation teaching strategies and warrants further research. The rubric evaluated students' performance of nursing intervention, which more importantly demonstrated their ability to critically think and apply knowledge learned. Equally vital to measuring students' performance, is that students retain what they learn. In this study, students in all three teaching strategy groups experienced improved performance of nursing interventions over time, from first performance to retention performance. Additional research is needed to understand the impact of simulation on students' performance and retention performance of nursing interventions. This study also measured students' responses to Satisfaction and Self-Confidence in Learning Instrument and Educational Practices Questionnaire, which revealed no significant differences across the teaching strategy groups. The findings from this study varied from the findings of other researchers' using these instruments, so that additional nursing research, including replications with different samples, are important in these areas too.

APPENDIX A

INFORMED CONSENT

FOR IRB USE ONLY
APPROVED BY: IRB-02
IRB ID #: 200709719
APPROVAL DATE: 12/23/08
EXPIRATION DATE: 09/02/09

INFORMED CONSENT DOCUMENT

Project Title: **Comparison of Selected Outcomes Based on Teaching Strategies that Promote Active Learning**

Research Team: **Elizabeth Swanson, RN, MA, PHD, Anita Nicholson, MA, Anita Stineman, RN, MA, PHD, Kim Tew, RN, BSN**

This consent form describes the research study to help you decide if you want to participate. This form provides important information about what you will be asked to do during the study, about the risks and benefits of the study, and about your rights as a research subject.

- If you have any questions about or do not understand something in this form, you should ask the research team for more information.
- You should discuss your participation with anyone you choose such as family or friends.
- Do not agree to participate in this study unless the research team has answered your questions and you decide that you want to be part of this study.

WHAT IS THE PURPOSE OF THIS STUDY?

This is a research study. We are inviting you to participate in this research study because you are taking 96:135 Complex Concepts of Nursing Care course.

The purpose of this research study is to look at how select teaching strategies affect the ability of students to perform nursing interventions and retain knowledge to perform nursing interventions. The study will also look at the attitudes of students towards the teaching strategies as well as their comfort level in providing nursing care. In nursing education it is important to prepare students to apply knowledge, make independent nursing decisions, think critically, and provide competent care to patients with complex health care needs. There are multiple teaching strategies that are used everyday in education to prepare students for nursing practice, yet these strategies need formal testing to show the benefit to student learning. It is important to know through studies, which strategies help students apply knowledge in patient care situations.

HOW MANY PEOPLE WILL PARTICIPATE?

Approximately 190 people will take part in this study at the University of Iowa.

HOW LONG WILL I BE IN THIS STUDY?

Timeline:

- Two hour small group teaching strategy session, week 8 of the semester, which will be your 96:135 simulation lab (for that week).
- Forty-five minute individual simulation performance demonstration, week 10 of the semester (96:135 simulation lab for that week). Fifty minute individual second simulation performance demonstration, week 15 of the semester (96:135 simulation lab for that week).

. **WHAT WILL HAPPEN DURING THIS STUDY?**

- In order to participate in the study, you will need to return this consent form (signed and sealed in the envelope provided) to the Student Services Office in room 37 of the Nursing Building by Friday at 5:00 p.m. A box is available in room 37 NB to place your sealed envelope. You will be sent an e-mail "Thank-you/Reminder" to turn in the consent form by Friday if you want to participate.
- Attend your 96:135 Complex Concepts of Nursing Care Cardiac lecture or listen to the lecture audio file. If you do not attend the 96:135 Cardiac lecture or do not listen to the lecture audio file, your participation in the study will be ended.
- You will be asked to sign a confidentiality agreement not to communicate experiences during the study to other students so there is fairness among the experiences.
- You will take the 96:135 laboratory quiz on cardiac content prior to your week 8 simulation lab.

The study begins with you attending a 96:135 simulation lab, which involves a small group Teaching Strategy Session (week 8 of the semester).

- You will be randomly assigned (by chance, like flipping a coin) to one of three teaching strategies by the research team. All three teaching strategies reinforce the same cardiac content and are typically used in teaching 96:135 simulation labs. One teaching strategy will use a written case scenario with questions for students to talk among themselves. In this situation, the faculty member will serve as a resource person and guide students through a review of critical aspects of care. In the second teaching strategy students will work through the scenario using a high fidelity mannequin. The faculty member will guide students through a review of critical aspects of care after the simulation experience. In the third teaching strategy students will work through the scenario using a high fidelity mannequin. The faculty member will interact with students during the simulation experience and dialogue with them after the simulation experience is completed. The faculty member will guide students through a review of critical aspects of care.
- Your teaching strategy session time will be given to you by Professor Boese.
- You will be asked to review your 96:135 Cardiac lecture notes and laboratory Cardiac study guide (estimated time 30 minutes), then actively participate in 96:135 lab, involving a teaching strategy session on cardiovascular nursing care with a small group of your classmates (estimated time 2 hours).
- If you consent to participate in the study, after lab (teaching strategy session) you will complete 3 questionnaires (questions relate to your attitude towards the teaching strategies and your comfort level in providing nursing care, estimated time 15 minutes). You are free to skip any questions that you would prefer not to answer.

Two weeks later, you will individually participate in a simulation performance demonstration (which is your 96:135 simulation lab for week 10 of the semester).

- Your individual simulation performance demonstration session time will be given to you by Professor Boese. You will be asked to read through a scenario of a patient with cardiovascular disease (15 minutes). Next you will participate in a 30 minute simulation performance demonstration using a simulation mannequin. Based on the scenario, you will perform nursing interventions to care for the patient. Your performance will be digitally recorded.
- You will be asked to write a one-page self-reflection (critique) of your

performance demonstration and submit it to the 96:135 ICON course drop box by 11:00 pm (of the same day).

Seven weeks later, you will individually participate in a second simulation performance demonstration (which is your 96:135 simulation lab for week 15 of the semester).

- Your second individual simulation performance demonstration session time will be given to you by Professor Boese. You will be asked to read through a different scenario of a patient with cardiovascular disease (15 minutes). Next you will participate in a 30 minute simulation performance demonstration using a simulation mannequin. Based on the scenario, you will perform nursing interventions to care for the patient. Your performance will be digitally recorded. You will receive verbal feedback on your performance at this time.
- If you consent to participate in the study, after the performance demonstration, you will complete a short questionnaire (questions about your current patient care experiences), which will take about 5 minutes. You are free to skip any questions that you would prefer not to answer.

You may skip any of the questions on the study questionnaires or forms that you do not wish to answer.

Audio/Video Recording or Photographs

One aspect of this study involves making digital recordings of you. Every fifth teaching strategy session of the researcher and the student group will be digitally recorded. You may be randomly chosen to participate in this digital recording. During the simulation demonstrations, digital recordings will be made to review your performance of nursing interventions. Your digital recordings (DVDs) will be assigned a non-identifying code and placed in a lock cabinet in the Nursing Clinical Education Center (NCEC). Two members of the research team will review digital recordings and at the end of the study the DVDs will be destroyed.

WHAT ARE THE RISKS OF THIS STUDY?

You may experience one or more of the risks indicated below from being in this study. In addition to these, there may be other unknown risks, or risks that we did not anticipate, associated with being in this study.

It may be possible for persons who view the digital recordings made for this study to identify you. The recordings will be used only by the research team members and will be secured as described in the Confidentiality section below.

You may be concerned that your performance on the study procedures will affect your course grade. It is your decision to participate in the study or not and there will be no impact on your grade for 96:135 Complex Concepts of Nursing Care or any other nursing course.

WHAT ARE THE BENEFITS OF THIS STUDY?

We don't know if you will benefit from being in this study. We hope that in the future, other people might benefit from this study because of increased knowledge on teaching strategies and student performance of nursing interventions.

WILL IT COST ME ANYTHING TO BE IN THIS STUDY?

You will not have any costs for being in this research study.

WILL I BE PAID FOR PARTICIPATING?

You will be paid for being in this research study. You will receive a $5.00 Java House or the UIHC Roof Top Cafe gift certificate at the completion of the study. If you withdraw from the study, you will not be eligible for the gift certificate.

WHO IS FUNDING THIS STUDY?

The American Nurses Foundation (ANF)is funding this research study. This means that the University of Iowa is receiving payments from ANF to support the activities that are required to conduct the study. No one on the research team will receive a direct payment or increase in salary from ANF for conducting this study.

WHAT ABOUT CONFIDENTIALITY?

We will keep your participation in this research study confidential to the extent permitted by law. However, it is possible that other people such as those indicated below may become aware of your participation in this study and may inspect and copy records pertaining to this research. Some of these records could contain information that personally identifies you.

- Federal government regulatory agencies,
- Auditing departments of the University of Iowa,
- The University of Iowa Institutional Review Board (a committee that reviews and approves research studies), and
- Philips Medical Systems.

To help protect your confidentiality:

- There will be only one list of the names of students participating in the study.
- Once the name list is compiled, Professor Swanson will assign a non-identifying code adjacent to your name. From that point on, only a number code will be used by the research team to identify you.
- Professor Swanson will keep the master list in a locked cabinet in the Nursing Clinical Education Center. Professor Swanson or another member of the research team will be in attendance at your teaching strategy sessions, and the two performance demonstrations to check you in as a participant and assign your non-identifying code to be placed on questionnaires and digital recordings (DVDs).
- All your forms and questionnaires for the study will be labeled with your non-identifying code and held in a locked cabinet in the Nursing Clinical Education Center.
- The digital recordings (DVDs) of your performance demonstrations with your non-identifying code will be housed in a locked cabinet in a locked office in the NCEC and access will only be available to research team members.
- Data on computer files will be password protected.

The colleagues at Philips whose cardiac monitoring equipment is in the NCEC are interested in seeing the impact of simulation in using monitoring equipment. The College of Nursing will be sharing nonidentified aggregate data with Philips Medical Systems to

assist them in ongoing evaluation of equipment and the effectiveness of simulation learning. In the future, Philips Medical Systems may continue to use the data that is collected as part of this study. For example, Philips Medical Systems may combine information from this study with the results of other studies to re-analyze the effectiveness of the equipment and simulation learning, to evaluate other products, or to improve the design of future research studies. Philips Medical Systems may also share information from this study with regulatory agencies in foreign countries.

When we write a report or article about this study or share the study data set with others, we will do so in such a way that you cannot be directly identified, as all data will be reported as group data.

IS BEING IN THIS STUDY VOLUNTARY?

Taking part in this research study is completely voluntary. You may choose not to take part at all. If you decide to be in this study, you may stop participating at any time. If you decide not to be in this study, or if you stop participating at any time, you won't be penalized or lose any benefits for which you otherwise qualify. There will be no impact on your grade in the course 96:135 Complex Concepts of Nursing Care or any other nursing course.

What if I Decide to Drop Out of the Study?

If you decide to leave the study early, we will ask you to notify Professor Swanson by e-mail (elizabeth-swanson@uiowa.edu). Your participation is voluntary and there will be no impact on your grade in the course 96:135 Complex Concepts of Nursing Care or any other nursing course for leaving the study early.

WHAT IF I HAVE QUESTIONS?

We encourage you to ask questions. If you have any questions about the research study itself, please contact: Professor Swanson at 319-335-7006. If you experience a research-related injury, please contact Professor Swanson.

If you have questions, concerns, or complaints about your rights as a research subject or about research related injury, please contact the Human Subjects Office, 340 College of Medicine Administration Building, The University of Iowa, Iowa City, Iowa, 52242, (319) 335-6564, or e-mail irb@uiowa.edu. General information about being a research subject can be found by clicking "Info for Public" on the Human Subjects Office web site, http://research.uiowa.edu/hso. To offer input about your experiences as a research subject or to speak to someone other than the research staff, call the Human Subjects Office at the number above.

This Informed Consent Document is not a contract. It is a written explanation of what will happen during the study if you decide to participate. You are not waiving any legal rights by signing this Informed Consent Document. Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

Subject's Name (printed):
_____

Do not sign this form if today's date is on or after EXPIRATION DATE: 09/02/09.

_____
(Signature of Subject) (Date)

Statement of Person Who Obtained Consent

I have discussed the above points with the subject or, where appropriate, with the subject's legally authorized representative. It is my opinion that the subject understands the risks, benefits, and procedures involved with participation in this research study.

_____
(Signature of Person who Obtained Consent) (Date)

APPENDIX B

CONFIDENTIALITY AGREEMENT AND INSTRUMENTS

Study: Comparison of Selected Outcomes based on Teaching Strategies
that Promote Active Learning in Nursing Education

Confidentiality Agreement

I _____, agree to maintain confidentiality by not sharing details and experiences regarding my teaching strategy session and two performance demonstrations to other students throughout the entire study. I understand that communication of details may interfere with the study results.

I will also not discuss the performance of my classmates during the teaching strategy sessions with others.

_____ _____
(Student Signature) (Date)

Spring 2009 Student Study ID_____
10 points

Cardiac Test

CASE SITUATION:
Mr. Brown (58 years old) experienced significant chest pressure throughout the night, but did not want to wake his wife. By morning, his chest pain was "unbearable". His wife called 911. The paramedics transport Mr. Brown. to the emergency room with a probable acute myocardial infarction (MI). His history reveals obesity, medically managed hypertension and congestive heart failure. (Please refer to this case in answering the 10 questions).

1. The physician orders Nitroglycerin for Mr. Brown's chest pain. Which of the following is the correct order? Nitroglycerine _____ sublingual every five minutes, repeat times three.
   a. 0.4 mg
   b. 4 mg
   c. 40 mg
   d. 400 mg

2. Which of the following best describes the pharmacological action of Nitroglycerin in decreasing chest pain? Nitroglycerin dilates coronary arteries and _____.
   a. increases myocardial oxygen demand.
   b. decreases myocardial contractility.
   c. increases afterload.
   d. decreases preload.

3. Which of the following side effects of Nitroglycerin is the nurse most concerned about? Headache and _____.
   a. hypokalemia.
   b. hypotension.
   c. bradycardia.
   d. vasovagal response.

4. The physician orders morphine sulfate 5 mg IV to help relieve Mr. Brown's chest pain. Which of the following explanations best describes the action of Morphine to decrease chest pain. Morphine sulfate alters the perception of pain in the central nervous system and _____.
   a. dilates vein, which decreases the amount of blood returning to the heart.
   b. dilates capillaries, which improves blood flow to the periphery.
   c. causes reperfusion, restoring blood flow.
   d. causes afterload to increase.

5. The physician orders thrombolytic therapy to treat Mr. Brown. Which of the following nursing diagnoses is the highest priority when caring for a patient treated with thrombolytics?
   a. Fatigue
   b. Risk chest pain
   c. Risk injury: bleeding
   d. Decreased cardiac output related to bradydysrhythmia

6. Mr. Brown is admitted to the emergency room with crushing chest pain. What data would best assist diagnosis of his myocardial infarction (MI) within the first few hours of admission?
   a. Rhythm status
   b. Troponin I and levels
   c. C-reactive protein levels
   d. 12 Lead electrocardiogram (EKG) and portable chest x-ray (CXR) results

7. Mr. Brown continues to experience severe chest pain on arrival to the emergency room. Which of the following ECG findings indicates that he is experiencing myocardial injury?
   a. P wave depression
   b. Widened QRS complex
   c. S T segment elevation
   d. Prolonged QT interval

8. Mr. Brown states "I feel like there is a lot of pressure on my chest. It really hurts." Which of the following nursing interventions should be initiated? Choose all that apply.
   a. Continuous cardiac monitoring
   b. Bedrest with bathroom privileges
   c. Elevate HOB
   d. Administer the Nitro that was ordered prn
   e. O_2 at 2-3 L per nasal prongs

9. Which of the following are nursing interventions appropriate for the care of the client with congestive heart failure? (Choose all that apply)
   a. Elevate extremities to decrease edema
   b. Elevate HOB
   c. Monitor I & O
   d. Encourage oral fluids as tolerated

10. The patient with chronic heart failure is taking digoxin and lasix. Which of the following is the nurse closely monitoring for?
   a. Hyperkalemia
   b. Hypocalcemia
   c. Subtherapeutic effects of the digoxin
   d. Dig toxicity

Student Study ID Number _____

Study: Comparison of Selected Outcomes based on Teaching Strategies that Promote Active Learning in Nursing Education

Demographic Questionnaire

It is important that you provide information about your prior health care experience and background to help us in the future. Confidentiality will be maintained. All information will be reported as a group.

Please complete the following information:

1. Have you ever been employed in health care?

   ___ Yes If YES, continue to 1A, 1B, 1C.
   ___ No If NO, skip to question 2.

   1A. Which of the following best describes your employment (check all that apply):

   Nursing Assistant:
   ___ Hospital …….. Type of Hospital Unit _____
   ___ Clinic/Physicians office.. Type of clinic/office _____
   ___ Long term care
   ___ Home health care

   ___ Emergency Medical Technician
   ___ Other (Please specify _____

   1B. What is the total length of your employment experience in health care?
   ___ Less than 6 months
   ___ 6 months to 1 year
   ___ More than 1 year and up to 3 years
   ___ More than 3 years

   1C. In your health care employment, rate the frequency of contact with patients whose primary health problem is cardiovascular disease.

   ___ Always ___ Most of the time ___ Sometimes ___ Rarely ___ Never

2. In your clinical rotation(s), rate the frequency of contact you have with patients whose primary health problem is cardiovascular disease.

   ___ Always ___ Most of the time ___ Sometimes ___ Rarely ___ Never

3. Indicate your gender:
   ___Female
   ___Male

4. Indicate your ethnic background:
   ___ Caucasian ___ Asian
   ___ African American ___ Multiracial
   ___ Native American ___ Other
   ___ Hispanic

5. Indicate the range that includes your age:
   ___ Under 21 ___ 30-39
   ___ 21-24 ___ Over 40
   ___ 25-29

6. Indicate your marital status:
   ___ Single ___ Divorced
   ___ Partnered ___ Separated
   ___ Married

7. Indicate your level of education completed (Check all that apply):
   ___ High School

   ___ College Degree

   7A. If you have a college degree, indicate the degree level you earned.
   ___ 1 year degree
   ___ 2 year degree
   ___ 4 year degree
   ___ Masters
   ___ Doctorate _____

   7B. Please specify the focus area of the college degree program(s) you completed
   (i.e. 1 year degree- LPN, or 4 year degree- Biology).
   _____

   _____

Student Study ID Number_____

Educational Practices Questionnaire

Use the following rating system when assessing the educational practices: 1 - Strongly Disagree with the statement 2 - Disagree with the statement 3 - Undecided - you neither agree or disagree with the statement 4 - Agree with the statement 5 - Strongly Agree with the statement NA - Not Applicable; the statement does not pertain to the simulation activity performed.	Rate each item based upon how important that item is to you. 1 - Not Important 2 - Somewhat Important 3 - Neutral 4 - Important 5 - Very Important

Item	1	2	3	4	5	NA	1	2	3	4	5
1. I had the opportunity during the learning activity to discuss the ideas and concepts taught in the cardiovascular lecture with the instructor and other students.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
2. I had the chance to work with my peers during the learning activity.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
3. I actively participated in the reflective session after the learning activity.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
4. During the learning activity, my peers and I had to work on the clinical situation together.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
5. I had the opportunity to put more thought into my comments during the reflective session.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
6. There were enough opportunities in the learning activity for me to find out if I clearly understand.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
7. The learning activity offered a variety of ways in which to learn the material.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
8. I learned from the comments made by the teacher before, during, or after the learning activity.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
9. This learning activity offered a variety of ways of assessing my learning.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
10. I received cues during the learning activity in a timely manner.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5

Use the following rating system when assessing the educational practices: 1 - Strongly Disagree with the statement 2 - Disagree with the statement 3 - Undecided - you neither agree or disagree with the statement 4 - Agree with the statement 5 - Strongly Agree with the statement NA - Not Applicable; the statement does not pertain to the simulation activity performed.	Rate each item based upon how important that item is to you. 1 - Not Important 2 - Somewhat Important 3 - Neutral 4 - Important 5 - Very Important

Item	1	2	3	4	5	NA	1	2	3	4	5
11. The objectives for the learning activity experience were clear and easy to understand.	Ol	O2	O3	O4	O5	ONA	O1	O2	O3	O4	O5
12. I had the chance to discuss the learning activity objectives with my instructor.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
13. My instructor communicated the goals and expectations to accomplish during the learning activity.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
14. I had the opportunity to discuss ideas and concepts taught in the learning activity with my instructor.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
15. The instructor was able to respond to the individual needs of learners during the learning activity.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5
16. Using learning activities made my learning time more productive.	Ol	O2	O3	O4	O5	ONA	Ol	O2	O3	O4	O5

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Student Study ID Number_____

Student Satisfaction and Self-Confidence in Learning

Instructions: This questionnaire is a series of statements about your personal attitudes about the instruction you receive during your learning activity. Each item represents a statement about your attitude toward your satisfaction with learning and self-confidence in obtaining the instruction you need. There are no right or wrong answers. You will probably agree with some of the statements and disagree with others. Please indicate your own personal feelings about each statement below by marking the numbers that best describe your attitude or beliefs. Please be truthful and describe your attitude as it really is, not what you would like for it to be. This is anonymous with the results being compiled as a group, not individually.

Mark:

1 = STRONGLY DISAGREE with the statement
2 = DISAGREE with the statement
3 = UNDECIDED - you neither agree or disagree with the statement
4 = AGREE with the statement
5 = STRONGLY AGREE with the statement

	SD	D	UN	A	SA
1. The teaching methods used in this learning activity were helpful and effective.	Ol	O2	O3	O4	O5
2. It is the instructor's responsibility to tell me what I need to learn of the learning activity content during class time.	Ol	O2	O3	O4	O5
3. The learning activity provided me with a variety of learning materials and activities to promote my learning the cardiovascular content.	Ol	O2	O3	O4	O5
4. I know how to use this learning activity to learn critical aspects of cardiovascular patient care.	Ol	O2	O3	O4	O5
5. I enjoyed how my instructor taught the learning activity.	Ol	O2	O3	O4	O5
6. I know how to get help when I do not understand the concepts covered in the learning activity.	Ol	O2	O3	O4	O5
7. The teaching materials used in this learning activity were motivating and helped me to learn.	Ol	O2	O3	O4	O5
8. It is my responsibility as the student to learn what I need to know from this learning activity.	Ol	O2	O3	O4	O5
9. The way my instructor(s) taught the learning activity was suitable to the way I learn.	Ol	O2	O3	O4	O5
10. My instructors used helpful resources to teach this learning activity.	Ol	O2	O3	O4	O5
11. I am confident that I am mastering the cardiovascular content of the learning activity that my instructors presented to me.	Ol	O2	O3	O4	O5

12. I am confident that I am developing the skills and obtaining the required knowledge from this learning activity to perform necessary tasks in a clinical setting.	Ol	O2	O3	O4	O5
13. I am confident that this learning activity covered critical content necessary for the mastery of the cardiovascular content.	Ol	O2	O3	O4	O5

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Selected Outcomes Based on Teaching Strategies Research Study

Student Performance Demonstration Rubric

Instructions for researcher:

Please use the following rubric to score the student's DVD performance demonstration caring for a patient with cardiovascular disease. The demonstration begins when the student enters the room.

Please use a 0-1 scale. A zero indicates inaccurate performance and a one indicates accurate performance of nursing interventions. Sum the scores to provide a total score for the student's performance of nursing intervention activities.

Please feel free to add comments as needed.

Element of care	Score Yes = 1 No = 0	Comments to guide the researcher
Physical Assessment		
Dyspnea within first 5 minutes		Questions pt. about difficulty breathing
SaO_2 within first 5 minutes		Places SaO_2 probe on finger
Connects 3 lead ECG within first 5 minutes		
3 lead ECG connection completed		If applies ECG before calling physician
Heart rate within first 5 minutes		If places ECG, also score heart rate here
Heart rhythm within first 5 minutes		Provides verbal statement about rhythm
Blood pressure within first 5 minutes		
Epigastric discomfort assessed first 10 minutes (i.e. nausea, heart burn, or stomach pain)		Questions patient
Diaphoresis		States observation of diaphoresis
Physical Assessment is free of extraneous information (i.e. no pupil checks, no peripheral vascular assessment)		If the information ties to an assessment (i.e. assesses bowel sounds because of nausea) – score "1"
Pain Assessment (before physician called)		
Character		
Location		
Intensity		
Duration		
Pain scale used		
Independent interventions		
Head of bed elevated		
Oxygen applied (before called physician)		
Bedrest (provides rationale-decreases work of heart)		

SBAR (call to physician)/ Situation		NOTE TIME CALL ENDED
Who is calling?		
Calling about whom?		States patient's name
Background		
Presented why patient is in the hospital		States patient presents with chest pain and fluttering feeling in chest
Presented change in pt. status (i.e. chest pain started)		
CURRENT Assessment described to physician		
Pain		
Heart rate (92, irregular)		
Blood pressure (146/90)		
Respiratory rate		If states respiratory rate - score "1"; Also go back to physical assessment and score "1" for respiratory rate
Dyspnea		
SaO_2 (96% room air)		
Heart sounds (S_1, S_2, no extra sounds)		
Lung sounds (Clear)		
Epigastric discomfort		
Diaphoresis		
Summarizes interventions done		
3 lead ECG connected		
HOB elevated		
O_2 2 liters/nasal cannula applied		
Initiated bed rest		
Made recommendations		
Morphine		
Oxgyen		
Nitroglycerin		
Aspirin		
12 lead ECG		
ABG		
Repeated physician orders back		Reads back all physician orders
Repeated orders accurate		100% accurate – score "1"; If physician has to clarify – score "0"
Dependent Interventions		
Requested 12 lead ECG		
Requested ABG		
Used 5 rights of Medication Administration BEFORE first medication administered		
Student looked at pt. name band		
Patient stated name (right patient)		
Patient stated birthday (right patient)		
Nitroglycerin (NTG) administered BEFORE Morphine		
Morphine administered within 15 minutes (of calling physician)		If unable to manipulate carpujet, and pretended Morphine given – score "0"
No Morphine medication error for **dose**		

No Morphine medication error for **route**		
No Morphine medication error for **time**		
Aspirin administered within 30 minutes (of calling physician)		
No Aspirin medication error for **dose**		
No Aspirin medication error for **route**		
No Aspirin medication error for **time**		
1st tablet NTG administered within 10 minutes (of calling physician)		Researcher note time given, and time of next NTG
No NTG medication error for **dose**		
No NTG medication error for **route**		
No NTG medication error for **time**		
2nd tablet NTG administered (5 minutes after 1st)		Researcher note time given, and time of next NTG
No NTG medication error for **dose**		
No NTG medication error for **route**		
No NTG medication error for **time**		
3rd tablet NTG administered (5 minutes after 2nd)		
No NTG medication error for **dose**		
No NTG medication error for **route**		
No NTG medication error for **time**		
Reassessed pain within 3-5 min after NTG 1st dose		
Pain assessed		
Character		
Location		
Intensity		
Physical assess/ reassessed within 5 min after NTG 1st dose		
Heart rate & or rhythm		
Blood pressure		
Respiratory rate		
Oxygen saturations		
Heart sounds		
Lung sounds		
Reassessed pain within 3-5 minutes after NTG 2nd dose		
Pain assessed		
Character		
Location		
Intensity		
Physical assess/ reassessed within 5 minutes after NTG 2nd dose		
Heart rate & or rhythm		
Blood pressure		
Respiratory rate		
Oxygen saturations		
Heart sounds		
Lung sounds		

Reassessed pain within 3-5 minutes after NTG 3rd dose		
Pain assessed		
Character		
Location		
Intensity		
Physical assessment reassessed within 5 minutes after NTG 3rd dose		
Heart rate & or rhythm		
Blood pressure		
Respiratory rate		
Oxygen saturations		
Heart sounds		
Lung sounds		
NTG administration		
Hold NTG under tongue until dissolves (do not swallow, chew)		
Avoid ice water near time of NTG		
Wore glove to administer NTG		
Headache		
SBAR (lab and ECG results and assessment update)/ Situation		Score, when student calls physician after 3rd NTG given
Who is calling?		
Calling about whom?		
Background		
Presented change in pt. status (i.e. chest pain improved)		
CURRENT Assessment described to physician		
Pain		
Heart rate		
Blood pressure		
Respiratory rate		
Dyspnea		
Oxygen saturations		
Amount of oxygen applied		
Heart sounds		
Lung sounds		
Epigastric discomfort		
Diaphoresis		
ECG		States: Sinus tachycardia with PACs, ST and T wave elevation
ABG		Ph 7.28, PO2 55, PCO2 35, HCO3 16
SUM OF SCORES		

Student Study ID Number _____

Study: Comparison of Selected Outcomes based on Teaching Strategies that Promote Active Learning in Nursing Education

Follow-up Information Questionnaire

-Information about your health care experiences will help the researches describe the sample of the study. Confidentiality will be maintained.
-Please complete the following information:

1. During the last 8 weeks of your clinical rotation(s), rate the frequency of contact you have had with patients whose primary health problem was cardiovascular disease.

   ___ Always ___ Most of the time ___ Sometimes ___ Rarely ___ Never

2. Since your teaching strategy session (8 weeks ago), have you had work experience providing care to a patient with cardiovascular disease?

   ___ Yes If YES, describe the experience _____
   ___ No

3. Have you personally experienced cardiovascular disease?

   ___ Yes If YES, when? _____
   ___ No

4. Have you had a family member/friend experience cardiovascular disease?

   ___ Yes If YES, when? _____
   ___ No

5. Which of the following best describes your level of preparation for the simulation experience today? (Check all that apply)

   ___ No preparation
   ___ Reviewed your cardiac lecture notes
   ___ Reviewed assigned cardiac readings
   ___ Reviewed cardiac laboratory study guide
   ___ Reviewed notes from laboratory cardiac teaching strategy
   ___ Read additional cardiovascular readings
   ___ Discussed cardiovascular content with faculty
   ___ Discussed cardiovascular content with peers
   ___ Returned to lab for additional practice
   ___ Other ……....(Please describe _____

APPENDIX C

TEACHING STRATEGY INSTRUCTIONS

Case-Based Learning Teaching Strategy Instructions

1. Take cardiac quiz.

2. Sign Confidentiality Agreement form.

3. Read the case scenario on Leo Brooker. You may use resources such as a drug guide, textbooks, computer, and your personal notes to review information for this case.

4. THINK OUT LOUD as you participate in the group discussion answering questions related to the case scenario- Leo Brooker.

5. A 30-minute reflection session will follow group discussion of the case scenario. Please take notes during this session.

6. Before you leave today, if you are participating in the study, please complete three questionnaires, which will take approximately 10 minutes.

Simulation Teaching Strategy Instructions

1. Take cardiac quiz.

2. Sign Confidentiality Agreement form.

3. Read the case scenario on Leo Brooker. You may use resources such as a drug guide, textbooks, computer, and your personal notes to review information for this case.

4. If you have an asterisk by your name, you are the nurse assigned to Leo Brooker. All students will work as a team in providing care in the simulation laboratory. You will have 30 minutes to organize and provide care to Leo Brooker.

5. The scenario is in REAL TIME, so please keep notes on the time you perform assessments and administer medications.

6. THINK OUT LOUD as you participate in the simulation laboratory. State details of what you are assessing (i.e. pulse is 98, blood pressure is 120/80, etc…). When you administer medications, talk out loud about the 5 rights of medication administration.

7. A 30-minute reflection session will follow. Please take notes during this session.

8. Before you leave today, if you are participating in the study, please complete three questionnaires, which will take approximately 10 minutes.

APPENDIX D

TEACHING STRATEGY SCENARIO AND SCRIPTS

Student-Teaching Strategy Scenario

Client Name: Leo Brooker

Birth date: 4/3/1972

Background: Mr. Brooker underwent a laparoscopic gastric banding procedure for morbid obesity one day ago. His height is 5'8" and his weight preoperatively was 170.5kg. He has a history of Type 2 diabetes and hypertension. His postoperative period has been uneventful and he has been progressing as expected.

Past Medical History: No significant medical problems
Cc: Morbid obesity

0700: The following was your assessment of the client at the beginning of the shift

• HR=84 • BP=132/78 • RR=20 and regular • Temp=37.4°C • SpO2=97% on room air • Breath Sounds=Clear • Heart Sounds=S1, S2, no extra sounds • Bowel Sounds=Hypoactive • Urine: None- catheter discontinue at 0600 with adequate output of clear, yellow urine; • Alert, oriented x3; • Pupils equal; • Steri strips dry and intact; • No drainage from incision • States incisional pain is tolerable at 2/10 since last pain medication 2 hours ago • Denies nausea, vomiting, or other discomfort • Abdomen obese, soft, nondistended; • Pupils reactive 4mm to 2m	*0600 labs:* *CBC* • WBC 11.9 • Hgb 11.5 • Hct 35.1% • Platelets 250 *Chemistry* • Na 138 • K 3.4 • Cl 99 • CO2 24 • Glucose 122 • Creatinine 1.2 • BUN 6

0800 Morphine 4 mg IV given for incisional pain of 6/10

0930 It is now 9:30 a.m. Mr. Brooker put his call light on at 0930 and states: "My chest hurts." The nursing assistant who answered the light finds you, the nurse assigned to his care, to evaluate him.

Physician's Orders:

- CBC, electrolytes, BUN, creatinine, glucose every day
- Vital signs every 4 hours;
- Check pulse oximetry every 6 hours x 24 hours
- Incentive spirometer every 2 hours while awake
- Sips of ice chips every hour, if tolerated progress to sips of clear liquids every hour
- IV of Lactated Ringers at 125mL/hour
- Metformin 20 mg po every a.m.
- Cefoxitin sodium 2 grams IV every 6 hours x4 doses
- Morphine sulfate 4 mg IV every 1 hour prn
- Famotidine 20mg PO every 12 hours
- Metoclopramide 10mg IV every 12 hours
- Enoxaparin 40mg SQ every AM;
- Ondansetron 4 mg IV every 8 hours prn nausea
- Compression stockings bilateral;
- Ambulate next day every 2 hours;
- Intake and Output every 4 hours;
- Weigh in AM

Notify the physician for:

- HR greater than 140 or less than 60
- Systolic BP less than 100 or greater than 180
- Blood sugar < 80 >140
- Urine output less than 240mL/8 hours
- Temp greater than 38°C
- SpO_2 less than 92%

Remember to think out loud. In order to accurately understand your thinking, you need to verbalize what you are assessing and what you are considering; otherwise the researcher is not able to tell what your thoughts and judgments are.

Script: Case-Based Learning Simulation Teaching Strategies-
Leo Brooker

General Information:

The following case-based learning questions serve as the script. The researcher reads each question to the group and facilitates students' discussion in answering questions. The researcher also provides cues and critical thinking questions using the "Script- Teaching Strategy Essential Content" which helps students identify the important elements of care for a patient experiencing a myocardial infarction to thoroughly answer each question.

Case-Based Learning Questions

1. As the nurse enters the room at 0930, what assessment(s) should be completed?

2. Based on the initial data, what are the priorities related to the care of this patient?

3. Are there other members of the health care team that should be contacted? If yes, identify whom the nurse would call.

4. At what point does the nurse contact another health care team member?

5. Describe the important elements that need to be included in the communication with the team member who has been called?

6. Based on the findings of the nurse's 0930 assessment, what are the interventions the nurse should expect to implement?

7. Following the interventions, what patient response does the nurse anticipate?

Scripts: Simulation Teaching Strategies-
Leo Brooker

General Information:

The scripts: Simulation and Simulation with narrative pedagogy teaching strategies are combined in this document. The following description differentiates the two strategies.

Simulation

The simulation teaching strategy involves one researcher, who plays the voice of the patient, doctor, and unit secretary. She is hidden in the corner of the simulation room behind a large white screen, and runs the computer that controls the high-fidelity simulation mannequin. Students are told that during the simulation scenario, the teacher will play the voice of the patient, doctor, and unit secretary while running the computerized mannequin hidden behind a screen.

Simulation with narrative pedagogy

The simulation with narrative pedagogy teaching strategy involves two researchers. One researcher plays the voice of the patient, doctor, and unit secretary, while running the computerized mannequin. The other researcher, who implements all of the teaching strategies, plays the role of teacher standing near the bedside. Students are told that the teacher will call a few brief "time out" periods throughout the scenario to help them think about their nursing care performance. The researcher/teacher responds to whether students consider the best choice of nursing care or whether there are more appropriate assessments and interventions to implement. The teacher's feedback is based on essential standards of care for a patient experiencing a myocardial infarction found in the "Script-Teaching Strategy Essential Content". After short discussions, students resume providing care to Leo Brooker.

Script:

When students (nurses) enter the room, the researcher (playing the voice of Leo Brooker) states, "My chest hurts."

The researcher's response to students' assessment questions	
-Pain: ***Character***– "My chest hurts, it feels like an elephant on my chest" ***Location***– "middle of my chest" ***Intensity*** – "severe" "8" (on 0-10 scale) ***Duration*** – "it started a few minutes ago" ***-Diaphoresis***– "I feel sweaty." *(visible sweat is on mannequin)* ***-Dizziness*** – "I feel woozy and kind of dizzy" ***Nausea*** – "My stomach is upset. My breakfast really didn't set very well"	***-Dyspnea*** –"I'm having a really hard time catching my breath" -When student counts respirations on mannequin: ***Respiratory rate*** *= 28* -When student connects monitoring equipment the following will appear on the cardiac monitor: ***-Electrocardiogram (ECG) waveform:*** Heart rate = 110 and irregular rhythm ***-Blood pressure***: 164/98 ***Oxygen saturation:*** 90%

When students perform the following independent nursing interventions, the researcher-computer controller will activate the mannequin. (Note: The high-fidelity simulation

mannequin is pre-programmed for an acute myocardial infarction scenario, which will show physiological improvement in response to oxygen and medication administration.

Students perform independent nursing interventions	**Researcher-computer controller**
Applies oxygen at 2 liters nasal cannula	Opens the oxygen treatment scenario and chooses 2 liters flow
Applies 3 lead ECG	Turns on the monitor ECG wave form
Gives morphine 4 mg IV (2 mg/mL in the syringe)	Opens the medication treatment scenario and chooses morphine 4mg IV dose
Elevates the head of the bed	
Instructs Mr. Brooker to not get out of bed	

Students' communication with the doctor will include standard communication known as SBAR (Situation, Background, Assessment, and Recommendation). (Note: If students call the doctor before doing essential assessments, the researcher (voice of the doctor) will state, "What assessments have you done?" Student states, "None." Researcher states, "Go back to get assessment data and call me back."

Students' expected standard communication with doctor
Situation: Who is calling, about whom, and for what purpose? **Background:** Explanation of why the patient is in the hospital, and the change in condition. **Assessment**: Pain, dyspnea, heart rhythm (irregular rhythm), dizziness, nausea, diaphoresis, heart rate, blood pressure, and respiratory rate. Summarizes interventions done: Applied oxygen at 2 liters, morphine 4 mg IV given, and head of the bed elevated. **Recommendation** or anticipation of indicated orders: Nitroglycerin, aspirin, morphine, 12 lead ECG, arterial blood gas (ABG), and bed rest

If the student does not give a recommendation, the researcher will state, "What do you recommend for Mr. Brooker?"

The researcher will give the following doctor's orders	
Administer O2 at 10 liters via nasal cannula now	Call the unit secretary to order a 12 lead ECG and ABG now.
Give nitroglycerin 0.4 mg sublingually now. You may repeat it after 5 minutes, two more times with continued chest pain for a total of three doses.	Place him on 3 lead ECG monitor (if not already applied)
Give aspirin 81 mg orally now	Keep him on bed rest
Give morphine 4 mg IV (if not already given) and you may repeat it in 1 hour if his chest pain continues.	Call me when you have an update on Mr. Brooker's condition

Standard communication with the doctor requires students read back and verify the orders. Students are also expected to recognize and confront the doctor that oxygen 10 liters flow rate is too high. When students comment on the oxygen level, the doctor will re-order oxygen at 2 liters flow rate. (Note: This error was built into the teaching strategy scenario to help students independently indentify the correct dose of oxygen.)

When students perform the doctor's orders, the researcher-computer controller will activate the simulation mannequin.

Students perform doctor's orders	**Researcher-computer controller**
Applies oxygen 2 liters per nasal cannula (if not already applied)	Opens the oxygen treatment scenario and chooses 2 liters flow (if not already applied)
Attaches 3 lead ECG (if not already attached)	Turns on the monitor ECG wave form (if not already applied)
Administers aspirin (with room temperature water)	
Administers nitroglycerin	Opens the medication treatment scenario and chooses nitroglycerin 0.4 mg SL dose
Gives morphine (if not already given)	Opens the medication treatment scenario and chooses morphine 4 mg IV dose (if not already given)
Calls the unit secretary to order a 12 lead ECG and ABG right away	States, "I will get these tests ordered right away."

Additional expected behaviors
Students will: • Instruct Mr. Brooker to remain on bed rest (if not already instructed) • Use the 5 Rights of Medication Administration • Instruct him to place nitroglycerin under his tongue and let it dissolve. Do not chew or swallow. It may cause a headache. • Wear gloves when administering nitroglycerin • Reassess pain after morphine and nitroglycerin given (Note: Mr. Brooker's chest pain remains an "8" on a 0-10 scale until the third nitroglycerin administered.

After students administer the third nitroglycerin, the researcher will click the computer button – chest pain resolved, and hand students a print out of Mr. Brooker's 12 lead ECG and ABG results.

The researcher's response to the student's assessment questions	
Pain: ***Character***- "It feels better, the elephant is gone" ***Location***- "middle of my chest" ***Intensity*** – "mild" "2" on 0-10 scale ***Dyspnea*** –" My breathing is better." ***Diaphoresis***- "I don't feel sweaty any more." ***Dizziness*** – "My dizziness is gone" ***Nausea*** – "None"	Respiratory rate = 20 Cardiac Monitor: Heart rate = 80 and regular Blood pressure = 130/78 Oxygen saturation = 97%

Students will recall the doctor with an update on Mr. Brooker's condition using SBAR standard communication.

Students' expected follow up communication with doctor:
Situation: Who is calling, about whom **Background:** Update on chest pain **Assessment**: Provides current assessment data, explains interventions done, and reads 12 lead ECG and ABG results.

Researcher responds:
"I am glad to hear that Mr. Brooker is doing better. I am finishing up in the clinic, and will be down to check on him in about 10 minutes."

Students' expected behavior
Returns to Mr. Brooker's bedside and provides an update on his condition, and reports the physician will be down to assess him in about 10 minutes.

END OF TEACHING STRATEGY SCENARIO (30 minutes)

Next: 30-minute reflection session

Students participating in the study complete 3 instruments.

ECG and ABG Results for Leo Brooker

Leo Brooker
(4/3/72)

12 Lead ECG:
Sinus tachycardia with occasional PVCs (premature ventricular contractions) and PACs (premature atrial contractions)

ST elevation and T wave elevation

(Note: ECG abnormalities indicate ischemic injury to heart muscle)

Arterial Blood Gas Analysis: Uncompensated Metabolic Acidosis
pH = 7.30 (acidic)
PO2 = 58 mm Hg (low)
PCO2 = 35 mm Hg (normal)
HCO3 = 16 mEq/L (low)
Base Deficit = -3 mEq/L (low)

(Note: Abnormal ABG is a result myocardial ischemia and build up of lactic acid. Bicarbonate and base is being used up to buffer high lactic acid levels.)

(PLEASE RETURN this page to at the end of the scenario)

Script: Teaching Strategy Essential Content

Group/Date: _____

General Information:

The following "Script- Teaching Strategy Essential Content" helps the researcher provide consistent information in all three teaching strategies on the important elements of care for a patient experiencing a myocardial infarction. The content in this script is used during the simulation with narrative pedagogy teaching strategy, case-based learning teaching strategy, and reflection sessions for all three teaching strategies. In the simulation with narrative pedagogy teaching strategy the researcher/teacher uses this content to guide student thinking during the "time out" sessions. In the case-based learning teaching strategy the researcher poses questions based on the script to guide students' critical thinking in answering the case-based learning questions.

Instructions to students prior to the teaching strategy:

__Today is teaching strategy. In *2 weeks and 8 weeks* you will have a *1:1 Performance demonstration* with the simulation mannequin in room 420, in which you will provide care based on a cardiac scenario.

Researcher's script after the teaching strategy:

__Take notes during today's reflection session. This will help you remember the *important standards of care* in caring for a patient with a MI. Your notes will also *help you prepare* for *your 1:1 Performance* demonstration and your *written self-reflection* after your performance.

__Reminder: *Talk out loud* when you perform these in your 1:1 performance demonstration. Pretend your nursing instructor is standing next to you and you need to explain the data you are assessing.

__Priority Physical Assessments- (first 5 minutes):

~ heart rate

~ heart rhythm (Applies 3 lead cardiac monitor- irregular rhythm- common in chest pain)

~ BP

~ respiratory rate

~ SaO2

~ dyspnea (labored breathing, use of accessory muscles, drop in SaO2…. (talk out loud when assessing this)

~ diaphoresis

~ epigastric discomfort (*nausea, heart burn,* or stomach pain)

__Pain Assessment- (first 5 minutes):

~ character "feels like an elephant standing on my chest"

~ location "below my sternum"

~ intensity "8/10"

~ duration "It just started in the last few minutes"

__Additional Assessments- (first 10 minutes):

~ heart sounds

~ lung sounds

~ dizziness

Independent Nursing Interventions (No doctor order needed) to complete prior to calling the doctor:
__Placed patient on *3 lead EKG*
__*Elevates head of bed*
__Instructs patient on *bed rest* (Because of your chest discomfort- it is important to rest & not get of bed, to decrease the work of your heart) *It is important to teach the pt. why he needs to stay in bed.
__Applies *oxygen 2 liters* per nasal cannula (Instruct: This oxygen will help get more oxygen to your heart) NOTE: Nurses can independently start oxygen at 2 liter/nasal cannula for shortness of breath & chest pain.
__ NOTE: Administers *Morphine sulfate*- since an order for it already exits.
Uses 5 rights of medication administration.

Calls the doctor and presents:
__ Situation:
~ who is calling
~ about whom
~ for what purpose
(i.e.: Hello Dr. Peterson. This is Nurse Smith on 3W calling about your patient Leo Brooker- 36 years old).

_ Background data presented:
~ why the patient is in the hospital (i.e. laparoscopic gastric banding procedure one day ago)
~ what changed (i.e. now having acute chest pain- he stated feels like "an elephant standing on my chest")
__ Assessment PART 1:
~ pain (0-10 scale; location; character; and when started)
~ dyspnea
~ vitals (HR, BP, R, SaO2)
~ heart rhythm
~ dizzy
~ nauseated (epigastric discomfort)
~ diaphoretic
~ heart & lung sounds
__ Assessment PART 2:
Summarizes interventions done
~ 3 lead EKG connected
~ morphine 4 mg IV given
~ HOB elevated/Bedrest
~ O2 on at 2L via nasal cannula
__ Recommendation or anticipation of indicated orders:

MONA
~ morphine
~ oxygen
~ nitro
~ aspirin
~ 12 lead ECG & ABG
*Reads back and verifies all orders; questions inappropriate orders

Interventions (Orders from doctor):
__Oxygen 2 liters/nasal cannula & 3 lead ECG monitor-if not already done

__ Administers medications immediately: Uses and VERBALIZE 5 rights for all medications
__When you do this pretend you are explaining these to your clinical instructor
~ right patient (2 pt identifiers: Check *ID Band* and have Pt. state *name & birthday*/)*

~ right *drug*	ASA	NTG	MSO4
~ right *dose*	81 mg	0.4 mg	4mg
~ right *route*	PO	SL	IV
~ right *time*	Now	Now	Now

__Encourage students to gather all three medications –Nitro, Aspirin, Morphine at one time.
-Check each medication NAME, DOSE, ROUTE, and TIME when:
a. Check all of these to physician orders as take medications *out of drawer*
b. Check all of these again to physician orders at the *medication counter*
c. AND Check all of these again, when double check to physician orders at the *patient's bedside*
-At the bedside- check the patients name on name band and have patient to state name and birth date.
-STATE OUT LOUD (with the three medication checks): i.e. I have ASA 81 mg and it is to be given by mouth…. NTG 0.4mg SL….Morphine 4 mg IV. All are to given now).

__*What order* do you administer these medications? You learned MONA, BUT give in a different order.
1. ASA; 2. NTG; 3. MSO4
__*Why this order*? Think about *action* of medication……. (Incorrect to give MSO4 1st because of action & it takes too much time- 2-3 minutes)
__*What is important to teach* about each of these medications

__ Administer ***aspirin 81 mg po*** (Use 5 rights of administration)
NOTE: Give ASA first, then quickly follow with NTG since NTG will need to dissolve under the tongue.
__ASA Instructs patient: take aspirin with room temperature water, NOT ice water (since ice water will decrease the absorption of the nitroglycerin, which I will give you next). ASA helps to prevent further clot formation in your blood.

__ Administer *nitroglycerin .04 mg sublingual* (every 5 minutes for a total of 3 doses) (Use 5 rights of administration) (WEAR GLOVE(s) when administer NTG- prevent skin absorption)

__NTG Instructs patient:

~ allow the nitroglycerin to dissolve under your tongue, DO NOT chew or swallow

~ may get a headache because of vasodilating effects of the medication, don't worry this is expected and the headache will go away

~ nitroglycerin helps to dilate your vessels to get more oxygen to your heart and decrease chest pain

~ Write time down when giving NTG to help track giving it every five minutes.

~ REASSESS:*4 minutes after NTG administered: Pain rating/intensity (+character & location), HR (& rhythm), BP (want to have *time for NTG to take effect*; If pain gone- do not need to administer more NTG; If BP drops significantly- hold next NTG & call doctor.)

~ Remember to talk out loud about your assessment findings (i.e. HR- 90; BP 150/90….._

~ CONTINUE TO REASSESS (same as initial assessment) while waiting to give next NTG: RR, SaO2 & Dyspnea (respirations regular & nonlabored), Heart sounds, Lung sounds

__ Administer *morphine 4 mg IV* (Use 5 rights of administration)

__ MSO4 Instructs: help to decrease the pain you are experiencing in your chest.

__ Call for 12 lead ECG and ABG (turn on call light- and ask unit secretary to call for 12 lead ECG & ABG (by Resp. Therapy). Give patient name and room number….)

__ CONTINUE TO REASSESS PATIENT (as we just discussed) every 5 minutes.

__ Call doctor with 12 lead ECG & ABG and PATIENT CONDITION USING SBAR

__Before you call the doctor wait 5 minutes after 3rd NTG and complete full REASSESSMENT of patient to know full effect of the medication. Organize your data, before you call the doctor.

SBAR:

__Situation: Who is calling… Calling about whom… Explanation of purpose calling…

__Background: Presents why pt. in hospital…. Present status of patient…(CP resolved);

__Assessment: Pain/HR/BP/RR/Dyspsnea/SaO2/FiO2/Heartsounds/Lung sounds/Nausea/ Diaphoresis/ EKG/ABG results= read back exact numbers, no need to give interpretation data.

__ Recommendations: The patient needs Morphine, Oxygen, Nitroglycerin, and Aspirin

SUMMARY:

__Rethink: Primary Assessments; Independent Nursing Interventions; SBAR; Expected doctors orders-MONA; 5 RIGHTS of medication administration; Comprehensive reassessment every 5 minutes; Recall doctor

__When you participate in your 1:1 Performance Demonstration please think about the following:

__It is going to be important that you *TALK OUTLOUD* about your assessments (state numbers you see on the monitor); state out loud the 5 RIGHTS of medication.
__The performance demonstration is in *REAL TIME*, so remember to continue to reassess the patient and provide supportive conversation to the patient. Write down the time of NTG, since 5 minutes goes by fast.
__Use *professional behavior*: Wear watch, keep hair pulled back, work on organizational skills, and take notes to assist with charting.

Script: Teaching Strategy Reflection Session
(in classroom)

During the reflection session, we will review your thoughts regarding the teaching strategy and discuss the standards of care for a patient experiencing a myocardial infarction.

Questions:

- How do you think the session went?
- What went well regarding your learning in the session?
  (Note: Provide feedback on what students did well. *"You did a good job on ...."*)
- Give examples of where you prioritized assessments and nursing interventions effectively.
- What could you have improved upon? (i.e. Care decisions that would have been more appropriate? Care decisions that were omitted?)
- What were the important standards of care in providing care to the patient- Leo Brooker who was experiencing a myocardial infarction?
- How would you describe communication among team members?

Closing:

- In summary, these are things that you did well….
- These are things you could improve upon….
- The take home points include……

APPENDIX E

FIRST PERFORMANCE SCENARIO AND SCRIPTS

Student - Performance Scenario

Client name: Maria Sanchez

Birth date: 2/17/1965

Background: Yesterday, Ms Sanchez drove herself to the Emergency Department in the afternoon; she presented with chest discomfort and a fluttering feeling in her chest. She was transferred to the Telemetry unit at 1800. Her current height is 5'4", weight is 135 lbs.

PMH: Ms Sanchez has a current history of high cholesterol and smokes a pack a day. She had 3 normal pregnancies; children aged 18,14, and 12 and a cholecystectomy 5 yrs ago.

0700 (It is the next morning on the Telemetry Unit)
The following was your assessment of the client at the beginning of your shift:

• HR=92, irregular • BP=136/80 • RR=22 • Temp=37.5°C • SpO2=96% on room air • Breath Sounds=Clear • Heart Sounds=S1, S2, no extra sounds • Peripheral pulses present in all extremities • Bowel Sounds=Hypoactive • Last voided at 0600 • Alert, oriented x3; • Pupils equal and reactive	*0600 labs:* • LDL 210 • HDL 30 • Hgb 13 • Hct 38% • Platelets 300 *Chemistry* • Na^+ 140 • K^+ 4.0 • Cl 100 • CO2 26 • Serum glucose 128 • Creatinine 1.0 • BUN 10

It is now 1000 as you go in to recheck on her, she is drenched in sweat. She states, "I am feeling terrible".

Physician orders include the following: • Vital signs and SaO_2 every4 hour • IV D5/.45 NS at 80 cc/h	Notify healthcare provider if: ➢ HR > 180 or < 60 ➢ SBP > 180 or < 100 ➢ SpO2 < 90

Remember to think out loud. In order to accurately understand your thinking, you need to verbalize what you are assessing and what you are considering; otherwise the researcher is not able to tell what your thoughts and judgments are.

Individual Performance Demonstration Instructions

- Please read the attached performance scenario information on Maria Sanchez.

- Use the next 15 minutes to review and look up information in the scenario as needed. You may use resources such as a drug guide, textbooks, and your personal notes.

- At the end of 15 minutes, you will begin your individual performance demonstration.

- You will have 30 minutes to provide care to Maria Sanchez in the scenario.

- The scenario is in REAL TIME, so please keep notes on the time you perform assessments and administer medications.

- THINK OUT LOUD as you participate in the scenario i.e. state details of what you are assessing and what you are doing. Please speak loudly, so that you can be heard.

- The mannequin operator will not be able to answer questions during the scenario.

- Take home handout: Written Self-Reflection of First Performance Demonstration. You will self-reflect on your performance demonstration today and submit your answers to the 96:135 ICON course drop box by 11:00pm today.

PLEASE RETURN THE PERFORMANCE SCENARIO (MARIA SANCHEZ)
AT THE END OF YOUR PERFORMANCE DEMONSTRATION.

Script: Performance Scenario-
Maria Sanchez

General Information:

The first performance demonstration involves three researchers. One researcher greets the student. The researcher and student read the instructions to the individual performance demonstration. She takes the student to a quiet room for 15 minutes to prepare for the scenario. The second researcher (who implemented the teaching strategies) plays the voice of the patient, doctor, and unit secretary from the audio-control room. The third researcher runs the computerized mannequin hidden behind a screen in the simulation room.

Script:
When the student (nurse) enters the room, the researcher (playing the voice of Maria Sanchez) states, "I'm feeling terrible."

The researcher's response to student's assessment questions	
Pain: ***Character***– "heavy aching" ***Location***– "jaw, left arm & chest" ***Intensity*** – "severe" "9" (on 0-10 scale) ***Duration*** – "it started a few minutes ago" ***Diaphoresis***– "I am really sweaty." *(visible sweat is on mannequin)* ***Dizziness*** – "I feel woozy and kind of dizzy" ***Nausea*** – "My stomach feels lousy"	***Dyspnea*** –"I'm feeling really short of breath" When student counts respirations on mannequin: ***Respiratory rate*** *= 24* When student connects monitoring equipment the following will appear on the cardiac monitor: ***Electrocardiogram (ECG) waveform:*** Heart rate = 92 and irregular rhythm ***Blood pressure***: 148/90 ***Oxygen saturation:*** 95%

When the student performs the following independent nursing interventions, the researcher-computer controller will activate the mannequin. (Note: The high-fidelity simulation mannequin is pre-programmed for an acute myocardial infarction scenario, which will show physiological improvement in response to oxygen and medication administration.

Student performs independent nursing interventions	**Researcher-computer controller**
Applies oxygen at 2 liters nasal cannula	Opens the oxygen treatment scenario and chooses 2 liters flow
Applies 3 lead ECG	Turns on the monitor ECG wave form
Elevates the head of the bed	
Instructs Ms. Sanchez to not get out of bed	

Student's communication with the doctor will include standard communication known as SBAR (Situation, Background, Assessment, and Recommendation). (Note: If the student calls the doctor before doing essential assessments, the researcher (voice of the doctor) will state, "What assessments have you done?" Student states, "None." Researcher states, "Go back to get assessment data and call me back."

Student's expected standard communication with doctor
Situation: Who is calling, about whom, and for what purpose? **Background:** Explanation of why the patient is in the hospital, and the change in condition. **Assessment**: Pain, dyspnea, heart rhythm (irregular rhythm), dizziness, nausea, diaphoresis, heart rate, blood pressure, and respiratory rate. Summarizes interventions done: Applied oxygen at 2 liters, and head of the bed elevated. **Recommendation** or anticipation of indicated orders: Nitroglycerin, aspirin, morphine, 12 lead ECG, arterial blood gas (ABG), and bed rest

If the student does not give a recommendation, the researcher will state, "Is there any other information?" (Note: This provides the student an opportunity to communicate recommendations, before the researcher continues with the doctor's orders for Ms. Sanchez.)

The researcher will give the following doctor's orders	
Administer O2 at 2 liters via nasal cannula now	Call the unit secretary to order a 12 lead ECG and ABG now.
Give nitroglycerin 0.4 mg sublingually now. You may repeat it after 5 minutes, two more times with continued chest pain for a total of three doses.	Place her on 3 lead ECG monitor (if not already applied)
Give aspirin 81 mg orally now	Keep her on bed rest
Give morphine 2 mg IV (if not already given) and you may repeat it in 1 hour if her chest pain continues.	Call me when you have an update on Ms. Sanchez's condition

Standard communication with the doctor requires the student read back and verify the orders.

When the student performs the doctor's orders, the researcher-computer controller will activate the simulation mannequin.

Student performs doctor's orders	Researcher-computer controller
Applies oxygen 2 liters per nasal cannula (if not already applied)	Opens the oxygen treatment scenario and chooses 2 liters flow (if not already applied)
Attaches 3 lead ECG (if not already attached)	Turns on the monitor ECG wave form (if not already applied)
Administers aspirin (with room temperature water)	
Administers nitroglycerin	Opens the medication treatment scenario and chooses nitroglycerin 0.4 mg SL dose
Gives morphine (if not already given)	Opens the medication treatment scenario and chooses morphine 2 mg IV dose (if not already given)
Calls the unit secretary to order a 12 lead ECG and ABG right away	States, "I will get these tests ordered right away."

Additional expected behaviors
Student will: • Instruct Ms. Sanchez to remain on bed rest (if not already instructed) • Use the 5 Rights of Medication Administration • Instruct Ms. Sanchez to place nitroglycerin under her tongue and let it dissolve. Do not chew or swallow. It may cause a headache. • Wear gloves when administering nitroglycerin • Reassess pain after morphine and nitroglycerin given (Note: Ms. Sanchez's chest pain remains an "8" on a 0-10 scale until the third nitroglycerin administered.

After the student administers the third nitroglycerin, the researcher will click the computer button – chest pain resolved, and hand the student a print out of Ms. Sanchez's 12 lead ECG and ABG results.

The researcher's response to the student's assessment questions	
Pain: ***Character***- "It feels better, the heavy aching is gone" ***Location***- "Jaw pain gone"; "Chest & Arm is mild" ***Intensity*** – "mild" "1" on 0-10 scale ***Dyspnea*** –" My breathing is better." ***Diaphoresis***- "I don't feel sweaty any more." ***Dizziness*** – "My dizziness is gone" ***Nausea*** – "None"	Respiratory rate = 16 Cardiac Monitor: Heart rate = 76 and regular Blood pressure = 120/68 Oxygen saturation = 97%

The student will recall the doctor with an update on Ms. Sanchez's condition using SBAR standard communication.

Student's expected follow up communication with doctor:
Situation: Who is calling, about whom **Background:** Update on chest pain **Assessment**: Provides current assessment data, explains interventions done, and reads 12 lead ECG and ABG results.

Researcher responds:
"I am glad to hear that Ms. Sanchez is doing better. I am finishing up in the clinic, and will be down to check on her in about 10 minutes."

Student's expected behavior
Returns to Ms. Sanchez's bedside and provides an update on her condition, and reports the physician will be down to assess her in about 10 minutes.

END OF FIRST PERFORMANCE SCENARIO (30 minutes)

Prior to the student leaving, the researcher will state, "Please complete a one-page self-reflection (critique) of your performance demonstration and submit it to the 96:135 ICON course drop box by 11:00 pm today. You will find it helpful to review your notes from the teaching strategy as write your self-reflection."

ECG and ABG Results for Maria Sanchez

Maria Sanchez
Birth date: 2/17/1965

12 Lead ECG:
Sinus tachycardia with occasional PACs (premature atrial contractions)

ST elevation and T wave elevation

Arterial Blood Gas Analysis: Uncompensated Metabolic Acidosis
pH = 7.28 (acidic)
PO2 = 55 mm Hg (low)
PCO2 = 35 mm Hg (normal)
HCO3 = 16 mEq/L (low)
Base Deficit = -3 mEq/L (low)

(PLEASE RETURN this page to at the end of the scenario)

Written Self-Reflection of First Performance Demonstration

Instructions: As you self-reflect on your performance demonstration today, answer the following questions. You will find it helpful to review your notes from the teaching strategy to write this. Submit the answers to the 96:135 ICON course drop box by 11:00pm today.

1. Reflecting on the standards of care learned during your cardiovascular teaching strategy, what did you do well during your performance demonstration?

2. What could you have improved upon?

3. What do you need to do to prepare for your next performance demonstration?

APPENDIX F

SECOND PERFORMANCE SCENARIO AND SCRIPTS

Student - Retention Performance Scenario

Client name: Herman Morris

Birth date: 7/27/1927

BACKGROUND: Mr. Morris was admitted to a medical unit two days ago for pneumonia. He has lived in a long term care center for the last two years since the death of his wife of 55 yrs. He has been hospitalized 4 times over the past two years. His height is 5'10", weight is 185 lbs; his weight increased 4 lbs in the last week.

PMH- Smoked 1-2 packs/day for 20 yrs, quit 40 yrs ago. He had a myocardial infarction in 1997 and subsequent coronary artery bypass (CABG) surgery. Additional history includes high cholesterol and hypertension.

0700: You obtained the following information from report:

• HR- 92, irregular • BP- 156/88 • RR- 22 • T- 38.0 C • SaO2- 91% on room air • Crackles in both lung bases • Heart sounds- S1,S2 and S3 • Peripheral pulses present in all extremities • 3+ peripheral edema • Bowel sounds hypoactive • Urine (Reported last void 0600- dark amber urine) • Pupils equal and reactive • Skin dry, sparse hair on extremities	*0600 labs:* • LDL 138 • HDL 40 • Hgb 13 • Hct 38% • Platelets 300 • Serum albumin 3 • Na+ 149 • K+4.9 • Cl 100 • CO 26 • Serum glucose 108 • BUN 20 • Creatinine 2.0

Physician orders include the following:

- Vital signs and SaO2 every 4 hours
- Clear liquid diet as tolerated
- IV D5/.45 NS at 20 cc/hr

Medications:

- Furosemide 40 mg p.o. q am
- Lovastatin 20 mg p.o. q day at bedtime
- Metoprolol 50 mg p.o. bid
- Captopril 25 mg TID p.o.
- Levofloxacin 500 mg IV Q 6 hours (next dose due at 1200)

Notify healthcare provider if:

- HR > 180 or < 60
- SBP > 180 or < 100
- SpO2 < 90 %
- 3 PVC's/min

0800: It is now 0800, you go in to do your assessment and the patient says: **"**I really need to see the doctor, I'm feeling really bad."

Remember to think out loud. In order to accurately understand your thinking, you need to verbalize what you are assessing and what you are considering; otherwise the researcher is not able to tell what your thoughts and judgments are.

Second Individual Performance Demonstration Instructions

- Please read the attached performance scenario information on Herman Morris.
- Use the next 15 minutes to review and look up information in the scenario as needed. You may use resources such as a drug guide, textbooks, and your personal notes.
- At the end of 15 minutes, you will begin your individual performance demonstration.
- You will have 30 minutes to provide care to Herman Morris in the scenario.
- The scenario is in REAL TIME, so please keep notes on the time you perform assessments and administer medications.
- THINK OUT LOUD as you participate in the scenario i.e. state details of what you are assessing and what you are doing. Please speak loudly, so that you can be heard.
- The mannequin operator will not be able to answer questions during the scenario.

PLEASE RETURN THE PERFORMANCE SCENARIO (HERMAN MORRIS)
AT THE END OF YOUR PERFORMANCE DEMONSTRATION.

Before you leave today please complete a short questionnaire
if you are participating in the study.

Script: Retention Performance Scenario-
Herman Morris

General Information:

The retention performance demonstration involves four researchers. One researcher greets the student. The researcher and student read the instructions to the individual performance demonstration. She takes the student to a quiet room for 15 minutes to prepare for the scenario. The second researcher (who implemented the teaching strategies) plays the voice of the patient, doctor, and unit secretary from the audio-control room. The third and fourth researchers alternate scoring students' performance using the Performance Demonstration Rubric while running the computerized mannequin (hidden behind a screen) in the simulation room. At the end of the 30-minute scenario, students' will be provided formal feedback on their performance.

Script:

When the student (nurse) enters the room, the researcher (playing the voice of Herman Morris) states, "I'm feeling really bad."

The researcher's response to student's assessment questions	
Pain: ***Character***– "heavy trunk on my chest" ***Location***– "middle of my chest" ***Intensity*** – "severe" "9" (on 0-10 scale) ***Duration*** – "it started a few minutes ago" ***Diaphoresis***– "I am sweaty." *(visible sweat is on mannequin)* ***Dizziness*** – "I don't feel right, like I just got off a roller coaster" ***Nausea*** – "I'm feeling nauseated- I think I am going to throw-up"	***Dyspnea*** –" I'm having trouble catching my breath" When student counts respirations on mannequin: ***Respiratory rate*** *= 28* When student connects monitoring equipment the following will appear on the cardiac monitor: ***Electrocardiogram (ECG) waveform:*** Heart rate = 102 and irregular rhythm ***Blood pressure***: 150/90 ***Oxygen saturation:*** 95%

When the student performs the following independent nursing interventions, the researcher-computer controller will activate the mannequin. (Note: The high-fidelity simulation mannequin is pre-programmed for an acute myocardial infarction scenario, which will show physiological improvement in response to oxygen and medication administration.

Student performs independent nursing interventions	**Researcher-computer controller**
Applies oxygen at 2 liters nasal cannula	Opens the oxygen treatment scenario and chooses 2 liters flow
Applies 3 lead ECG	Turns on the monitor ECG wave form
Elevates the head of the bed	
Instructs Mr. Morris to not get out of bed	

Student's communication with the doctor will include standard communication known as SBAR (Situation, Background, Assessment, and Recommendation). (Note: If the student calls the doctor before doing essential assessments, the researcher (voice of the doctor) will state, "What assessments have you done?" Student states, "None." Researcher states, "Go back to get assessment data and call me back."

Student's expected standard communication with doctor
Situation: Who is calling, about whom, and for what purpose? **Background:** Explanation of why the patient is in the hospital, and the change in condition. **Assessment**: Pain, dyspnea, heart rhythm (irregular rhythm), dizziness, nausea, diaphoresis, heart rate, blood pressure, and respiratory rate. Summarizes interventions done: Applied oxygen at 2 liters, and head of the bed elevated. **Recommendation** or anticipation of indicated orders: Nitroglycerin, aspirin, morphine, 12 lead ECG, arterial blood gas (ABG), and bed rest

If the student does not give a recommendation, the researcher will state, "Is there any other information?" (Note: This provides the student an opportunity to communicate recommendations, before the researcher continues with the doctor's orders for Mr. Morris.)

The researcher will give the following doctor's orders	
Administer O2 at 2 liters via nasal cannula now	Call the unit secretary to order a 12 lead ECG and ABG now.
Give nitroglycerin 0.4 mg sublingually now. You may repeat it after 5 minutes, two more times with continued chest pain for a total of three doses.	Place him on 3 lead ECG monitor (if not already applied)
Give aspirin 81 mg orally now	Keep him on bed rest
Give morphine 2 mg IV (if not already given) and you may repeat it in 1 hour if his chest pain continues.	Call me when you have an update on his condition

Standard communication with the doctor requires the student read back and verify the orders.

When the student performs the doctor's orders, the researcher-computer controller will activate the simulation mannequin.

Student performs doctor's orders	Researcher-computer controller
Applies oxygen 2 liters per nasal cannula (if not already applied)	Opens the oxygen treatment scenario and chooses 2 liters flow (if not already applied)
Attaches 3 lead ECG (if not already attached)	Turns on the monitor ECG wave form (if not already applied)
Administers aspirin (with room temperature water)	
Administers nitroglycerin	Opens the medication treatment scenario and chooses nitroglycerin 0.4 mg SL dose
Gives morphine (if not already given)	Opens the medication treatment scenario and chooses morphine 2 mg IV dose (if not already given)
Calls the unit secretary to order a 12 lead ECG and ABG right away	States, "I will get these tests ordered right away."

Additional expected behaviors
Student will: • Instruct Mr. Morris to remain on bed rest (if not already instructed) • Use the 5 Rights of Medication Administration • Instruct him to place nitroglycerin under his tongue and let it dissolve. Do not chew or swallow. It may cause a headache. • Wear gloves when administering nitroglycerin • Reassess pain after morphine and nitroglycerin given (Note: Mr. Morris' chest pain remains an "9" on a 0-10 scale until the third nitroglycerin administered.

After the student administers the third nitroglycerin, the researcher will click the computer button – chest pain resolved, and hand the student a print out of Mr. Morris' 12 lead ECG and ABG results.

The researcher's response to the student's assessment questions	
Pain: ***Character***- "The pressure of the heavy trunk is gone" ***Location***- "middle of my chest" ***Intensity*** – "mild" "1" on 0-10 scale ***Dyspnea*** –" My breathing is much better." ***Diaphoresis***- "I don't feel sweaty any more."	***Dizziness*** – "My dizziness is gone" ***Nausea*** – "None" Respiratory rate = 20 Cardiac Monitor: Heart rate = 74 and regular Blood pressure = 128/70 Oxygen saturation = 96%

The student will recall the doctor with an update on Mr. Morris' condition using SBAR standard communication.

Student's expected follow up communication with doctor:
Situation: Who is calling, about whom **Background:** Update on chest pain **Assessment**: Provides current assessment data, explains interventions done, and reads 12 lead ECG and ABG results.

Researcher responds:
"I am glad to hear that Mr. Morris is doing better. I am finishing up in the clinic, and will be down to check on him in about 10 minutes."

Student's expected behavior
Returns to Mr. Morris' bedside and provides an update on his condition, and reports the physician will be down to assess him in about 10 minutes.

END OF RETENTION PERFORMANCE SCENARIO (30 minutes)

Two researchers alternate giving students formal feedback on their performance using the Performance Demonstration Rubric.

ECG and ABG Results for Herman Morris

Herman Morris
Birth date: 7/27/1927

12 Lead ECG:
Sinus tachycardia with occasional PACs (premature atrial contractions)

ST elevation and T wave elevation

Arterial Blood Gas Analysis: Uncompensated Metabolic Acidosis
pH = 7.25 (acidic)
PO2 = 50 mm Hg (low)
PCO2 = 45 mm Hg (normal)
HCO3 = 13 mEq/L (low)
Base Deficit = -3 mEq/L (low)

(PLEASE RETURN this page to at the end of the scenario)

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