

**Simulation Design in Nursing Education: The Impact of Mid-Scenario Reflection on
Learner Satisfaction and Self-Confidence**

by

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Abstract

While high-fidelity simulation (HFS) is used increasingly in nursing education, there is a dearth of quantitative evidence regarding the most effective role of the instructor in simulation. This descriptive correlational study examined the effect of a simulation design incorporating mid-scenario reflection on learning outcomes. The results were obtained by employing descriptive statistical analysis (mean and standard deviation) and correlational statistical analysis (multiple linear regression).

A convenience sample of 47 junior nursing students enrolled in a women's health clinical course was used for this study. Students participated in a HFS obstetrical scenario and cared for a laboring patient who developed an infection. Once the students reached the point when it became necessary to telephone the CNM to request treatment orders, the instructor paused the simulation. The group then adjourned to an adjacent classroom for a five to ten minute instructor-led guided reflection period that included a discussion regarding assessment findings and the diagnoses based on the findings. At that time, the group mutually developed a plan of care and returned to the simulation lab in order to resume the scenario and begin interventions. Following the simulation, participants completed a demographic questionnaire, the Simulation Design Scale, and the Student Satisfaction and Self-Confidence in Learning Scale.

Results from the Student Satisfaction and Self-Confidence in Learning Scale indicate that participants were satisfied with the simulation exercise and generally felt self-confident after the

HFS. The participants perceived that all five design characteristics included in the Simulation Design Scale were incorporated into the HFS.

The correlational analyses revealed that all five simulation design elements were significantly correlated with the learning outcomes of self-confidence and learner satisfaction. A multiple regression analysis indicated that the simulation design elements accounted for over half the variance in learning outcomes. The mid-scenario reflection did not significantly contribute to the level of self-confidence or learner satisfaction. Rather, the design characteristic of Outcomes was the single best predictor for both learning outcomes while Support significantly contributed to the level of learner satisfaction.

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CHAPTER 1. INTRODUCTION

The nursing shortage in the United States continues to grow while the acuity of hospitalized patients increases and medical technology becomes more sophisticated (Buerhaus, Donelan, Ulrich, Norman, & Dittus, 2006; Heller & Nichols, 2001; Rhodes & Curran, 2005). As a result, nursing graduates enter a demanding healthcare environment - one that requires greater responsibility and accountability by its nurses than ever before. New nursing graduates often report feeling unprepared to face the complex challenges and high expectations of the healthcare system (Candela & Bowles, 2008; Kilstoff & Rochester, 2004).

Finding clinical experiences that prepare undergraduate students to practice in an increasingly demanding workplace is a challenge for nurse educators. Moreover, while enrollment into nursing programs has increased, availability of clinical education sites has declined (American Association of Colleges of Nursing, [AACN], 2005). During this challenging time, nurse educators must employ creative teaching strategies based on research findings in order to prepare students for successful practice (Institute of Medicine [IOM], 2007; National League for Nursing [NLN], 2005). High-fidelity simulation (HFS) is one such innovative instructional technique.

Problem Statement

The use of HFS is relatively new in nursing education and its use is growing (Katz, Peifer, & Armstrong, 2010; Nehring & Lashely, 2004). However, there is a dearth of knowledge regarding best HFS practices (Kardong-Edgren, Adamson, & Fitzgerald, 2010; Prion, 2008).

Moreover, the current literature lacks specific recommendations regarding the role of the facilitator in simulation (Jeffries, 2005). And while the effects of post-simulation debriefing have been studied, the effectiveness of mid-simulation learner reflection has not been studied or described in the literature.

Background

Gaba (2007) defines simulation as a technique “to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner” (p. 126). In healthcare, a medical simulation endeavors to “replicate some or nearly all of the essential aspects of a clinical situation so that the situation may be more readily understood and managed when it occurs for real in clinical practice” (Morton, 1995, p. 76).

History of Simulation as a Teaching Strategy

The use of simulation as a teaching strategy began prior to World War I with airplane pilot training (Rolfe & Staples, 1986). Human patient simulators (HPS) were first used in medical education in the late 1960s for anesthesiology training (Abrahamson & Denson, 1969). Other high-stakes industries using simulation-based education include the military, space programs, and the nuclear power industry (Issenberg, Mcgaghie, Petrusa, Gordon & Scalese, 2005).

The use of simulation in nursing education is not new. In 1911, a life-size mannequin was produced by the doll manufacturer, M.J. Chase Company, for the purpose of student nurse training (Nehring & Lashley, 2010). For the past century, nurse educators have continued to integrate simulation into clinical instruction.

The use of HFS in nursing education is increasing in large part due to lack of available clinical sites. According to Medley and Horn (2005), the dwindling availability of clinical sites is directly attributable to shorter lengths of stay, higher patient acuity, increased enrollment in nursing programs, and shortages of nursing staff. Other factors influencing the use of simulation are public concerns for safety and quality in healthcare delivery, ethical considerations inherent in practicing skills on patients, and the pressure on students to become competent as quickly as possible (Boller & Jones, 2008; Nehring, 2010; Patel & Gould, 2006).

Human Patient Simulators

Steady advances in technology have lead to the development of integrated simulators that offer a continuum of complexity from low-fidelity to high-fidelity HPS. Low-fidelity simulators are static mannequins traditionally used in teaching specific psychomotor skills such as injections. Low-fidelity simulators are limited to simple, gross body movements and do not provide a realistic context for patient-nurse interaction (Seropian, Brown, Gavilanes, & Driggers, 2004). It has been proposed that low-fidelity instruction may improve performance through repetition of a specific skill (Nagle, McHale, Alexander, & French, 2009).

Moderate-fidelity simulators possess some physiological properties of human patients that allow the learner to, for example, listen to breath and heart sounds and palpate pulses; however, these models are unable to exhibit chest expansion when breathing or eye movement (Nehring & Lashley, 2010). While moderate-fidelity simulators offer more realism than the low-fidelity models, these simulators are most useful in introductory courses that teach specific physical assessment competencies (Seropian et al., 2004).

High-fidelity simulators, used in nursing education since the 1990s (Solnick & Weiss, 2007), are computer-integrated models that have the ability to breathe, talk, move, and blink.

These models have programmable physiological functions such as heart, breath, and bowel sounds and can simulate patient responses to student actions (Nehring & Lashley, 2010). High-fidelity simulators provide students an opportunity to "... demonstrate their ability to establish priorities, make decisions, take appropriate action, and work successfully as part of a team" (Jeffries, 2007, p. 4).

Advantages

The advantages of using simulation in nursing education are numerous, varied, and well-documented in the literature. Undoubtedly, the most important benefit is the student's ability to make mistakes in a safe environment without threat to patient safety. Moreover, errors that *are* made can be corrected and discussed immediately (Fletcher, 1995). The use of simulation also eliminates random learning opportunities instead providing standardized clinical experiences for all (LeFlore, Anderson, Michael, Engle, & Anderson, 2007). Furthermore, simulated scenarios can be designed to meet course objectives (Rhodes & Curran, 2005; Vessey & Huss, 2002) and can be repeated in order to build competence more quickly (Beyea & Kobokovich, 2004). The complexity of scenarios may increase along with students' level of knowledge (Seropian, 2003) and simulation may also serve as a strategy for clinical remediation (Haskvitz & Koop, 2004). Lastly, simulation provides an active learning environment that is consistent with adult learning theory (Feingold, Calaluce, & Kallen, 2004).

Disadvantages

Despite simulation's many advantages, there are disadvantages associated with the use of HFS. Cost is the biggest challenge. Simulation equipment ranges in price from \$50,000 to \$300,000 (Adamson, 2010). Additional expenses include the cost of operation, maintenance and repair of the equipment, and the need for additional space in which to operate and store the

equipment (Rauen, 2001). The time required to both develop and implement HFS is also a major challenge for faculty. Rauen (2001) found that the faculty time required to create a HFS scenario is comparable to the time needed to create a complex lecture. In addition, the HFS technology is intricate and requires a significant time commitment for faculty technical training. Simulation can also be time-intensive due to the need for a limited number of students participating in a session at one time (Nehring & Lashley, 2004).

Conceptual Framework

The conceptual framework used for this study was developed by Jeffries (2005) and is based on adult educational theory. The Nursing Education Simulation Framework (NESF) was created in order to guide nurse educators in the design, implementation, and evaluation of HFS. The NEFS describes the relationship of the simulation components (educational practices, student, and instructor) and simulation design characteristics (objectives, fidelity, problem solving, student support, and reflection) and their effect on learning outcomes (knowledge, skill performance, learner satisfaction, critical thinking, and self-confidence). The NESF is based on the proposition that a well-designed simulation improves learning outcomes. Jeffries (2007) found that design factors had a significantly positive effect on learner satisfaction and self-confidence.

Study Purpose

The purpose of this study was to evaluate the effect of a partial instructor-driven simulation design incorporating mid-scenario reflection on learning outcomes. Learning outcomes were measured by post-simulation reports of student self-confidence and student satisfaction with the simulation experience. The relationship between the features of a partial instructor-driven simulation design and learning outcomes were also explored.

Research Questions

1. What are the perceived characteristics of a simulation design incorporating mid-scenario reflection?
2. What is the effect of a simulation design incorporating mid-scenario reflection on student self-confidence?
3. What is the effect of a simulation design incorporating mid-scenario reflection on learner satisfaction?
4. What is the relationship between perceived simulation design characteristics and learning outcomes?

Significance of the Study

High-fidelity simulation is changing the landscape of nursing education as virtual clinical experiences are replacing actual clinical experiences. Given the increased use of this costly teaching method, nurse educators must examine how simulation design characteristics contribute to learning outcomes. Leaders in the field of HFS in nursing education have called for studies that determine the most effective role of the facilitator in simulation (Jeffries, 2005; Leighton, 2010; Prion, 2008) and, more specifically, that explore the effectiveness of incorporating guided reflection into simulation experiences (Decker, 2007). Findings from this study may add to the body of evidence needed to guide nurse educators in the development of successful simulation design.

Limitations

There are several limitations to the study. The study used a convenience sample of junior-level nursing students. The results rely on self-reported data. There was some variability in communication during each mid-session reflective period due to differing student responses

and questions. Lastly, the results of this study may not be generalizable since the sample for the study was obtained from one public university in the southeastern United States.

Delimitation

The study was limited to one high-risk obstetrical scenario.

Assumptions

Each simulation participant will be willing to engage in active learning and will prepare for the simulation experience as assigned by faculty. Each participant will respond honestly to instrument items and be able to identify and self-report the level of learner satisfaction and self-confidence. Finally, the human patient simulator (HPS) will perform reliably throughout the study.

Definitions

In this study, the following terms were used:

1. *Active Learning* – a process whereby instructors become facilitators and students become engaged in a dialog with their colleagues (Modell, 1996).
2. *BSN Students* – enrollees in a four-year academic nursing degree program in a nationally accredited school.
3. *Chorioamnionitis* – an infection of the chorionic and amniotic membranes of the uterus and placenta that is potentially life-threatening to the pregnant woman and the fetus. A major complication of pregnancy.
4. *Feedback* – an evaluative response given by the instructor to the student regarding learner actions in order to develop knowledge (Jeffries, 2005).
5. *Fidelity* – the degree to which the simulated clinical experience replicates reality (Jeffries, 2005).

6. *High-Fidelity Simulation (HFS)* – a teaching methodology that closely mimics reality using a simulator that displays physiological reactions such as breathing, speaking, and eye movement (Seropian et al., 2004). The operational definition of HFS for this study was an obstetrical nursing care scenario using a manikin, Noelle^R, manufactured by Gaumard Scientific^R.
7. *Human Patient Simulator (HPS)* – “a computerized, full-body mannequin that is able to provide real-time physiological and pharmacological parameters of persons of both genders, varying ages, and with different health conditions” (Nehring, Ellis, & Lashley, 2001, p.195).
8. *Instructor-Driven Simulation* – a simulation design incorporating frequent direction, immediate cueing and prompting by the instructor who is present at the bedside during the simulation (Dubose, Sellinger-Karmel, & Scoloveno, 2010).
9. *Learner Satisfaction* – the extent to which the learner believes the educational activity provides a relevant learning experience.
10. *Learner Self-Efficacy* – a self-judged perception about whether one can successfully perform required actions (Bandura, 1977).
11. *Mid-Scenario Reflection* – a brief hiatus during a simulation exercise in which simulation participants engage in an instructor-guided reflective discussion period. An opportunity for students to take a “time out” in order to consider the obtained assessment information and develop a plan for nursing care.
12. *Partial Instructor-Driven Simulation* – a method of simulation instruction that provides prompting by the patient or family member only. The facilitator is not

- present at the bedside but is instead available to redirect students during a pause when, and if, redirection is required (Dubose et al., 2010).
13. *Reflection* – an active process that occurs during or after an experience (Dewey, 1933).
 14. *Simulation Scenario* – a sequence of possible events in the care of an imaginary patient.
 15. *Simulated Clinical Experience (SCE)* – “a realistic enactment of a clinical situation in which the student is able to step into the role of the nurse” (Schoening, Sittner, & Todd, 2006).
 16. *Student Support* – assistance provided by the facilitator to the student during the course of a simulation exercise. Such assistance may take the form of a verbal cue by the patient, a phone call from the physician, or a laboratory report (Jeffries, 2007).
For the purposes of this study, student support also includes mid-scenario reflection.

Study Organization

Chapter 1 introduces the study and includes a statement of the problem, purpose of the study, limitations, delimitations, and assumptions. Research questions are identified, definitions of terms are provided, and the significance of the study is discussed.

Chapter 2 includes a literature review exploring the use of simulation in nursing education, the Nursing Education Simulation Framework, learning theories related to self-efficacy, learner satisfaction, reflection, and design characteristics of HFS. The link between HFS, learner satisfaction, self-efficacy, and reflection are also discussed.

Chapter 3 describes the population and sample along with the instruments used for data collection. The data collection and data analysis process are explained. Chapter 4 presents the

study findings. Chapter 5 contains a summary of the study along with conclusions and recommendations for further practice and research.

CHAPTER 2. REVIEW OF LITERATURE

Introduction

This chapter presents the review of the literature regarding simulation in nursing education along with the philosophical underpinnings of simulation design. Current literature regarding the relationship between simulation design and learning outcomes was reviewed along with the role of guided reflection in experiential learning.

The use of high-fidelity simulation (HFS) is relatively new in nursing education and its use is growing (Katz, Peifer, & Armstrong, 2010; Nehring & Lashely, 2004). However, there is a dearth of knowledge regarding best HFS educational practices (Kardong-Edgren, Adamson, & Fitzgerald, 2010; Prion, 2008). Moreover, the current literature lacks specific recommendations regarding the role of the facilitator in simulation (Jeffries, 2005). And while the effects of post-simulation debriefing have been studied, the effectiveness of mid-simulation guided reflection has not been studied or described in the literature.

The purpose of this study was to evaluate the effect of a partial instructor-driven simulation design incorporating mid-scenario reflection on learning outcomes. Learning outcomes were measured by post-simulation reports of student self-confidence and student satisfaction with the simulation experience. The relationship between the features of a partial instructor-driven simulation design and learning outcomes were examined.

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3. What is the effect of a simulation design incorporating mid-scenario reflection on learner satisfaction?
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Theoretical Framework

The Nursing Education Simulation Framework

Jeffries (2005, 2007) described the Nursing Education Simulation Framework (NESF), a theory-based framework developed specifically for the design, implementation, and evaluation for clinical simulation in nursing education. Recognizing the many unanswered questions regarding effective simulation practices, Jeffries proposed a framework for the purpose of identifying best teaching practices using a consistent model based on the theoretical literature and empirical knowledge related to learning outcomes in higher education (Chickering & Gamson, 1987).

Jeffries further recognized the need for an organizing framework to provide a consistent measurement of influencing variables related to simulation design. A review of nursing and other healthcare literature along with related literature from non-healthcare disciplines guided the development of the framework (Jeffries, 2006). The NESF was developed and tested in a multi-

site research project jointly organized and funded by the National League of Nursing (NLN) and the simulator manufacturer Laerdal Corporation. The NESF is used by many nursing education programs nationwide (Nehring & Lashley, 2010). The premise of the NESF is that well-designed simulations improve learning outcomes.

Model Description

The NESF is based on several assumptions: the learning needs of the student determine the nature of the simulation design, the student must be a motivated and self-directed participant, and the teacher's role will vary according to the purpose of the simulation and faculty perception of best educational practices.

The five conceptual components of the framework, as seen in Figure 1, are design characteristics, educational practices, teacher characteristics, student characteristics, and learning outcomes. The model examines how teachers, students, and educational practices affect simulation design characteristics and attempts to explain the relationship of these concepts to learning outcomes.

Simulation design characteristics recognized in the NESF include objectives, fidelity, complexity, student support, and reflection/debriefing. Jeffries (2005, 2007) proposes that clearly articulated objectives are essential in simulation design. Simulation objectives should include enough detail for optimal learner participation in addition to specific learning outcomes for the clinical simulation experience (CSE). It is essential that the objectives match the student's skill and knowledge level (Jeffries, 2005, 2007). Fidelity refers to the authenticity of the CSE. In a HFS design, the environment must be as realistic as possible (Medley & Horne, 2005). Problem Solving refers to the number of problems the human patient simulator (HPS) exhibits; the complexity will vary depending on the knowledge and skill level of the student.

This complexity allows the student to determine underlying relationships and prioritize planned care. Student support refers to the assistance provided to the student by the facilitator. This support can be defined as cues or hints built into the scenario such as a doctor's telephone call, a patient's remark, or a family member's question. The degree of support should not interfere with the student's ability to make independent decisions and yet should offer enough information to enable the student to continue the scenario.

Finally, reflective thinking/debriefing traditionally refers to the period immediately after the CSE when faculty and students critically examine the simulation experience. This is the time when theory and practice are linked and the relevant teaching points are explored. Debriefing, considered a vital component of effective simulation design, may have a role in the development of critical thinking skills (Bruce, Bridges & Holcomb, 2003). For the purposes of this study, reflection and student support included the mid-scenario guided reflection incorporated into the CSE.

The final component of the NESF is learning outcomes consisting of knowledge, skill performance, learner satisfaction, critical thinking, and self-confidence. The evaluation of learning outcomes is essential to verify what students have learned in order to validate the effectiveness of the CSE (Jeffries, 2005, 2007; Kirkpatrick, DeWitt-Weaver, & Yeager, 2005). The NESF was chosen for this study because it was developed in order to explore the relationship between simulation design and learning outcomes.

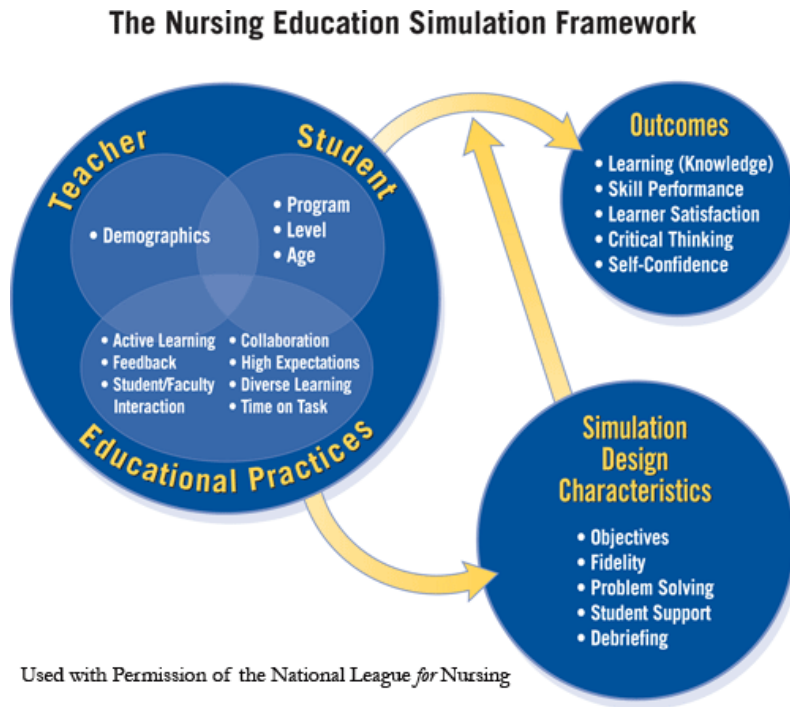


Figure 1. *The Nursing Education Simulation Framework*

Note. From *Simulation in Nursing Education: From Conceptualization to Evaluation* (p. 23), edited by P.R. Jeffries, 2007, New York: National League for Nursing. Copyright 2007 by the National League for Nursing. Reproduced with permission (Appendix A).

Novice-to-Expert Theory

Another theoretical framework suitable to this study is Benner's Novice-to-Expert Theory (1984) which is based on the Dreyfus and Dreyfus (1980) Model of Skill Acquisition in students. Benner's framework serves as a model for the development of expertise in both nursing education and nursing practice and has often been the basis for HFS research and design (Nehring, 2010). For example, it has been suggested that simulation design (objectives, level of fidelity, degree of student support and scenario complexity) should be guided by Benner's theory of student nurses' experience levels (Larew, Lessans, Spunt, Foster, & Covington, 2006).

Model Description

Patricia Benner (1984) describes five levels of competency in nursing: novice, advanced-beginner, competent, proficient, and expert. These levels of proficiency are distinguished by both the nurse's experience and the theoretical knowledge of nursing science (Waldner & Olson, 2007). At the first level of skill acquisition, the novice's actions are governed, due to lack of experience, by context-free rules based on principles and concepts learned in the classroom. The novice's attention is focused on tangible measurable data such as blood pressure readings or laboratory values. At this stage, the novice's connection to the situation and sense of responsibility to the patient is constrained by the single-minded attention to specific assessment data.

At the next level of skill, the advanced-beginner has obtained enough practice to recognize, for example, that variations in blood pressure and laboratory findings are potential manifestations of a more complex disease process. Subsequent interventions are based on standard management guidelines and the student must prioritize patient-care tasks. These crucial decisions require evolving clinical judgment skills. Clinical judgment is defined as knowing what assessments should be made, what the assessment data mean, and what action should be taken first (Tanner, 2006). The advanced-beginner becomes personally accountable for completing the necessary interventions.

At the competent level of practice, the concept of patient care becomes more comprehensive. The competent practitioner possesses a deeper understanding of patient care issues particularly in relation to long-term health goals. The nurse's sense of responsibility for the patient at this stage is "profound" (Benner, Tanner, & Chesla, 1992, p. 22). At the fourth

level, the proficient nurse's actions are guided by *experience* rather than established assessment protocols. Intuition is well-developed at this stage, as is the ability to anticipate events.

At the final stage of skill acquisition, the expert bases clinical decisions on extensive experience and relies on an instinctive grasp of the situation “without wasteful considerations of a large range of unfruitful, alternative diagnoses and solutions” (Benner, 1984, p. 32). The sense of responsibility at this stage is viewed within the context of the realities of the healthcare system e.g. the imbalance of decision-making power (Waldner & Olson, 2007).

The student nurse gradually progresses through the levels of proficiency during the educational experience and most will attain the level of advanced beginner before graduation (Benner et al., 1992). For the purpose of this study, junior baccalaureate students are considered advanced beginners and CSEs should be designed with that in mind.

Novice-to-Expert Theory and Simulation Design

When designing simulation experiences in nursing education, the progression of skill attainment may be based on Benner's first three proficiency levels (Waldner & Olson, 2007). These simulation experiences should progress from simple psychomotor skills practice to complex scenarios incorporating critical thinking and clinical judgment (Medley & Horne, 2005).

Learning situations for novices should include basic assessment skills associated with contextual situations and principles they have been exposed to in the classroom; for example, respiratory wheezing could be heard using a stethoscope on an asthmatic patient. The use of low and medium-fidelity simulators is most appropriate at this level (Seropian, Brown, Gavilanes, & Driggers, 2004). Simulation at the advanced beginner level should incorporate decision-making and protocol application. For example, after assessment of the patient's pain level, the student

determines the choice of pain medication along with the dosage and route of delivery. High-fidelity simulators are appropriate at this stage in order for the student to see the patient's response to the pain relief measure (Seropian et al., 2004). Students are able to not only demonstrate appropriate interventions, but also see the consequences of their actions. Simulation exercises at the competent level should be designed with a degree of complexity that includes multiple patient problems, interaction with family members, and multidisciplinary collaboration (Larew, et al., 2006).

Benner's concepts regarding the skill acquisition of developing nurses can provide the blueprint for simulation design. Applying Benner's framework to simulation design may help ensure that learning opportunities are properly sequenced in the nursing education program for the most effective knowledge and competency development.

Social Cognitive Theory

Bandura's Social Cognitive or Social Learning Theory (1977, 1986) is also applicable to this study. Bandura's conceptual framework addresses the role and importance of self-efficacy in learning. Bandura (1995) defines perceived self-efficacy as the individual's belief that one can successfully complete a designated task. Self-efficacy is thought to be positively correlated with the learner's motivation, perseverance, and academic success (Bandura, 1977; Bong & Clark, 1999). This attainment of self-efficacy is also considered necessary for successful nursing practice (Davidhizar, 1993; White, 2003). The fundamental goal in clinical nursing education is to improve self-efficacy by involving students in learning experiences that result in the development of skill mastery. Mastering new skills will further increase students' self-efficacy and provide new graduates with the necessary proficiency to enter the complex healthcare environment (Blum, Borglund, & Parcels, 2010). As a result, current research in nursing

education is concerned with investigating non-traditional teaching strategies, such as simulation, that may increase student self-efficacy (Leigh, 2008a).

The terms self-efficacy and self-confidence are frequently used interchangeably. Bandura (1986) makes a distinction between the two terms. Self-efficacy is one's confidence in one's ability to learn new skills, a general self-perception that is not associated with any specific task. An individual's self-efficacy is developed throughout life as new situations are experienced and new knowledge is acquired. Someone who has low self-efficacy may believe that the learning process is filled with obstacles, a belief that negatively affects motivation and persistence, while someone with high self-efficacy approaches a task with a feeling of calm assurance (Pajares, 1996). By contrast, Bandura states that self-confidence is "a nondescript term that refers to strength of belief but does not necessarily specify what the certainty is about. I can be supremely confident that I will fail at an endeavor" (1997, p. 382).

Bandura (1986) describes methods through which self-efficacy can be achieved. The first route to self-efficacy is through successful performance of a task. The second method in building self-efficacy is the observation of others' successful performance of a task. Thirdly, self-efficacy may be enhanced through positive verbal feedback during task performance. And, lastly, minimizing the learner's level of anxiety during a task can improve self-efficacy. A simulation experience that incorporates a low-risk learning environment in which to deliver successful patient care, the opportunity to observe peer performance, and positive instructor feedback provides the methods Bandura believes are crucial to improved self-efficacy. Of particular interest in this study is the additional student support provided through the mid-scenario guided reflection.

Self-Efficacy and High-Fidelity Simulation

Because self-efficacy can affect student performance and learning, it is important to examine whether and in what ways HFS can promote self-efficacy. Although HFS is used extensively in nursing education, there is a dearth of research supporting this teaching technique (Solnick & Weiss, 2007). However, much of the available research examines the effect of HFS on learner self-efficacy (Kardong-Edgren, Adamson, & Fitzgerald, 2010; Prion, 2008). Results of studies measuring student self-confidence with HFS have, with some consistency, shown a positive effect (Brown & Chronister, 2009). Bandura's described methods for achieving self-efficacy (successful performance, observation of others, positive instructor feedback, and decreased anxiety) and their relationship to HFS outcomes will be examined.

Successful Performance

Bandura's (1977) theory proposes that students' self-confidence increases when they see their actions bring about desired outcomes. One of the biggest benefits in the use of HFS in healthcare education is the opportunity for students to successfully provide care for a virtual patient in a risk-free environment (Seropian et al., 2004). Marshall et al. (2001) tested the trauma management skills of medical interns using HFS. The authors found a significant ($p < 0.002$) improvement in participants' skills from pre- to post-simulation. The participant's self-confidence scores also rose significantly ($p < 0.01$) after the CSE. McCausland, Curran, and Cataldi (2004) designed a HFS scenario requiring 72 students in groups of four to provide care to a patient with heart failure. Following the CSE, 85% of the students reported that they had the knowledge to make the necessary decisions regarding care of the patient.

Ravert (2002) undertook a meta-analysis of HFS in healthcare education and found that 75% of the studies showed a positive effect on skill acquisition. Radhakrishnan, Roche, and

Cunningham (2007) conducted a pilot study evaluating the clinical performance of 12 senior baccalaureate students. Students who practiced with the human patient simulator prior to an actual clinical experience had significantly higher skills scores than the control group consisting of students who had only standard clinical training.

Observation of Others

Bandura (1986) proposes that self-efficacy can be improved when the learner observes others successfully accomplish a task. Simulation experiences in nursing education are typically collaborative experiences with ample opportunity to observe the actions of others. This observation can occur as the scenario progresses in addition to the common practice of viewing a recording of the simulation exercise during the post-simulation debriefing. As simulation participants observe others, they are also processing information and internalizing the experience (Leflore, Anderson, Michael, Engle, & Anderson, 2007). Participants in a study that examined student perceptions of a CSE (Schoening, Sittner, & Todd, 2006) reported that observing peers' decision-making and communication patterns was particularly instructive. Leflore et al. (2007) found that instructor-modeled learning was more effective than self-directed learning among nurse practitioner students. In a qualitative study conducted by Lasater (2007) involving the effect of HFS on clinical judgment and the value of collaborative learning in HFS, students reported that observation of peer simulation experiences was as informative as providing the care themselves.

Positive Feedback

Bandura (1986) suggests that learners' self-efficacy is enhanced by positive verbal feedback from the teacher. One advantage of simulation in education is the ability to supply the learner with immediate feedback (Haskovitz & Koop, 2004; Theroux & Pearce, 2006). HFS is a

teaching strategy that provides frequent opportunity for positive feedback and the importance of verbal encouragement to the student regarding HFS has been demonstrated (Alinier, Hunt, Gordon, & Harwood, 2006). Improvement in the patient's condition as a result of successful student intervention by itself is a form of positive feedback. While students should be allowed to make mistakes during a CSE, the CSE for novices should be designed to avoid a catastrophic outcome such as death (Horn & Carter, 2010; Kesten, Brown, Hurst, & Briggs, 2010). Furthermore, during the post-simulation debriefing, the facilitator should avoid focusing on the errors committed during the CSE but rather highlight the successful student actions (Cantrell, 2008). Public acknowledgment of performance improvement is not only pleasing to the learner, but also reinforces correct actions (Johnson-Russell & Bailey, 2010).

Minimizing Anxiety

According to Bandura (1986), students who face a task with a feeling of dread generally lack confidence about their ability to accomplish that particular task. A common experience for new nursing students is anxiety related to fear of harming a patient, feeling unprepared for a clinical situations, and concerns about the ability to communicate with a patient (Evans & Kelly, 2004). Gore, Hunt, Parker, and Raines (in press) sought to study the effects of HFS on student nurses' anxiety levels prior to first-time patient contact. The study measured self-reported student anxiety levels among first-semester novice nursing students using the Spielberger State-Trait Anxiety Inventory. The control group had no CSE before their first contact with actual patients in a hospital setting while the experimental group participated in a pre-clinical simulation experience. The experimental group's anxiety scores were significantly lower ($p = .01$) than the control group's (11.0 +/- 2.8 vs. 13 +/- 3.4). Anecdotal evidence supplied by the

hospital clinical instructors supported the notion that the experimental group members were more confident in their abilities than the control group.

Bremner, Aduddell, Bennett, and VanGeest (2006) also documented the effect of HFS on nursing students' reported anxiety levels. Forty-one junior-level baccalaureate students completed a questionnaire to determine whether a simulation experience relieved the stress associated with the first clinical day. Forty-two percent reported that HFS decreased some of the stress associated with the first day of patient care. Additionally, Schoening et al. (2006) studied the perceptions of 60 nursing students who participated in a preterm labor CSE. The participants then reflected upon the CSE in journal form where they frequently reported feeling "more comfortable" (p. 257) with a high-risk patient situation and further expected that the experience would be valuable to them in the future.

Effect of HFS on Undergraduate Nursing Student Self-Efficacy

Studies regarding the influence of HFS on the development of nursing student self-confidence are numerous (Bearnson & Wiker, 2005; Jeffries & Rizzolo, 2006; Peteani, 2004; Smith & Roehrs, 2009). One such study involved 56 novice nursing students using a human patient simulator to learn physical assessment skills. Sixty-one percent of students reported increased confidence in assessment skills following the simulation exercise while 42% agreed that the simulation experience relieved some of the stress associated with the first day in clinical (Bremner, 2006). In another study, researchers examined whether simulation participation increased the confidence of third-year students regarding their health teaching skills (Goldenberg, Andrusyszyn, & Iwasiw, 2005). The students' self-efficacy scores for patient teaching were significantly higher following the simulation experience ($p = 0.001$).

Furthermore, students reported increased self-confidence in their skills regarding specific components of the teaching process - assessment, implementation and evaluation.

Leigh (2008b) measured the confidence level of senior nursing students when responding to emergencies, a situation in which students are quite likely to find themselves soon after graduation. Students ($n = 65$) participated in a simulated emergency using a one-group pre-test, post-test design. Statistically significant increases in self-efficacy were found after the simulation experience indicating that simulation is an effective teaching tool in the transition from student to nurse.

Students have reported greater levels of confidence in caring for patients in an actual clinical setting following an HFS experience. One such study examined the gains in self-confidence of junior nursing students ($n = 60$) caring for an insulin-managed patient (Dobbs, Sweitzer, & Jeffries, 2006). Following the simulation, study participants expressed an overall confidence in their ability to care for an insulin-dependent patient in an actual clinical experience (mean = 4.3; scale 1-5; 5 = strongly agree). Similarly, McCausland, Curran, and Cataldi (2004) conducted a study with senior nursing students ($n = 72$) who participated in a heart failure scenario using HFS. Results from the study revealed that 96% thought the simulation would help them in future actual patient care situations.

Despite the research indicating a positive correlation with self-efficacy and HFS, not all studies conclude that self-efficacy improves following HPS. Feingold, Calaluce and Kallen (2004) investigated student perceptions regarding the value of HFS. Baccalaureate students enrolled in an advanced acute care course completed a survey following a scenario involving a patient with worsening respiratory distress. Less than half of the students (46.9%) believed that the CSE increased their self-confidence.

Furthermore, research on HFS and its effects on self-efficacy is inconclusive regarding the superiority of HFS to other methods of instruction. Swanson et al. (2010) explored the difference in self-confidence among students who used three different active learning methods: case study, student-led high-fidelity simulation, and an instructor-driven high-fidelity simulation. Analysis of the participants' self-reported self-confidence scores revealed no significant difference across the three groups ($p = .878$). Scherer, Bruce and Runkawatt (2007) compared the perceived self-confidence of nurse practitioner students who participated in a cardiology HFS exercise with a control group of students who presented a case study about managing a cardiac event. The students in the control group rated their confidence as significantly higher than did those in the simulation group ($p = .040$).

Blum et al. (2010) reported similar results when comparing a group of junior-level baccalaureate students demonstrating newly acquired skills using low-fidelity mannequins or using HFS. The investigators found a greater increase in student-perceived self-confidence for the control group compared to the simulation group. Brown and Chronister (2009) compared measured self-confidence between two groups of senior nursing students enrolled in an electrocardiogram course. The experimental group participated in a weekly HFS exercise while the control group received traditional classroom instruction only. The reported self-confidence measures showed no significant difference between the two groups ($p < .05$). Clearly, current research regarding HFS and self-efficacy contains conflicting findings and highlights the need for further research.

Learner Satisfaction and High-Fidelity Simulation

Learner satisfaction has been the focus of educational research (Jeffries, 2007). More specifically, measuring learner satisfaction has been a focus of simulation research in nursing

education (Kardong-Edgren et al., 2010). According to Chickering and Gamson (1987), students perform at a higher level if they are satisfied with their learning. Chickering and Gamson further propose that learner satisfaction is highest when learning is relevant. One of the advantages of a simulation exercise in healthcare education is the opportunity for students to integrate knowledge and skills learned in the classroom and apply them to a patient care scenario (Prion, 2008). Students have described simulation as a safe and non-threatening method of practicing patient care skills (Abdo & Ravert, 2006; McCausland et al., 2004).

Bremner et al. (2006) sought to determine the value of using human patient simulators from the perspective of novice nursing students. The researchers were interested in investigating HPS teaching/learning utility, HPS realism, limitations of HPS as a teaching method, and the participants' confidence in using HPS to learn physical assessment skills. In the study, 56 new nursing students in a baccalaureate program used HPS to perform a physical assessment. Upon completion of this activity, students performed a second assessment. Faculty changed the physical characteristics of the simulator between the first and second assessments. Following the two assessments, 41 of the 56 students completed a two-part questionnaire regarding their experiences.

Students were asked to: identify overall perceptions of their experience with the HPS, express an opinion on whether the simulation should be a required or voluntary assignment, note whether the simulation experience gave them confidence in assessment skills, and report whether the experience alleviated some stress from the first clinical day at the hospital. A second survey requested written comments by the students after completing their entire clinical experience for the course. Ninety-five percent of participants rated the CSE from good to excellent, 68% believed that simulation should be mandatory, 61% reported that the experience increased their

confidence with physical assessment skills, and 42% stated that practicing the skills relieved some stress associated with the first day of hospital clinical. Student comments revealed that they believed HPS to be beneficial regarding clinical teaching, realism, and as preparation for working with actual patients. The limitation reported most often by the students was lack of sufficient time with HPS.

Feingold et al. (2004) also evaluated student and faculty perceptions regarding the use of a simulated clinical scenario. Sixty-five senior nursing students participated in two scenario experiences at the beginning and end of an Acute Care of the Adult nursing course. Students then completed a 20-item Likert style satisfaction survey that examined simulation realism, transfer of learned skills to a clinical setting, and value of the experience. Faculty completed a 17-item Likert style survey related to faculty support and the necessary training of faculty required to implement the simulation technology. Students felt the experience provided appropriate realism (86.1%), tested clinical skills (83%), and decision-making (87.7%), was valuable to learning (76.5%), and provided adequate feedback (96.9%). One unexpected finding was that less than half of the students felt that their confidence (46.9%) or competence (46.9%) increased. Faculty all (100%) felt that the experience was realistic and effective. Both faculty and students valued the experience.

In a pilot study, Schoening et al. (2006) examined students' opinion of simulation as a method of instruction. Sixty junior baccalaureate nursing students participated in the study during their high-risk obstetrical course. Students participated in a high-fidelity patient simulation orientation with two weeks of scenario practice followed by a debriefing session. A four-phase teaching method based on previous research was incorporated in the following manner: Phase One: orientation, Phase two: participant training, Phase three: Simulation, Phase

four: Debriefing. Students completed a ten-item evaluation instrument developed by the researchers that used a four-point Likert scale. Some students supplied additional narrative comments.

Participants felt they were able to practice appropriate skills. They also reported increased confidence as a result of the safe environment of the simulation setting. Students also reported that they found value and satisfaction in the experience and they believed that the skills practiced were transferable to a clinical setting. Students further stated that they enjoyed the teamwork experience.

Similar to the research on HFS and its effects on self-efficacy, the evidence regarding learner satisfaction is inconclusive when comparing HFS to other instructional techniques. Swanson et al. (2010) investigated whether HFS is superior in terms of learner satisfaction by comparing HFS to the methods of: case study, student-led high-fidelity simulation, and an instructor-driven high-fidelity simulation. The investigators found no significant difference across the groups in learner satisfaction scores ($p = .892$).

Kardong-Edgren, Lungstrom, and Bendel (2009) studied possible differences in learner satisfaction between medium-fidelity and high-fidelity simulation exercises. Following the simulation experiences, student satisfaction was measured by a faculty-designed six-item tool. Results revealed that students were equally pleased with both the medium and high-fidelity simulation experiences. No statistically significant difference in reported satisfaction was found between the two simulation technologies.

The Role of Reflection in Learning

Simulation is an experiential learning activity (Gilley, 2004). Simulation in health care education replicates the clinical experience and requires active involvement on the part of the

learner. Adults learn best when they are actively engaged (Caine & Caine, 2006); however, this engagement requires that the learner experience “reflection and action and feeling and thinking” (Kolb & Kolb, 2005, p. 194). Fanning and Gaba (2007) state that “the concept of reflection on an event or activity and subsequent analysis is the cornerstone of the experiential learning experience” (p. 116). Reflection is defined as follows:

Reflection involves taking the unprocessed, raw material of experience and engaging with it as a way to make sense of what has occurred. It involves exploring often messy and confused events and focusing on the thoughts and emotions that accompany them. (Boud, 2001, p. 10)

The gap between *experiencing* an episode and *fully understanding* it is bridged when the facilitator provides guided reflection within the learning experience. In simulation, this guided reflection is customarily offered, after the scenario has ended, during the post-scenario debriefing. The simulation design for this study will incorporate a guided reflection component in the middle of the CSE – a phase this author refers to as mid-scenario reflection. The philosophical foundation for this study and its focus on guided reflection is found in the works of Dewey (1933) and Schön (1983).

Reflective thought as a component of the learning process was first described by Dewey (1910, 1933). Dewey explains the relationship between learning and experience and describes learning as “not learning things, but the *meanings* of things” (1910, p. 176). The inclusion of a reflective period is integral to learning the meaning of experiences. With reflection, learning now becomes a dynamic process compared to a passive learning experience such as didactic instruction. Dewey encourages educators to strategically place reflection within the learning experience.

According to Dewey, reflection begins with a “perplexed, troubled, or confused situation” (1933, p. 12). This leads to consideration of the problem, i.e. reflection – the purpose of which is to “transform a situation in which there is experienced obscurity, doubt, conflict, disturbance of some sort, into a situation that is clear, coherent, settled, harmonious” (p. 100). Student nurses confronted with a patient in acute, albeit simulated, distress almost certainly experience the situation as troubled, confused and filled with doubt. Confrontation with the perplexing situation signals the beginning of Dewey’s five phases of reflective thinking:

- 1) Suggestion: the mind grapples for possible solutions. If the solution seems plausible in step one, the solution is applied, the process stops, and reflection does not occur.
- 2) Intellectualization: the specific problem is placed into a relevant context for the purpose of further examination.
- 3) Hypothesis development: this serves as a guide for further data collection regarding the problem.
- 4) Hypothesis elaboration: reasoning about possible solutions occurs.
- 5) Hypothesis testing: overt action is taken.

Dewey explains that the five phases are not a lock-step process, they may occur in any order or not at all. Furthermore, reflection may occur either during or after an experience. Dewey’s phases of reflective thinking are akin to the nursing process which is recognized internationally as describing the work of professional nurses (Wilkinson, 2007). The nursing process consists of: assessment, problem identification, intervention planning, and implementation (American Nurses Association {ANA}, 2004). This systematic approach to clinical reasoning also serves as the framework for the mid-scenario reflection in this study.

Assessment frames the patient care situation and is based on the subjective and objective data received both from the patient's medical record and the patient's responses to questions. Assessment gives meaning to the clinical judgments being made. Problem identification involves choosing the focus of care and setting priorities based on the analysis of the assessment. At this point, the student must consider the relationships between and among competing nursing diagnoses, i.e. determining the relationship between pain and heart rate. Once the focus of care is determined, the student plans research-based interventions based on the desired outcome i.e. administering antibiotics in order to reduce fever. Implementation of the planned care occurs after the mid-scenario reflection.

According to Pesut (2004), "framing" is defined as attributing meaning to a set of facts. Although providing students with a structure for reflection to achieve framing is important, integration of the simulation experience into a conceptual framework can be challenging (Dreifuerst, 2009). The instructor must build on a framework that the learner is familiar with and can use in the future – hence the choice of the nursing process for this study. The mid-scenario reflection incorporated into this study's simulation design is intended to guide the clinical reasoning process in a structured manner using the existing cognitive framework of the nursing process. Using the nursing process for the integration of new knowledge is common and usually occurs during post-scenario debriefing (Kuiper, Heinrich, Matthias, Graham, & Bell-Kotwell, 2008).

Influenced by Dewey's model, Schön (1983) studied reflective practices among medical professionals whose learning, he believes, can be greatly enhanced by reflection. Schön makes the distinction between "reflection-in-action" and "reflection-on-action." Reflection-in-action takes place while the individual is engaged in an experience and is fundamental to the "art of

practice” (p. 50). At this stage, knowledge gained from past experiences are woven into the new, unfamiliar situation. Schön believes that the level of response is affected by the competence of the practitioner. Finding time for reflection-in-action during an actual busy clinical experience is often not possible (Pierson, 1998); however, lack of time is not problematic in simulated patient care. The scenario design for this study incorporates a distinct, dedicated, and guided reflection-in-action “time out” period more suitable to the inexperienced practitioner.

Schön’s concept of reflection-on-action is described as the review of an event following its completion. The goal of this post-mortem analysis is to establish new discoveries in the mind of the practitioner in order to apply the new knowledge to future situations. This reflection-on-action occurs in the post-scenario debriefing process. During debriefing, reflection-on-action involves a conscious return to the experience for the purpose of re-evaluation and to determine what should be done differently. Furthermore, Schön encourages learning by doing, a “reflective practicum” (p. 18). Patient care simulation contains elements of such a reflective learning environment proposed by Schön.

The Role of Reflection

The literature regarding the role of reflection in nursing practice shows support for the idea that focused reflection promotes the development of clinical reasoning (Davies, 1995; Mezirow, 1998; Shields, 1995)). Murphy (2004) defines clinical reasoning as “the practitioner’s ability to assess patient problems or needs and analyze the data to accurately identify and frame problems within the context of the patient’s environment” (p. 227). Babenko-Mould, Andrusyszyn, and Goldenberg (2004) believe that both reflection and feedback are essential to the professional development of the nurse.

Studies have identified positive outcomes of reflective professional nursing practice such as: increased learning from a clinical experience (Atkins & Murphy, 1993), acceptance of professional responsibility (Johns, 1995), improved patient care related to enhanced critical thinking in complex care situations (Brookfield, 2000), enhanced professional identity (Taylor, 2001), and increased professional competence (Rudolf, Simon, Rivard, Dufresne, & Raemer, 2007).

Although there is little research regarding the reflective practice of nurses and patient outcomes, Paget (2001) examined whether reflection had a direct influence on clinical practice. Study participants ($n = 70$) received formal instruction regarding reflective practices in the form of classroom teaching and self-study using modules. Seventy-eight percent of the sample group reported positive changes to their practices — increased self-awareness and assertiveness — as a result of the reflection training. What is not clear is whether these changes would persist over the long-term.

In a related study, Conway (1998) explored ways in which the reflective ability of the nurse affects patient care. Among the participants who were identified as “experts” ($n = 35$), Conway found variations in the reflective abilities of the group. The study results indicate that nurses with minimal reflective abilities gave illness-oriented care while the more reflective nurses gave care based on the needs of the individual.

A link has been made in nursing education between competent clinical judgment and teaching strategies that provide guided reflection (Decker et al. 2010; Glaze, 2001; Paget, 2001). Such structured reflection is best provided by a mentor who is available throughout learning to help the learner infuse meaning into the experience, and anchor theory to practice (Johns, 2004). In this way, the use of reflection narrows the gap between theory and practice (Ruth-Sahd, 2003).

Kuiper and Pesut (2004) proposed that guided, structured reflection is especially beneficial to the novice practitioner because the necessary skills to analyze nursing practice are not yet in place.

Kolb's experiential learning theory (1984) hypothesizes that the learner makes the experience meaningful by reflecting upon it. The meaning attained through reflection is then categorized and incorporated into an existing cognitive framework. Bandura (1977) also recognizes the role of reflection in learning and defines the learner as someone who is self-directed, proactive, and reflective. Benner (1984), too, recognizes how reflection assists in the metamorphosis from novice to nurse expert.

Sewchuck (2005) describes how experiential learning accommodates four different styles of learning: accommodating learners, diverging learners, converging learners, and assimilating learners. Diverging learners learn best from experience but then internalize the experience by reflecting upon it. Kolb (1984) classifies nursing as a profession that attracts diverging learners.

However, engaging in reflection does not guarantee learning; there must be active involvement on the part of the learner (Teekman, 2000). Nor do all learners reflect in a consistent manner (Dreifuerst, 2009). Furthermore, the development of reflective thinking can be impeded by students' fear of harsh judgment and evaluation by instructors (Richardson & Maltby, 1995). A non-judgmental supportive climate is necessary for the reflective process (Davies, 1995). Johns (2004) warns that because reflection can lead to negative thinking, faculty must be willing to serve as guides to support the learner throughout the process. These concepts, the role of guided reflection in learning, active involvement in the learning process, and student support to achieve reflection, form the basis of this study's simulation design.

Guided reflection should be an integral part of the simulation experience (Jeffries, 2007). Jeffries proposes the following: simulation is an experiential learning strategy, guided reflection

promotes insight, insight is important in developing clinical judgment, and improved clinical judgment promotes effective patient care. These assumptions are sound and Jeffries encourages researchers in the systematic study of these concepts.

Research regarding guided reflection and its role in simulation supports the notion that students consider guided reflection in the form of faculty feedback an important feature of simulation design (Issenberg, McGaghie, Petrusa, Gordon, & Scales, 2005). Chickering and Gamson (1987) contend that the interaction between faculty and students is one of the cornerstones of best educational practices. Students wish to be supported and share interactive time with faculty whose purpose it is to help develop their understanding of quality patient care (Jeffries & McNelis, 2010). Additionally, a qualitative synthesis of simulation-based medical training covering a 40 year period found that feedback is the most important variable in simulation for promoting effective learning (McGaghie, Issenberg, Petrusa, & Ross, 2010).

Lasater (2007) explored the experiences of nursing students ($n = 48$) enrolled in a nursing program that implemented a high-fidelity simulation of an adult in respiratory distress. One of the themes that emerged in the focus group data analysis was a strong desire for more direct feedback from the simulation facilitator. The students reported that faculty feedback consisted of supportive verbal comments such as “good job” (p. 274), but what they most desired was more definitive clinical feedback about the patient’s condition.

Cantrell, Meakim, and Cash (2008) published similar findings regarding student perceptions of a pediatric-based clinical simulation. Students identified a need for support and guidance from faculty during the simulations. When the expected guidance from faculty was not forthcoming, the students reported an increase in anxiety and stress levels. In addition, students perceived that the *nature* of the feedback was important as well. Students identified several

effective feedback techniques including humor and a “supportive and coaching demeanor” (p. 26). In contrast, faculty who did not assist students in making patient care decisions during the scenario actually had a *negative* effect on learning. The authors recommend that students should be aware regarding what support and guidance they can (or cannot) expect from faculty. These findings bolster an earlier study by Cantrell (2008) wherein students rated support and feedback as the most important features of simulation.

Childs and Sepples (2006) examined the perceptions of students ($n = 55$) who participated in a series of scenarios that increased in complexity after which students evaluated the simulation design characteristics. The participants identified faculty feedback as the most important educational practice of the simulation. Clearly, nurse educators need to be aware that learning outcomes and learner satisfaction are dependent upon faculty support and feedback during the simulation.

Levels of Facilitation

A number of reflective/debriefing models are described in the literature. Dismukes and Smith (2000) examined debriefing strategies in the aviation industry and identified three levels of facilitation, high, intermediate, and low, by which instructors can facilitate guided reflection with simulation participants. McDonnell, Jobe, and Dismukes (1997) contend that facilitation “is conducted on a broad continuum from high (most desirable) to low (least desirable)” (p. 8). The authors recommend that group discussion should be facilitated at the highest levels possible.

The *high* level of facilitation actually denotes a *low* level of facilitator involvement. At this level, the facilitator may outline steps in the debriefing but participants are essentially responsible for debriefing themselves. The facilitator encourages discussion through the strategy

of open-ended question and the liberal use of silence in order to stimulate group responses. At this level, participants are capable of discussing salient issues with little instructor guidance.

The intermediate level of instructor involvement is useful when participants need assistance in analyzing the experience at a deep level yet are capable of some independent discussion. Techniques that are appropriate at this level include asking questions in various ways to illicit responses from the group. The primary role of the facilitator is to help the participants in the self-discovery of important concepts related to the simulation.

Low-level facilitation may be necessary when the participants show little initiative and when superficial responses are elicited during the reflective period. The facilitator may need to lead a step-by-step discussion of the issues. Self-discovery is restricted at this stage and the group may need a detailed identification and summary of the problems along with explicit directions regarding the proper steps in addressing the problems.

For the purpose of this study, the intermediate level of instruction was chosen for the mid-scenario reflection. Junior nursing students lack the experience to participate at the high level of facilitation yet are eager to make meaning of the simulation and appear highly motivated to do so. These advanced beginner students should best respond to an intermediate level of facilitation in which the facilitator attempts to evoke substantive analysis, discussion, and evaluation of the patient-care scenario.

Literature Support for Mid-Scenario Reflection

A basic premise for this study is the inclusion of a guided reflection period during a simulation time-out. While a reflection period is traditionally incorporated into the post-scenario debriefing, this may be too late. Boud, Keogh, and Walker (1985) warn that the reflective process “can become diffuse and disparate so that conclusions or outcomes may not emerge”

(p. 3). It is the author's experience that students will often reach incorrect or non-contextual conclusions early in the CSE and this erroneous thinking continues unchecked throughout the scenario. The "messy and confused events" that Boud (2001, p. 10) describes may best be tidied up and clarified *during* the scenario as opposed to *after* the scenario.

As the scenario unfolds, there is little time for reflection and little opportunity for the learner to gather one's thoughts and enhance one's existing cognitive framework (Waldner & Olson, 2007). The scenario minutes tick by quickly and students often feel buffeted by so much relentless sensory and data input. There is little time to make sense of it all. The purpose of mid-scenario reflection is to pause and attempt to corral these untamed thoughts and give them order.

Yet, little information is found in the literature regarding the practice of mid-scenario reflection in high-fidelity simulation. However, a teaching strategy defined as "partial-instructor-driven simulation", described by Dubose, Sellinger-Karmel, and Scoloveno (2010), affords a pause during the scenario at which time the instructor provides guidance and direction as needed. The authors liken the scenario to a play and the "states" (p. 199) are analogous to scenes in the play. The partial-instructor-driven strategy is described as follows:

When state 1 begins, the students enter the room (with a plan) and carry out their plan without interruption. This approach gives students time to carry out their intended plan and offers them the opportunity for self-corrections. Group decisions and discussions are employed to assist in the recognition of problems presented. If the students venture off track, as often happens, the simulated experience is taken in that new direction. Otherwise, redirection will not occur until the students themselves change the direction of the experience or until the students

reach a time when they need to leave the bedside to either obtain labs or call the healthcare provider. That ends the state and begins a debriefing session with the facilitator.

During the debriefing period, the faculty member can ask prompting questions, tie together students' assessment findings, and discuss how the students perceive they addressed their plan. This period of reflection gives students time away from the stress of hands-on care to regroup and assess their decisions. They may choose to alter their plan or recognize that they drifted from their intended plan. *Being away from the bedside also offers students a chance to reorganize their thoughts without the simulation progressing so that further responses are required* [emphasis added]. (Dubose et al., 2010, pp. 199–200).

Once questions are answered, points clarified, and a plan of care is agreed upon, the scenario resumes and is now in “state 2” (p. 200). The authors describe the advantages of the partial-instructor-driven design:

The benefits of this style is that it allows students to reorganize their thoughts without further simulated conditions altering their decisions. It promotes an opportunity for the student to self-correct or to correct one another as opposed to receiving instruction from a faculty member. This simulation approach also allows a new plan to be formulated before the next state is presented. (Dubose et al., 2010, p. 200).

This method is associated with Dewey's belief that allowing learners to discover and self-correct gives them a chance to take responsibility for their learning. Offering mid-scenario reflection also correlates with Benner's (1984) idea that for learners at the novice or advanced-beginner stage, the facilitator should be present to guide the students' decisions and actions at pre-determined intervals. However, research regarding this teaching strategy has not been found in the simulation literature.

Furthermore, the literature contains few examples, definitions, or discussions of mid-scenario reflection as a simulation teaching strategy. Waldner and Olson (2007), describe the application of Benner's (1984) theory to simulation design and suggest that, as advanced beginners focus on the patient's condition, the simulation "can either be interrupted to discuss assessments and decisions on the spot or this debriefing can occur afterwards" (p. 9). The authors contrast this strategy with that of a more complex simulation with learners at the competent level when interrupting the scenario to discuss decisions would be distracting and intrusive.

Clapper (2009) recommends "ongoing reflection" (p. 6) during the simulation experience. The advantage with ongoing reflection is that immediate corrections can be made if necessary. Clapper believes that such ongoing reflection benefits the learner by allowing the learner to change course as needed in addition to correctly perform tasks.

Fanning and Gaba (2007) briefly describe a situation when "in-scenario debriefing" (p. 6) could occur. The authors recommend this pause in the proceedings in instances of team dysfunction or for the purpose of teaching a specific psychomotor skill. The debriefing should take place in a room that is separate from the virtual bedside in order to diffuse tension and provide a "comfortable, private, and a relatively intimate environment" (p. 6).

One study regarding selected teaching strategies for simulation (Swanson et al., 2010) describes a simulation design in which the instructor designated "time-out" periods in the midst of the scenario. During the time-out, the instructor guided students in thinking about their assessments and interventions before resumption of the scenario. Though the reflection period was not the focus of the study, the authors report that this pause allowed students to think about their performance and subsequent decision-making during a myocardial infarction scenario.

Ishoy, Epps, and Packard (2010) conducted a pilot study exploring a similar simulation strategy that incorporated what the researchers termed “do-overs” (p. 117). The researchers examined first-year nursing students’ responses to a simulation design that included a chance for a “do-over” i.e. to perform the scenario once again following an instructor-led debriefing. The participants (n = 68) were divided into two groups. The experimental group reported experiencing less anxiety than the group that did not repeat the scenario. The control group reported the need for greater insight regarding the simulation experience compared to the experimental group. Furthermore, the students that were allowed a “do-over” had increased satisfaction and self-confidence scores following the simulation.

In conclusion, it has been proposed that reflective thinking is necessary for the development of clinical judgment (Kuiper & Pesut, 2004; Pesut & Herman, 1999). Yet there is little evidence regarding the integration of guided reflection during a simulated learning experience. The integration of reflection into simulated experiences may provide a way to ultimately improve clinical judgment. However, research is needed to find the most effective educational practices to achieve this goal.

Chapter Summary

The use of HFS is relatively new in nursing education and, as a result, there is a current lack of research regarding best educational practices for this new teaching strategy. The NESF is one theory-based framework developed to address unanswered questions about the design, implementation, and evaluation of simulation exercises in nursing education. Benner’s Novice-to-Expert Theory provides an additional conceptual framework with which to design HFS scenarios based on the student’s level of skill acquisition.

The measurements of student self-efficacy and learner satisfaction have been a focus of simulation research in nursing education. Bandura's Social Cognitive Theory (1986) explores the development of self-efficacy in education. Bandura's theory is congruent with a principle goal of nursing education: to improve student self-efficacy by involving students in learning experiences that result in skill mastery. Chickering and Gamson (1987) propose that students experience greater levels of learning satisfaction and perform more effectively when they perceive the lessons are relevant. Indeed, one of the foremost advantages of simulation as a teaching strategy is that it allows nursing students to integrate didactic knowledge by applying it to a patient care scenario.

Simulation is an experiential learning activity that requires active involvement on the part of the learner. However, such engagement requires reflection by the learner in order to bridge the gap between simply experiencing the scenario and fully understanding it. The works of Dewey (1910, 1933) and Schön (1983) regarding the role of guided reflection in learning provide additional philosophical foundations for this study.

Finally, Jeffries (2005) proposes that guided reflection should be an integral part of any simulation experience. However, little information is found in the literature regarding a simulation design that incorporates mid-scenario guided reflection. The information in this chapter was used to design a study in order to examine the effects of mid-scenario reflection on learning outcomes.

CHAPTER 3. METHODS

Introduction

The purpose of this study was to evaluate the effect of a simulation design incorporating mid-scenario reflection on learning outcomes. Learning outcomes were measured by post-simulation reports of student self-confidence and student satisfaction with the simulation experience. The relationship of mid-scenario reflection and learning outcomes was also explored. In addition, the perceived characteristics of a simulation design incorporating mid-scenario reflection were examined. This chapter includes information about the design, setting, sample, sampling procedures, instruments, data collection, and data analysis.

Research Questions

The following research questions were used in this study:

1. What are the perceived characteristics of a simulation design incorporating mid-scenario reflection?
2. What is the effect of a simulation design incorporating mid-scenario reflection on student self-confidence?
3. What is the effect of a simulation design incorporating mid-scenario reflection on learner satisfaction?
4. What is the relationship between perceived simulation design characteristics and learning outcomes?

Research Design

A descriptive correlational design was used for this study. This type of design examines the relationship between two or more variables. The researcher “is not testing whether one variable causes another variable ... but is interested in quantifying the strength of the relationship between variables or in testing ... a specific relationship” (LoBiondo-Wood & Haber, 2010a, p. 200). This research design was chosen in order to examine the relationship of the components in the Nursing Education Simulation Framework (NESF) (Jeffries, 2007). The NESF is used to implement and evaluate simulation in nursing education. A correlational study may provide “a potential foundation for future, experimental research studies” (LoBiando-Wood & Haber, 2010a, p. 201).

In this study, students participated in a required obstetrical high-fidelity simulation (HFS) scenario. Upon completion of the scenario, students were asked to complete two instruments — the Simulation Design Scale and Student Satisfaction and the Self-Confidence in Learning instruments. Results were analyzed to determine the relationships, if any, between the five simulation design characteristics and the learning outcomes of student satisfaction and student self-confidence. The independent variable in this study was the incorporation of a mid-scenario guided reflection period. The dependent variables in this study were the students’ self-reported satisfaction and self-confidence scores.

Setting

This study was conducted at a School of Nursing located in a public university in the southeastern United States. This school offers a traditional baccalaureate nursing curriculum in addition to a graduate program at the master’s level. The program has been approved by the state Board of Nursing and has received accreditation from the American Association of

Colleges of Nursing. Approximately 104 students comprised of both juniors and seniors are enrolled at any one time.

As students progress through the program, they are enrolled in courses that include fundamentals, professional theory, medical-surgical, pediatric, women's health, community health, critical care, research, and leadership. In the junior year, students are enrolled in the women's health course that offers didactic and clinical instruction in obstetrical and gynecological nursing. Part of the 90 hour clinical component includes a four-hour clinical simulation exercise (CSE) with a manikin, Noelle®. Noelle® is manufactured by Gaumard Scientific® and is a high-fidelity reproduction of an average-sized adult equipped with an interactive software package that allows the operator to reproduce normal and abnormal physiologic conditions encountered in practice. The manikin's features include the ability to simulate labor and birth.

The School of Nursing contains a simulation laboratory consisting of two large rooms both of which replicate a clinical setting. One room contains the low-fidelity manikins and task trainers. The room that houses Noelle® also contains two additional high-fidelity manikins. Noelle® is situated on an electronically-controlled hospital bed in a realistic representation of a private hospital room. Noelle® is connected to monitors that display vital signs — temperature, pulse, respiration, and oxygen saturation — in addition to a fetal monitor that displays real-time contractions and fetal heart rate.

The hospital room also features a bedside table with simulated oxygen and suction equipment situated on a wall panel. The room is also equipped with a telephone, clock, and bedside computer that displays Noelle's® medical record. There are microphones and cameras at the bedside of each high-fidelity manikin. A control booth installed behind a one-way glass

window contains the computer controls for the manikins and an audio system that allows communication between simulation participants and operators/faculty inside the booth. The control booth, with seating for three, also features audiovisual recording equipment and a large-screen monitor.

Sample

A convenience sample of 47 junior baccalaureate nursing students enrolled in a required women's health clinical course was used in this study. Students who did not wish to provide informed consent to complete the instruments were excluded from the study. Random assignment was used to schedule the students in groups of three for the CSE.

Ethical Considerations

For the purpose of human rights protection, a request for expedited approval from the university's Institutional Review Board was submitted and granted (Appendix B). Informed consent from the study participants was obtained (Appendix C). Although the simulation experience was a requirement for the course, participation in the study was not mandatory. Students were notified that participation was voluntary and that lack of participation would not affect their course grade. This information was reinforced on the informed consent form.

Participants were instructed to use a numerical identifier rather than names on the study instruments in order to minimize the risk that survey responses would be disclosed to others. After the data was entered in a software program, the completed instruments were placed in a locked cabinet that could be opened solely by the principal researcher.

Data Collection

Students enrolled in the women's health course are expected to complete a High-Fidelity Simulation (HFS) experience as part of the clinical requirement. Students were scheduled for a

60-minute HFS session offered on eight different days over a four-week period with two groups scheduled per day. Each group, consisting of three randomly assigned students, was given 35 minutes in which to complete the obstetrical scenario.

Prior to the HFS, all students received classroom content on the pathophysiology and nursing care of a full-term pregnant patient with chorioamnionitis. Students prepared further for the experience by reading the assigned material in the course textbook and reviewing the written HFS objectives prior to the simulation (see Table 1).

Table 1

Simulation Objectives of the Obstetrical Scenario

At the conclusion of the scenario, the student will be able to

1. Perform basic nursing skills necessary in giving care to the laboring patient
 2. Assess uterine contractions including intensity, duration, and frequency
 3. Assess fetal well-being during labor
 4. Analyze the laboring patient's reaction to drugs received during the labor process
 5. Develop a plan of care for the laboring patient experiencing complications using the nursing process
 6. Communicate effectively with the health care team
-

A term pregnancy chorioamnionitis scenario was developed by faculty for use in this study. The chorioamniotitis condition was chosen because students are seldom able to care for such patients due to the high-risk nature of the complication. Skills necessary for the scenario had been taught previously in the curriculum.

The physiological events involved in chorioamnionitis were programmed into the HPS by faculty. Communication by the patient included such statements as “I feel terrible”, “I’ve never hurt so bad in my life”, and “I’m burning up”. The fetal heart rate was programmed at the elevated rate of 158–168 beats per minute with moderate variability. Noelle’s™ vital sign monitor displayed a temperature of 101.4 degrees with an elevated heart rate of 102 and elevated respiratory rate of 22. Once the appropriate interventions were accomplished, the fetal heart rate, maternal heart rate, respiratory rate, and temperature returned to normal levels. Table 2 illustrates the outline for the scenario.

Table 2

Scenario Outline

Time Frame	Patient Responses	Expected Student Performance	Patient Cues
Assessment 5 – 10 Minutes	T - 101.4 P – 102 R – 22 FHR – 166	Introduce self	“I’ve never hurt so bad in my life.”
	Lung sounds – clear	Perform hand hygiene	“I’m burning up.”
	Cervix – 5/80%/0 station	Conduct initial assessment	“Please get me something for this pain.”
	Contractions 3 – 5 minutes for 60 seconds with moderate intensity	Recognize abnormal findings	“Is my baby OK?”
		Discuss patient’s status and the need to call the CNM	

(table continues)

Table 2 (continued)

Time Frame	Patient Responses	Expected Student Performance	Patient Cues
Reflection/Planning 5 Minutes		Discuss patient assessment, plan, interventions, and expected outcomes	
Intervention 10 Minutes	T – 101.5 P – 104 R – 22 FHR – 142 Contractions 3-5 minutes for 60 seconds with moderate intensity	Call CNM Explain rationales for medications Verify allergies Administer IV antibiotic, pain medication, acetaminophen Instruct patient regarding relaxation techniques	“I’m not allergic to anything.” “How long will this pain medicine take to work?”
Re-evaluation 10 Minutes	T – 99.5 P – 84 R – 16 FHR – 142 Contractions 3-5 minutes for 60 seconds with moderate intensity	Continue to monitor patient, fetal status, and labor progression Document care	“I’m starting to feel better.”

Immediately before the HFS, students were informed about the schedule of events for the simulation after which the written objectives for the exercise were reviewed. Students next received a brief orientation to the Human Patient Simulator (HPS) and the simulation laboratory.

Participants were randomly assigned to a role for the simulation – roles included that of primary nurse, secondary nurse, and nurse-recorder. The primary nurse was responsible for leading the team in patient care although all students were expected to be involved directly in the patient’s care. The role of the two faculty was to provide support, facilitate student activities as needed, and to monitor and evaluate the appropriateness of care.

The obstetrical scenario design included the partial instructor-driven teaching strategy described by Dubose, Sellinger-Karmel, and Scoloveno (2010). Two instructors were placed in the laboratory control booth – one operated the HPS, spoke for both the patient and the Certified Nurse Midwife (CNM) while the other observed the students. In accordance with the partial-instructor driven technique, there was no instructor at the bedside. Table 3 illustrates how the five design features that are part of the NESF (objectives, support, problem solving, guided reflection, and fidelity) were included in the scenario.

Table 3

Design Characteristics of the Obstetrical Scenario

Design Characteristics	Simulation Scenario
Objectives	Students reviewed the written simulation objectives and the patient’s medical record prior to the scheduled simulation. Upon arrival, students received a verbal report from the nurse. Students were allowed to ask questions and review the medical record located at the bedside.

(table continues)

Table 3 (continued)

Design Characteristics	Simulation Scenario
Support	<p>All necessary medical supplies were placed close to the patient’s bed. A telephone was in the room. Students also had hand-held electronic devices containing resources for medications and laboratory values.</p>
Problem Solving	<p>The patient complained of intense pain and feeling “hot”. The patient provided the pain cues every three minutes during contractions. Students assessed the patient’s pain level, vital signs, contraction status, fetal heart rate, and character of the amniotic fluid.</p>
Guided Reflection	<p>A 5–10 minute mid-scenario reflection was held before students called the CNM, i.e. between 7–10 minutes after the scenario commenced. Assessment data, diagnoses, and treatment plans were discussed during a facilitator-led group session in an adjacent classroom. The discussion points were written on a blackboard.</p> <p>A 15–20 minute post-scenario faculty-led debriefing was held. Students shared their feelings about the simulation, reviewed the patient’s condition, and discussed their actions. The debriefing also included a discussion about transferability to future clinical situations.</p>

(table continues)

Table 3 (continued)

Design Characteristics	Simulation Scenario
Fidelity	<p>The room resembled an actual hospital labor room. An intravenous line was connected to a bedside pump and inserted into the patient’s right forearm. The simulator supplied lung sounds and palpable uterine contractions, and talked to the students.</p>

To begin the scenario, students were informed that it was 2:30 p.m. Sunday on a labor and delivery unit. Students then received a verbal report by the nurse who had been caring for the patient since admission. The researcher played the role of the nurse. The verbal report was given as follows:

“Noelle Miller is a 23 year-old female gravida 2 para 1 at 39 weeks gestation who is a patient of the midwife, Doris Hall. She was admitted last night at 9 o’clock after coming to the unit complaining of vaginal leaking of clear fluid for three hours. A nitrazine test was done that was positive for ruptured membranes. At that time, she was 2 centimeters dilated, contracting about every 10 minutes and they were mild by palpation. She’s been contracting all night and now they are occurring every 3–5 minutes. The fetal heart rate has been stable in the 130s. I checked her an hour ago at 1:30 and she’s 5 centimeters, 80% effaced, and at 0 station. She says she doesn’t want an epidural right now. I gave her 2 milligrams of butorphanol IV for pain at 10:45 this morning. She’s coping well with the contractions but says she doesn’t feel good. She’s got an 18 gauge catheter in her right forearm with D5LR running at 125 ccs. per hour. Her husband

stayed all night but didn't sleep so he just went home to eat and get a shower. This is her second baby – her son is a year-and-a-half old. She has no significant medical history and hasn't had any problems with this pregnancy. Her lab work on admission was normal. Do you have any questions before I leave?"

When all questions were answered, students were instructed to enter the patient's room as they would in an actual clinical setting. The researcher then entered the control room. The students interacted with the patient, obtained initial physical assessment data, and discussed the findings as a group. The primary nurse usually delegated the data collection to others such as frequency and duration of contractions, fetal heart rate, vital signs, lung sounds, the relevant information regarding the patient's prenatal course, confirmation of medical record data, and character of the patient's pain. Students collaborated regarding the patient's abnormal assessment findings and invariably reached a decision to call the CNM.

Once the students reached the point when it became necessary to telephone the CNM and update her regarding the patient's status and receive new medication and treatment orders, the facilitator stopped the simulation. The group then adjourned to an adjacent classroom for a five to ten minute facilitator-led guided reflection period that included a discussion regarding assessment findings and the diagnoses based on the findings. At that time, the group mutually developed a plan of care and returned to the simulation lab in order to resume the scenario and begin interventions. The nursing process was used as a framework for the mid-scenario discussion.

The nursing process consists of: assessment, problem identification, intervention, planning, and implementation (American Nurses Association [ANA], 2004). Use of the nursing process was an attempt on the part of the researcher to guide clinical reasoning in a structured

manner using an existing cognitive framework with which the students were already familiar.

Figure 2 illustrates how the nursing process was incorporated into the mid-scenario reflection.

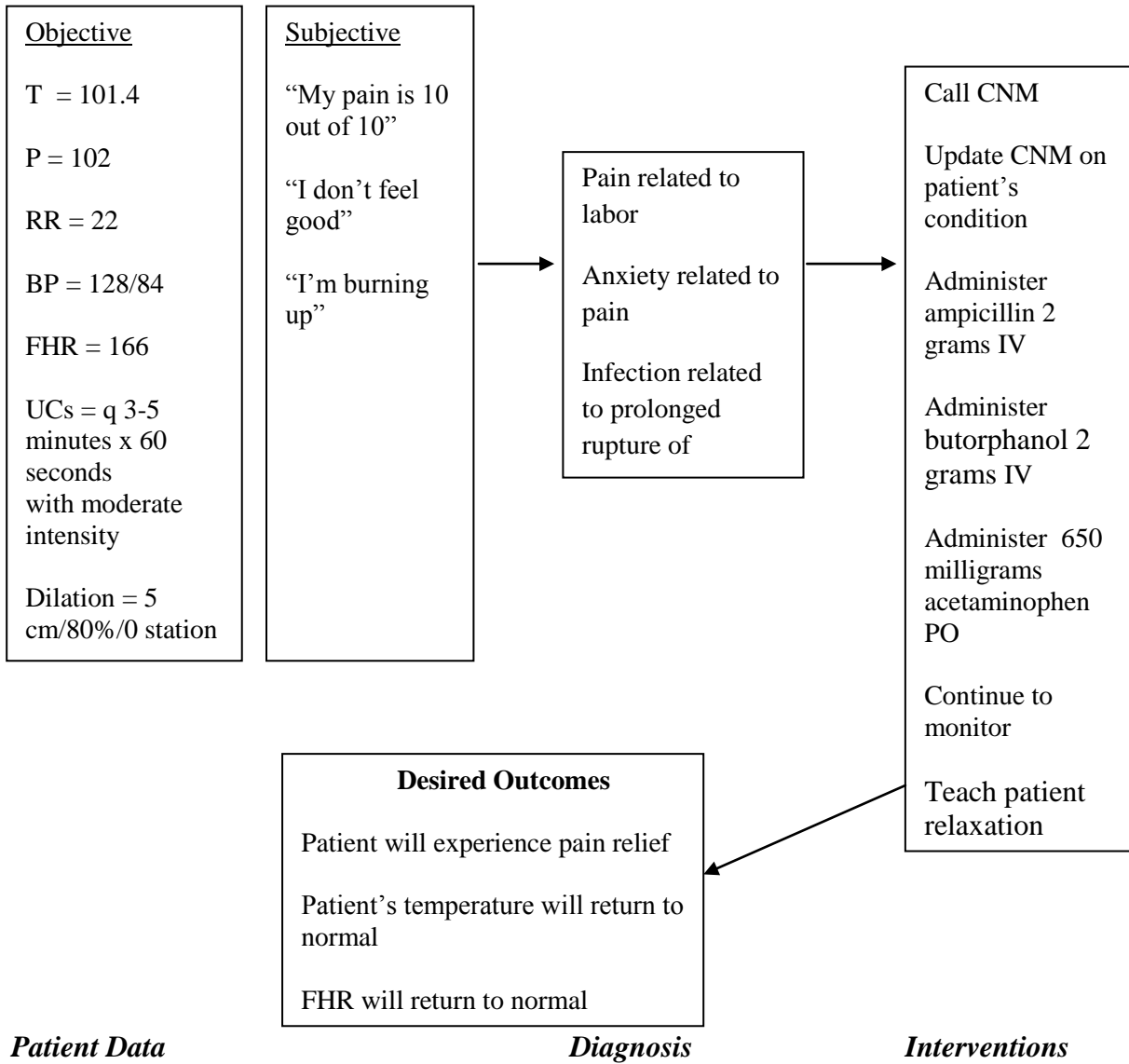


Figure 2. Nursing Process for the Mid-Scenario Debriefing

The scenario concluded when students administered IV pain medication, an IV antibiotic, and an oral dose of acetaminophen or 35 minutes had elapsed, whichever came first. All groups successfully completed the scenario during the allotted time. The total time for the scenario was 35 minutes, including the mid-scenario guided reflection period. Following the conclusion of the scenario, the students participated in a 15–20 minute post-simulation debriefing. Student feelings, opinions, and responses during the scenario were discussed. After debriefing, each participant completed the two instruments and a demographic questionnaire (Appendix D) after signing the informed consent. The researcher reminded the students that participation in the study was voluntary. After the instruments were completed, the researcher thanked the students. Completion time for the instruments was about 10 minutes.

Instrumentation

Two instruments developed by the National League of Nursing (NLN) were used in this study: 1) the Simulation Design Scale and 2) the Student Satisfaction and Self-Confidence in Learning Scale. Permission was received (Appendix D) for the use of both tools by the NLN. Sample items from both instruments can be found in Appendix E.

Simulation Design Scale (SDS)

The SDS is a 20-item tool with a five point Likert-type scale with subscales measuring the five simulation design features – objectives, support, problem solving, feedback, and fidelity. The instrument is composed of two parts. The first section examines students' reported perceptions of the presence of each of the design characteristics and the second asks students about the importance of the design features. Possible responses range from “strongly agree” to “strongly disagree.” An “undecided” option is also available. Content validity was determined by a panel of nine nurse experts and the SDS has a reported Cronbach's alpha of 0.92 for the

presence of the design features (Jeffries & Rizzolo, 2006). Alpha scores above .70 indicate sufficient evidence for internal consistency of an instrument (LoBiondo-Wood & Haber, 2010b).

In an effort to determine the students' perceptions of the mid-scenario reflection, the SDS instrument was modified for the purposes of this study. After analysis by six nurse experts, the following new questions were added. New additions to the problem-solving domain are as follows:

The mid-scenario discussion provided insight about my patient's condition

The mid-scenario discussion provided me the opportunity to prioritize nursing assessment and care

The mid-scenario discussion provided me the opportunity to set goals for my patient

Items added to the feedback/guided reflection domain:

The mid-scenario discussion provided constructive feedback

The mid-scenario discussion allowed me to analyze my own behavior and actions

The mid-scenario discussion helped link classroom theory to practice

The original SDS instrument includes a series of questions regarding how important each item is to the subject. This information was beyond the scope of this study and was therefore excluded.

Student Satisfaction and Self-Confidence in Learning

This 13-item instrument is scored on a five-point Likert-type scale and asks participants to rate their satisfaction with the simulation experience and their perceived levels of self-confidence gained through simulation participation. Possible responses range from “strongly agree” to “strongly disagree.” An “undecided” option is also available. The instrument is based on Kirkpatrick's (1995) evaluation framework. The Student Satisfaction and Self-Confidence in Learning Scale has a reported Cronbach's alpha of 0.94 for the five-item satisfaction subscale

and 0.87 for the eight-item self-confidence subscale. These scores indicate strong reliability for internal consistency (LoBionco-Wood & Haber, 2010b). Content validity was established by a review panel of 10 expert nurses (Jeffries & Rizzolo, 2006).

Data Analysis

Descriptive statistics were used for data analysis using simple means and standard deviations to describe characteristics of the data. Responses to the SDS and the Student Satisfaction and Self-Confidence in Learning scales were entered into a Microsoft Excel™ spreadsheet. The participants' responses were labeled with their identification numbers. The data from the spreadsheet were imported to the PASW™ 18.0 statistical software.

Descriptive statistics were used to answer research question one:

1. What are the perceived characteristics of a simulation design incorporating mid-scenario reflection?

Data from the SDS were used to answer this question including the mean and standard deviation scores for each of the instrument's five subscales. Furthermore, the mean and standard deviation scores for each of the 20 items of the SDS were analyzed.

Descriptive statistics and correlational analysis were used to answer research question two:

2. What is the effect of a simulation design incorporating mid-scenario reflection on student self-confidence?

Using the data from the Student Satisfaction and Self-Confidence in Learning Scale satisfaction subscale, a mean score and standard deviation were calculated for each of the eight items of the subscale. The Pearson Product-Moment Correlation was used to examine the relationship between the five simulation design characteristics and self-confidence.

A bivariate correlational analysis is used to determine the relationship, or degree of association, between two or more variables (Sullivan-Bolyai & Bova, 2010). The mean score of each of the five design characteristics of the SDS is compared to the mean score of the Satisfaction and Self-Confidence subscales.

Descriptive statistics and correlational analysis were used to answer research question three:

3. What is the effect of a simulation design incorporating mid-scenario reflection on learner satisfaction?

Using the data from the Student Satisfaction and Self-Confidence in Learning Scale satisfaction subscale, a mean score and standard deviation were calculated for each of the five items of the subscale. The Pearson Product-Moment Correlation was used to examine the relationship between the five simulation design characteristics and learner satisfaction.

A multiple regression analysis was used to answer research question four:

4. What is the relationship between perceived simulation design characteristics and learning outcomes?

Multiple regression is used to determine which variables contribute to the dependent variable and to what degree (Sullivan-Bolyai & Bova, 2010).

Chapter Summary

This chapter described the methods for this descriptive correlational study. The study design examined the relationships between simulation design characteristics and students' reported satisfaction and self-efficacy. The setting for this study, the participants, and the data collection procedures were described. The instruments for the collection of data along with their

attendant reliability and validity were discussed. The methods for descriptive data analysis were also described.

CHAPTER 4. RESULTS

Introduction

While high-fidelity simulation (HFS) is used increasingly in nursing education, there is a dearth of quantitative evidence regarding the most effective role of the instructor in simulation. The purpose of this descriptive correlational study was to examine the effect of a simulation design incorporating an instructor-led mid-scenario reflection on learning outcomes. This chapter examines the results obtained by employing descriptive statistical analysis (mean and standard deviation), correlational statistical analysis, and multiple linear regression. A description of the demographics of the sample is included.

Participants

The population for this study consisted of baccalaureate nursing students in their junior year enrolled in a Women's Health clinical course at a research university in the southeast during the summer term of 2011. The course is placed at mid-point in the nursing curriculum in the third semester of a five-semester program. This was the third high-fidelity simulation exercise that the students participated in since beginning their studies. Although the course enrollment was 49, one student did not provide consent and one returned survey included a response that did not correlate with any numerical identifiers listed at the time consent was given. Therefore, the final sample number was 47. The majority of the participants were female ($n = 45$). All participants were present during the class when the chorioamnionitis content was presented and each had spent at least one day providing actual patient care on an obstetrical unit.

Data Analysis

All data were examined before the analysis for data entry errors and outliers. The analysis of the data was accomplished using the PASWTM 18.0 statistical software program. An alpha of 0.05 was used for all statistical tests. A *p* value less than 0.05 was considered statistically significant and not a result of sampling error.

A Cronbach's alpha reliability coefficient was used to measure internal reliability for both NLN instruments used in the research. For an instrument to be considered reliable, a level of $r = 0.70$ or higher is needed (LoBiondo-Wood & Haber, 2010b). The reliability analysis using Cronbach's alpha in this sample was 0.89 for the 20-item Simulation Design Scale. This result indicated a strong internal consistency though the value was slightly lower than the reported 0.92 found by Jeffries and Rizzolo (2006). The result of the reliability analysis for this sample for the five-item satisfaction scale was 0.86 compared to the 0.94 results obtained by Jeffries and Rizzolo (2006). A Cronbach's alpha of 0.83 was obtained by this study for the self-confidence scale. Jeffries and Rizzolo (2006) had a reported value of 0.87.

The sample size ($n = 47$) was not large enough to conduct a factor analysis. A minimum of 10 participants per item is considered an appropriate number for a factor analysis. This would require 130 participants for the learner satisfaction and self-confidence instrument and 200 participants for the Simulation Design Scale items (Sullivan-Bolyai & Bova, 2010).

Analysis of the data was conducted to examine each research question. Analysis for each research question follows.

Research Question 1

Research question 1 was: What are the perceived characteristics of a simulation design incorporating mid-scenario reflection? Descriptive statistics from the Simulation Design Scale

were used to measure the overall mean score and standard deviation for each of the five subscales. The mean and standard deviation were also calculated for each of the 20 items in the subscale. Using the Simulation Design Scale, students rated each design characteristic using a five-point Likert scale. A response of “1” indicated “strongly disagree” and a response of “5” indicated “strongly agree”.

The results indicated that students perceived that each design feature was incorporated into the HFS. The highest mean score belonged to the subscales of Feedback (4.9, $SD = 0.17$) and Problem Solving (4.9, $SD = 0.22$) both of which elements included the mid-scenario reflection. However, the lowest mean score was only slightly lower for Objectives (4.7, $SD = 0.41$). One participant response of “not applicable” resulted in the 0 value for item number seven.

Descriptive statistics for all five design characteristics are provided in Table 4.

Table 4

Descriptive Information for the Simulation Design Scale (n = 47)

Item Number	Minimum	Maximum	Mean	Standard Deviation
Objectives	3.0	5.0	4.7	0.41
1	2.0	5.0	4.6	0.64
2	3.0	5.0	4.8	0.46
3	3.0	5.0	4.6	0.57
4	3.0	5.0	4.8	0.48
5	3.0	5.0	4.7	0.49

(table continues)

Table 4 (continued)

Item Number	Minimum	Maximum	Mean	Standard Deviation
Support	3.0	5.0	4.8	0.38
6	4.0	5.0	4.9	0.36
7	.00	5.0	4.7	0.83
8	4.0	5.0	4.9	0.28
9	4.0	5.0	4.9	0.34
Problem Solving	4.0	5.0	4.9	0.22
10	4.0	5.0	4.7	0.46
11	4.0	5.0	4.9	0.25
12	4.0	5.0	4.9	0.34
13	4.0	5.0	4.9	0.20
14	4.0	5.0	4.9	0.25
Feedback	4.0	5.0	4.9	0.17
15	4.0	5.0	4.9	0.20
16	4.0	5.0	4.9	0.24
17	4.0	5.0	4.9	0.20
18	4.0	5.0	4.9	0.15
Fidelity	4.0	5.0	4.8	0.40
19	4.0	5.0	4.8	0.43
20	4.0	5.0	4.8	0.40

Research Questions Two and Three

Research question two was, “What is the effect of a simulation design incorporating mid-scenario reflection on student self-confidence?” Research question three was, “What is the effect of a simulation design incorporating mid-scenario reflection on learner satisfaction?”

Descriptive statistics were also used to analyze the items in the Student Satisfaction and Self-Confidence in Learning instrument. Students rated each item using a five-point Likert scale with 1 indicating “strongly agree” and a response of “5” indicated “strongly agree”. The results indicated that students felt positively about the HFS. The overall Satisfaction score was 4.8 ($SD = .35$) and the overall Self-Confidence score was 4.6 ($SD = .40$). The individual satisfaction items with the highest scores were items three ($X = 4.9$; $SD = .35$) and five ($X = 4.9$; $SD = .40$). Items three and five were respectively “I enjoyed how my instructor taught simulation” and “The way my instructor taught simulation was suitable to the way I learn”. The response with the highest score in the Self-Confidence domain was item nine ($X = 4.8$; $SD = .46$). Item nine was “My instructor used helpful resources to teach the simulation”. Descriptive statistics for the overall scores for Self-Confidence and Satisfaction in addition to scores for all thirteen items are provided in Table 5.

Table 5

Descriptive Information for the Student Satisfaction and Self-Confidence in Learning

Item Number	Minimum	Maximum	Mean	SD
Satisfaction Overall	3.2	5.0	4.8	.35
1	4.0	5.0	4.8	.38
2	3.0	5.0	4.7	.52
3	3.0	5.0	4.9	.35
4	3.0	5.0	4.8	.46
5	3.0	5.0	4.9	.40
Self-Confidence Overall	3.5	5.0	4.6	.40
6	3.0	5.0	4.5	.62
7	3.0	5.0	4.6	.56
8	3.0	5.0	4.7	.49
9	3.0	5.0	4.8	.46
10	4.0	5.0	4.7	.47
11	3.0	5.0	4.7	.50
12	4.0	5.0	4.7	.47
13	1.0	5.0	4.3	.94

The Pearson Product-Moment Correlation was used to answer questions two and three. An analysis was conducted to examine the correlation between the five simulation design characteristics and the learning outcomes of satisfaction and self-confidence. The sample size ($n = 47$) was appropriate for the Pearson Product-Moment Correlation to examine correlational statistics. The statistics provide information about the strength and degree of the relationship

between two variables with a recommended correlation of 0.7 or greater in order to establish that a relationship exists (Sullivan-Bolyai & Bova, 2010).

Correlation between design characteristics and student self-confidence. All five design characteristics showed statistically significant correlations ($p < .05$) with self-confidence. The design element with the highest correlation to self-confidence was Objectives ($r_s = .660$) indicating a moderate correlation. The design element with the lowest correlation to self-confidence was Fidelity ($r_s = .429$) which indicated a weak/moderately weak correlation.

Correlation between design characteristics and learner satisfaction. All five design characteristics showed statistically significant correlations ($p < .05$) with learner satisfaction. The design characteristic with the highest correlation to learner satisfaction was Objectives ($r_s = .779$). The characteristic of Support was moderately correlated with learner satisfaction ($r_s = .605$). The design characteristic with the lowest correlation to satisfaction was Feedback ($r_s = .380$) which indicated a weak correlation between the two variables (see Table 6 for details).

Table 6

Correlation (r_2) between Design Characteristics and Self-Confidence/Satisfaction ($n = 47$)

Design Characteristics	Self-Confidence	Satisfaction
Objectives	.660**	.779**
Support	.547**	.605**
Problem Solving	.587**	.540**
Feedback	.441**	.380**
Fidelity	.429**	.408**

**Indicates significance at 0.01

Research Question Four

Research question four was, “What is the relationship between perceived simulation design characteristics and learning outcomes?” A multiple regression was conducted to determine if the design characteristics can predict the learning outcomes of self-confidence or satisfaction on the part of the HFS participant. The study was particularly interested in identifying whether the mid-scenario reflection contained in the Support and Feedback domains was a predictor for either learner self-confidence or learner satisfaction.

Self-confidence. A multiple regression was conducted to investigate whether the simulation design characteristics can predict self-confidence. The model summary demonstrated that the five design characteristics combined had an impact on self-confidence. Results indicated that the simulation design elements statistically significantly predict self-confidence ($R = .759, p = .000$). The R^2 indicated that approximately 58% of the variance in self-confidence can be accounted for by its relationship with the five design elements (see Table 7). The ANOVA analysis showed the model is appropriate to interpret the relationship between the design characteristics and learner self-confidence ($F_{(5,41)} = 11.133, p = .000$) (see Table 8).

Table 7

Model Summary of Design Characteristics as Predictors of Self-Confidence

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.759 ^a	.576	.524	.27268

a. Predictors: (Constant) Objectives, Support, Problem Solving, Feedback, Fidelity

Table 8

Multiple Regression Analysis of Design Characteristics as Predictors of Self-Confidence

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.139	5	.828	11.133	.000 ^a
Residual	3.049	41	.074		
Total	7.188	46			

a. Predictors: (Constant) Objectives, Support, Problem Solving, Feedback, Fidelity

The coefficient table showed that the design characteristic of Objectives ($t = 2.953, p = .005$) statistically significantly predicts self-confidence. The coefficient table demonstrated that the design characteristics of Support ($t = .916, p = .365$), Problem Solving ($t = 1.258, p = .215$), Feedback ($t = 1.958, p = .057$), and Fidelity ($t = .600, p = .552$) do not significantly predict self-confidence. The element of Feedback is very close to an alpha level of .05. However, power may be low due to the small number of participants. It is possible the relationship between Feedback and self-confidence might prove to be significant with a larger sample size (see Table 9).

Table 9

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	-2.447	1.398		-1.750	.088
Objectives	.376	.127	.392	2.953	.005
Support	.144	.158	.139	.916	.365
Problem Solving	.364	.289	.198	1.258	.215
Feedback	.502	.256	.213	1.958	.057
Fidelity	.071	.119	.072	.600	.552

a. Dependent Variable: Self-Confidence

Learner satisfaction. A multiple regression was conducted to investigate whether the simulation design characteristics can predict learner satisfaction. The model summary demonstrated that the five design characteristics combined had an impact on satisfaction. Results indicated that the simulation design elements statistically significantly predict learner satisfaction ($R = .834, p = .000$). The R^2 indicated that approximately 70% of the variance in satisfaction can be accounted for by its relationship with the five design elements (see Table 10). The ANOVA table showed the model is appropriate to interpret the relationship between the design characteristics and learner satisfaction ($F_{(5,41)} = 18.677, p = .000$) (see Table 11).

Table 10

Model Summary of Design Characteristics as Predictors of Satisfaction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.834 ^a	.695	.658	.20472

a. Predictors: (Constant) Objectives, Support, Problem Solving, Feedback, Fidelity

Table 11

Multiple Regression Analysis of Design Characteristics as Predictors of Satisfaction

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3.914	5	.783	18.677	.000 ^a
Residual	1.718	41	.042		
Total	5.632	46			

a. Predictors: (Constant) Objectives, Support, Problem Solving, Feedback, Fidelity

The coefficient table (see Table 12) showed the design characteristic Objectives ($t = 5.555, p = .000$) was found to significantly contribute to the level of learner satisfaction. The design characteristic of Support ($t = 2.452, p = .019$) was also found to significantly contribute to learner satisfaction. The remaining three design characteristics of Problem Solving ($t = -.281, p = .780$), Feedback ($t = 1.203, p = .236$), and Fidelity ($t = -.122, p = .903$) did not significantly contribute in predicting the level of learner satisfaction.

Table 12

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	.113	1.050		.108	.915
Objectives	.531	.096	.625	5.555	.000
Support	.290	.118	.315	2.452	.019
Problem Solving	.061	.217	-.038	-.281	.780
Feedback	.232	.193	.111	1.203	.236
Fidelity	-.011	.089	-.012	-.122	.903

a. Dependent Variable: Learner Satisfaction

Additional Findings

The debriefing sessions following the simulation exercise garnered additional information regarding learners' perceptions about the HFS. Several students commented that "it was nice to know exactly what we were going to be doing." Many students expressed the belief that the virtual clinical experience was actually "more stressful" than the actual clinical experience because they weren't always certain that they would be fully supported by faculty during the HFS. However, students had favorable comments regarding the HFS such as "I wish we could do more of these" and "This was the best simulation we've ever done". Several students indicated that they felt confident about caring for an actual patient with chorioamnionitis as a result of the simulation experience.

Students made many anecdotal comments regarding the mid-scenario reflection. Several noted that “I had felt more confident about talking to the nurse-midwife because I knew what I needed and wanted to communicate to her”. Several students also offered unsolicited comments such as “taking the time-out gave me a chance to think about what I needed to do for the patient”. Another frequent comment was “this experience gives me more confidence to go into a real clinical situation”.

In addition, faculty participants and faculty observers noted that every student group successfully cared for the patient and always appeared to “feel good about their performance” at the scenario’s conclusion.

Summary

A description of study participants ($n = 47$) was presented. This chapter also provided information regarding the reliability analysis of both NLN instruments used in this study. Descriptive statistics were presented for the five simulation design characteristics and how well participants perceived that these five elements were incorporated into the simulation exercise.

Correlational analyses were also presented. All five design characteristics were significantly correlated with the learning outcomes of self-confidence and satisfaction with the simulation experience. These correlations ranged from moderately weak to strong. Additional analysis using multiple regression found that the five combined design characteristics accounted for over half the variance in learning outcomes.

CHAPTER 5. CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

This study was based on the need to explore best practices for high-fidelity simulation (HFS) instruction in nursing education. The purpose of this study was to examine the perceived characteristics of a simulation design incorporating an instructor-guided mid-scenario reflection period and explore how and whether this design affected learning outcomes. Study participants included 47 junior nursing students enrolled in a Women's Health clinical course. Data for the study was obtained with the use of two instruments developed by the NLN — the Simulation Design Scale and the Student Satisfaction and Self-Confidence in Learning Scale. This chapter will provide a summary of the findings, implications for nursing education, and recommendations for further research related to HFS.

Summary of Findings

A descriptive correlational design was used for this study. Forty-seven baccalaureate junior nursing students in a southeastern university participated in the study. The students were enrolled in a Women's Health clinical course in which the HFS was part of the course requirement. The students participated in a HFS that focused on care for a full-term laboring patient with chorioamnionitis — an acute infection of the chorionic and amniotic membranes.

Each group, composed of three randomly-assigned students, was given 35 minutes in which to complete the simulation exercise. Prior to the HFS, students received the chorioamnionitis content in the form of a lecture, read the relevant assigned material in the

course textbook, and reviewed the written HFS objectives prior to the simulation. Once the students assessed the condition of the patient and determined it was time to speak with the Certified Nurse-Midwife (CNM), the facilitator stopped the simulation. The group then adjourned to a nearby classroom for a 10 minute facilitator-led guided reflection period. At this time, the group discussed the patient's condition, made a diagnosis, and developed a plan of care. The scenario resumed, interventions were accomplished, and a debriefing period followed after the nursing care was delivered.

Participants completed the two instruments – the Simulation Design Scale and the Student Satisfaction and Self-Confidence in Learning Scale. The surveys were compared to a list of identifying numbers participants provided at the time consent was given. One survey did not contain an identifying number and one participant declined to give consent to participate in the study. Data from the instruments were entered into the PASWTM 18.0 statistical software program.

The results indicated that study participants perceived that all five design characteristics measured in the Simulation Design Scale (objectives, support, problem solving, guided reflection, and fidelity) were present in the scenario. The elements of Feedback and Problem Solving had the highest mean scores. These two elements included the items regarding the mid-scenario reflection; however, each design characteristic was highly rated by the participants.

A Pearson Product-Moment Correlation revealed that all five design characteristics had statistically significant correlations with learner satisfaction and self-confidence. The design characteristic with the strongest correlation to both student self-confidence and learner satisfaction was Objectives. The weakest correlation for self-confidence was Fidelity while the weakest correlation for learner satisfaction was Feedback.

A multiple regression analysis was conducted to examine which design elements can best predict learning outcomes. These results revealed that the five design characteristics combined had an impact on both self-confidence and satisfaction. The *t*-tests indicated that Objectives was the single best predictor for both learner self-confidence and satisfaction. The design characteristic of Support also contributed to predicting learner satisfaction.

Conclusions

In spite of the growing use of HFS in nursing education, there is a dearth of research-based evidence regarding best simulation practices. More specifically, little is known about the role of the instructor in HFS. This study explored the relationship of simulation design characteristics, including the role of the instructor on learning outcomes.

The results of the students' perceptions of the presence of the five design characteristics based on the Jeffries (2005) Simulation Model revealed that all design features were present. The subscales of Feedback and Problem Solving had the highest means. The mean score for Feedback was 4.9 (SD = 0.17) and the Problem Solving mean was also 4.9 (SD = 0.22). Both of these elements contained items regarding the presence of the mid-scenario reflection. This finding indicates that participants may have found the inclusion of the mid-scenario reflection period valuable enough that these two domains scored higher than the other design elements. These results appear to support the use of mid-scenario reflection in HFS. The literature contains few examples of a reflective period incorporated in an HFS though some researchers have advocated that reflection be included in the scenario (Clapper, 2010; Fanning & Gabba, 2007; Waldner & Olson, 2007). No quantitative studies were found that examined mid-scenario reflection.

Responses to the Student Satisfaction and Self-Confidence in Learning instrument indicate that students were satisfied overall with the obstetrical HFS. These results are supported by other studies that have found that nursing students generally feel positive about the HFS experience (Bearnson & Wilker, 2005; Bremner et al., 2006; McCausland et al., 2004). Responses to the items measuring Self-Confidence indicate that students felt confident about their skills and knowledge regarding the simulation content. Additionally, many students commented that they enjoyed the HFS and several requested more obstetrical simulations. These findings are also supported by other studies (Goldenberg et al., 2005; Leigh, 2008b).

The analysis of the correlation of the five simulation design characteristics and the learning outcomes revealed that all five were significantly correlated with self-confidence and learner satisfaction. The domain of Objectives was the most strongly correlated design element. This finding supports the notion that specific, detailed, and clear Objectives are an essential component of HFS. Furthermore, the simulation objectives should also match the knowledge and experience level of the HFS participant (Jeffries, 2005, 2007). The strong positive correlation between Objectives and desired learning outcomes is consistent with findings from other studies regarding this relationship (Childs & Sepples, 2006; Smith & Roehrs, 2009).

Although still statistically significant, the design elements that included the mid-scenario reflection (Problem Solving and Feedback) were moderately to weakly correlated with learning outcomes. These findings are consistent with other studies that have examined the effect of design characteristics on learning outcomes (Dobbs et al., 2005; Ishtoy et al., 2010). However, these studies did not involve a structured instructor-led guided reflection period. There is little evidence in the literature regarding the role of instructor feedback in HFS; specifics regarding how and when feedback was given is inconsistent and often not defined at all (Jeffries, 2005).

These results of the effects of the mid-scenario reflection were surprising in light of the many favorable anecdotal remarks made by participants regarding the scenario “time out”. The students appeared to value the opportunity to experience a pause in the action in order to reflect. Perhaps measuring the level of learner anxiety would provide more information about the influence of a structured reflection period.

The multiple regression findings indicated that the five design characteristics combined had an impact on both learning outcomes. However, the findings revealed that Objectives was the best single predictor for self-confidence.

Two design elements — Objectives and Support — were predictors for learner satisfaction. Interestingly, the design characteristic of Objectives was not rated as highly on the Simulation Design Scale as Problem Solving or Feedback. However, Objectives was the most strongly correlated element for learning outcomes while Support was moderately correlated.

Implications

Because HFS is used increasingly in nursing education to teach the principles of safe and effective patient care, it is necessary to determine best simulation practices. Providing, planning, and implementing HFS is time-consuming and requires a great deal of organization commitment. The cost of the expensive HFS technology for schools and, ultimately, the student, makes the development of effective teaching strategies critical.

For nurse educators, the findings regarding the significance of the design characteristics illustrate the importance of a carefully considered simulation design on learning outcomes. It is not an overstatement to declare that desirable learning outcomes begin with the simulation design.

This study found that the design characteristics of the Nursing Education Simulation Framework (NESF) (Jeffries, 2005) were statistically significantly correlated with both learner satisfaction and self-confidence. The NESF is used extensively in simulation research and this study supports the relationships defined in that model. However, no information was found in the literature about how commonly the NESF is used by faculty for simulation design unrelated to research. The results of this study and others support the notion that the design characteristics suggested by the model are sound. Therefore, perhaps the formal adoption of the NESF should be considered by schools of nursing for use as a framework for curriculum-wide simulation design.

In this study, Objectives emerged as the most significant design characteristic in predicting learning outcomes. Clear objectives that are based on the learner's skill level lay the foundation for a solid simulation design. Nurse educators contemplating a simulation design should begin with written objectives. Collaboration with other faculty and the simulation center staff should be encouraged in order to determine and clarify the purpose of the simulation exercise. Too often, the focus may be on the "high-tech" simulation equipment while the "low-tech" list of written objectives is neglected. In addition, a clear set of learning objectives should serve as foundational principles that guide the operations of the simulation laboratory.

Information regarding the Objectives should include the timeframe, the purpose of the simulation, and what the learner is expected to learn. This information should be provided prior to the simulation in written form and reinforced by the instructor before the scenario commences. Pre-simulation objectives should also include an orientation to the simulation environment including the, mannequin, equipment, and supplies. Written objectives can also be used during

the debriefing as a template for students to discuss how they met the objectives and to help solidify the concepts of the patient care provided.

Reflection is essential to learning and guided reflection is a critical component of the simulation experience. This opportunity for the learner to reflect upon the learning experience usually occurs during the debriefing following the scenario. However, providing reflection during the scenario may provide additional insight into the patient's condition and aid in setting goals for the patient's care. Too often, students can reach an erroneous conclusion or get "lost" in the rapid current of events. In such a case, the mistakes made are not evident until the exercise is over.

The mid-scenario reflection in combination with the other design characteristics had an impact on learning outcomes. Though mid-scenario reflection was not the design element most predictive of self-confidence or learner satisfaction, it was positively correlated with learning outcomes. The anecdotal comments from the students indicated that the opportunity to reflect on the simulation was helpful. Perhaps a larger sample size might yield different results than those found in this study.

Recommendations

This study examined the relationship between simulation design characteristics and learning outcomes. However, only a small group of homogeneous baccalaureate nursing students from one public university in the southeastern United States was studied. Some bias may have resulted from the fact that the researcher and the instructor were one and the same person. In addition, the results relied on self-reported data. Furthermore, there was some variability in communication during each mid-scenario reflection due to differing student responses and questions. Further research is needed to determine which simulation teaching

strategies are most effective for which types of learners and in what stages of development. Future research should involve larger sample sizes representative of demographically and geographically-varied students to determine if similar results are found.

Although there were limitations to this study, it is the first to describe and study the concept of mid-scenario reflection. One limitation of this study was the lack of a control group. Further studies regarding the effectiveness of a mid-scenario reflection should compare data from students in both experimental and control groups. Experimental design in simulation research is the exception rather than the norm (Kardong-Edgren, et al., 2010). Furthermore, additional correlational research might also help define other teaching strategies that positively affect learning outcomes. The measurement of learner anxiety might yield interesting results in future studies examining the influence of mid-scenario reflection.

Little is known about the lasting effect of student self-confidence. While this study found that students reported high levels of self-confidence after the HFS, it is not known whether the confidence gained will help students during the transition to actual practice. Further research is needed to determine whether increasing the frequency of HFS opportunities will result in increasing levels of self-confidence. Furthermore, there is a dearth of knowledge regarding whether HFS is superior in producing high levels of self-confidence and learner satisfaction compared to more traditional educational strategies (Alinier, Hunt, & Gordon, 2006; Cioffi, 2001; Leigh, 2008; McConville & Lane, 2006; Scherer, Bruce, & Runkawatt, 2007). Some nurse educators consider HFS to be a superior teaching method but there is no current data to validate this belief (Medley & Horne, 2005).

This study measured two outcomes suggested by the Jeffries (2005) Simulation Model. Other learning outcomes proposed by the model such as knowledge, critical thinking, and

performance should be studied. Another important area of study would be the transferability of skills to the clinical setting. Simulation research in nursing education has focused primarily on learners' perceptions of the HFS rather than patient outcomes (Solnick, 2005). Rigorous studies exploring the relationship between HFS and actual patient outcomes would be beneficial.

Results of this study indicate that learning objectives significantly contributed to the levels of learner satisfaction and self-confidence. More research is needed to determine how HFS learning objectives can be developed and provided to simulation participants to improve learning outcomes. Different approaches to developing learning objectives may be needed depending upon the participant's level of skill.

Summary

Simulation allows nurse educators to create patient care situations in order to meet program learning objectives in a controlled environment without risk to the patient. Although the use of HFS in nursing education is increasing, there is a paucity of evidence regarding best teaching strategies for optimizing learning outcomes (Jeffries, 2005; Kardong-Edgren, Adamson, & Fitzgerald, 2010; Prion, 2008). More research is needed as nurse educators are beginning to use the body of simulation literature to determine the best practices for its use in nursing education programs (Harder, 2009). This study appears to add to the evidence that HFS is an effective teaching strategy.

This quantitative study also adds to the body of knowledge regarding the presence of design characteristics and the learning outcomes of self-confidence and satisfaction. The results of this study indicate that the design element of Objectives accounts for a significant amount of variation in both learning outcomes.

Simulation laboratories used in nursing programs provide the setting for both education and research. HFS is a powerful teaching tool allowing the direct application of theory. In the years ahead, HFS should continue to be an innovative and effective method for realizing the program objectives of nursing education.

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Appendix A

Permission to Use the Nursing Education Simulation Framework



**National League
for Nursing**

October 7, 2010

Kimberly H. Raines, MSN, RN, CRNP, WHNP
Auburn University
School of Nursing
140 Miller Hall
Auburn, AL 36849-5505

Dear Ms. Raines:

I am writing in response to your e-mail of August 26, 2010 in which you request permission to use the Nursing Educational and Simulation Framework in your doctoral dissertation. I am pleased to grant permission for the following, contingent upon meeting the assumptions and caveats noted below.

The figure, "The Nursing Education Simulation Framework," which appears as Figure 3-1 on page 23 in the book noted below, may be included in your doctoral dissertation.

Jeffries, P.R. (Ed.). (2007). *Simulation in nursing education: From conceptualization to evaluation*. New York: National League for Nursing Press.

In granting permission to include the figure noted above, it is understood that the following assumptions operate and "caveats" will be respected:

- The figure will be included only in the dissertation
- The figure will not be modified in any way
- The poster in which this figure appears will acknowledge that it has been included with the permission of the National League for Nursing, New York, NY
- No fees are being charged for this copyright permission
- The National League for Nursing owns these rights being granted

I am pleased that material published by the NLN is seen as valuable, and I'm pleased that we are able to grant permission for its use. Please call me (212-812-0329) with any questions about items noted in this letter. Thank you.

Respectfully,

Linda S. Christensen
Chief Administration Officer
National League for Nursing

61 Broadway
33rd Floor
New York, NY 10006

T: 800-669-1656
F: 212-812-0393
www.nln.org

Appendix B
Institutional Review Board Approval

3/4/2011

Dear Dr. Raines,

Your protocol entitled "Simulation Design in Nursing Education: The Impact..." has been reviewed. Your protocol has now received final approval as "Expedited" under 45 CFR 46.110(#7).

This e-mail serves as official notice that your protocol has been approved. A formal approval letter will not be sent unless you notify us that you need one. By accepting this approval, you also accept your responsibilities associated with this approval. Details of your responsibilities are attached. Please print and retain.

If you need your consent document quickly, please let us know. You may not begin your research that involves human subjects until you receive your informed consent with an IRB approval stamp applied. Please make two copies of the document for each participant. You will keep a signed copy and give the other to him/her.

Your protocol will ***expire on February 22, 2012.*** Put that date on your calendar now. About three weeks before that time you will need to submit a final report or renewal request. (You might send yourself a delayed e-mail reminder for next January.)

If you have any questions, please let us know.

Best wishes for success with your research!

Office of Research Compliance
307 Samford Hall
Auburn University, AL 36849
(334) 844-5966
hsubjec@auburn.edu

Appendix C
Informed Consent



The Auburn University Institutional Review Board has approved this document for use from 2/23/11 to 2/22/12
Protocol # 11-054 EP 1102

AUBURN UNIVERSITY

COLLEGE OF EDUCATION

EDUCATIONAL FOUNDATIONS, LEADERSHIP AND TECHNOLOGY

(NOTE: DO NOT SIGN THIS DOCUMENT UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

INFORMED CONSENT for a Research Study entitled Simulation Design in Nursing Education: The Impact of Mid-Scenario Reflection on

Learner Satisfaction and Self-Confidence

You are invited to participate in a research study to evaluate the relationship between a reflection period in the middle of a simulation exercise and learning outcomes. The study is being conducted by Kimberly Raines, Auburn University School of Nursing. You were selected as a possible participant because you are enrolled in NURS 3331 at AUSON and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to complete 2 surveys immediately after the scenario: the *Simulation Design Scale* and the *Student Satisfaction and Self-Confidence in Learning Scale*. These evaluation tools are required of all students, but by consenting, your confidential data can be used for research. Your total time commitment will be approximately 15 minutes.

Are there any risks or discomforts? The risks associated with participating in this study are breach of confidentiality and coercion. To minimize these risks, we will have Dr. Teresa Gore obtain the consent and retain the information until the study is completed. She will compile the data from consenting students and only present this to the members of this team. You will use the alphabetical letter of your clinical rotation group and then the last four numbers of your student ID as your identifier. The list with your identifier and name will be destroyed by shredding hard copy as soon as data that can be used is linked for the research.

Are there any benefits to yourself or others? If you participate in this study, you can expect to be more satisfied with learning during the simulation and increase your self-confidence. We cannot promise you that you will receive any or all of the benefits described.

Participant's initials _____

Page 1 of 2

4036 Haley Center, Auburn, AL 3684-5221; Telephone: 334-844-4460; Fax: 334-844-3072

w w w . a u b u r n . e d u

Will you receive compensation for participating? No

Are there any costs? If you decide to participate, there will not be any costs to you.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University or Auburn University School of Nursing.

Your privacy will be protected. Any information obtained in connection with this study will remain confidential. Information obtained through your participation may be used for publication in a professional journal, and/or presented at a professional meeting. If you consent, no information that could identify you will be used.

If you have questions about this study, please ask them now or contact Kimberly Raines at 844-6765 or Dr. Teresa Gore at 844-7360. A copy of this document will be given to you to keep.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334)-844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Participant's signature

Date

Investigator obtaining consent

Date

Printed Name

Printed Name

Co-Investigator

Date

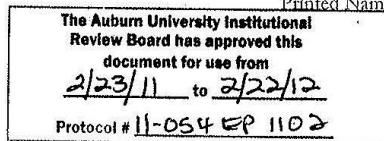
Co-Investigator

Date

Printed Name

Printed Name

Page 2 of 2



Appendix D

Permission for Use of NLN Instruments

From: Alyss Doyle | Coordinator of Educational Programming | National League for Nursing |

To: Kimberly Raines

Regarding: Request for NLN Survey Instruments

It is my pleasure to grant you permission to use the “Educational Practices Questionnaire,” and “Simulation Design Scale”. NLN/Laerdal Research Tools. In granting permission to use the instruments, it is understood that the following assumptions operate and "caveats" will be respected:

1. It is the sole responsibility of (you) the researcher to determine whether the NLN questionnaire is appropriate to her or his particular study.
2. Modifications to a survey may affect the reliability and/or validity of results. Any modifications made to a survey are the sole responsibility of the researcher.
3. When published or printed, any research findings produced using an NLN survey must be properly cited as specified in the Instrument Request Form. If the content of the NLN survey was modified in any way, this must also be clearly indicated in the text, footnotes and endnotes of all materials where findings are published or printed.

I am pleased that material developed by the National League for Nursing is seen as valuable as you evaluate ways to enhance learning, and I am pleased that we are able to grant permission for use of the “Educational Practices Questionnaire (student version),” and “Simulation Design Scale” instruments.

Alyss Doyle | Coordinator of Educational Programming | National League for Nursing | www.nln.org <<http://www.nln.org>>
adoyle@nln.org | Phone: 800-669-1656 x145 | Fax: 212-812-0391 | 61
Broadway | New York, NY 10006

<<http://www.nln.org/art/emailsigwithsummit.gif>>

Appendix E

Simulation Design Scale and Student Satisfaction and Self-Confidence in Learning Instruments

Sample Items from the Simulation Design Scale (SDS)

2. I clearly understood the purpose and objectives of the simulation
7. My need for help was recognized
9. I was supported in the learning process

Sample Items from the Student Satisfaction and Self-Confidence in Learning Instrument

1. The teaching methods used in this simulation were helpful and effective
3. I enjoyed how my instructor taught the simulation
6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me