USE OF A HUMAN PATIENT SIMULATOR WITH UNDERGRADUATE NURSING STUDENTS: A PROTOTYPE EVALUATION OF CRITICAL THINKING AND SELF-EFFICACY

by

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ABSTRACT

An instructional development pilot project with enrichment activities was undertaken to determine the effect of using a human patient simulator (HPS) on critical thinking and self-efficacy in a sample of nursing students. Twenty-five nursing students in their 3rd semester during 2003 at a private university completed the project. Dependent variables were the gain scores from the critical thinking and self-efficacy instruments, with prescores as covariates. Independent variables were the group and learning style.

Participants were stratified by learning style and randomly assigned to one of two enrichment activity groups. Group 1 discussed the patient cases in a classroom setting. Group 2 used a HPS to simulate actual patient cases and to perform nursing actions. Comparison of the two groups was performed using a general linear model procedure in which there were two factors, namely group and learning style quadrant, with the pretest score included as a covariate. Neither enrichment group had significant gain in critical thinking disposition scores. However, significant critical thinking skills total gain scores, $F(8, 16) = 20.74$, $p = .000$, and self-efficacy total gain scores, $F(8, 16) = 4.58$, $p = .01$, were noted for Groups 1 and 2. The gains were not predicted by learning style or group. Both enrichment groups showed increased critical thinking skills and self-efficacy scores; however, the HPS group was more enthused about learning and expressed a
desire for further sessions. The HPS group said “learning by doing” was helpful and felt more confident in caring for patients.
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CHAPTER 1

INTRODUCTION AND PURPOSE OF THE STUDY

Introduction and Background

The worsening of the national nursing shortage, which leads to higher patient-to-nurse ratios and associated increased mortality rates for surgical patients, should be a major concern for the American public (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002). Currently Utah’s shortage is the third most severe in the nation, behind California and Nevada (Nurse Leadership Forum, 2002). In 2001, Utah reported 592 nurses per 100,000 people as compared to the nation’s 782 nurses per 100,000 people (General Accounting Office, 2001). If the trend continues, by 2005 there are expected to be 150,000 vacancies for registered nurses, which is about a 7% shortage in the United States (Cooper & Parsons, 2002; Health Resources and Services Administration, 2002). The projected shortage for nurses in Utah will reach 12% by 2005, nearly twice as high as the projected national shortage (Health Resources and Services Administration, 2002).

Throughout the United States, during the financial pressures of the 1990s, many hospitals were forced to decrease the number of staffed beds. Even though the number of inpatient days has remained fairly steady over the last several years, many hospitals do not have enough acute care inpatient beds to meet the needs of patients being seen in emergency centers (American Hospital Association, 2003).
The nursing shortage and the inadequate number of hospital beds have decreased the number of registered nurses available to mentor students in the clinical setting.

Educating more nurses will require creative methods, because the number of sites for clinical learning experiences is not expected to increase to meet the increased number of students. Therefore, there may be a shortage of clinical sites, patient experiences for students, nurses to mentor students, and faculty. One of the creative methodologies, the human patient simulator (HPS), may help meet the need by creating experiences for clinical learning without increasing the number of clinical sites or nurses needed to mentor students. Simulations, using the HPS, are flexible, can be used anytime, and are not dependent on patients being in the hospital (Friedrich, 2002).

Nurse educators have used patient care simulations to enhance learners’ experiences with the belief that when the previously simulated situation is encountered in a real-life experience, the student will be able to understand and successfully manage the situation. Simulations should help students learn necessary cognitive and psychomotor skills and allow them to develop the confidence or self-efficacy needed to perform appropriate and correct nursing actions when similar conditions in real patients are encountered. Use of the HPS during the nursing education process is one option to increase the reality of the simulation. Using the HPS with nursing students for patient case simulations may also help teach students to think critically, work in teams, and implement and evaluate nursing care.
Across the nation, few schools of nursing are using the HPS, high-fidelity, full-body, computer-driven manikins that utilize gases and computer programs to simulate physiological responses to medications, fluids, and treatments. Specifically, HPSs have been designed to simulate pulses, gas-exchange respirations, heart sounds, breath sounds, and reactive pupils, and to closely simulate responses on a critical care cardiac monitor (see Appendix A for specifications). Physiological responses are programmed to respond as an adult patient of either gender depending upon the requirements of the simulation.

**Purpose of the Study**

The HPS may enhance the education of nursing students. However, after careful review of the literature, no quantitative studies were found regarding the use of the HPS for education and training of nursing students. This gap in the nursing research should be filled.

The purpose of this pilot instructional development project was to determine the effect of two different educational enrichment activities on critical thinking (disposition and skills) and self-efficacy (of being able to perform basic nursing skills) in a sample of undergraduate nursing students. The students’ preferred learning style, a possible moderating factor, was also investigated. In addition, I was interested in the students’ evaluation of their enrichment experiences.

Critical thinking was selected as a variable for the study because it is an important aspect of nursing practice. The American Association of Colleges of Nursing (1998) reported that critical thinking is a core competency in baccalaureate
nurses. Nurse educators have sought to teach critical thinking through a variety of methods. Even though manufacturers suggest that the use of HPS will enhance critical thinking and problem solving, this has not been well documented. For the purpose of this study, two instruments were used: (a) California Critical Thinking Disposition Inventory and (b) California Critical Thinking Skills Test.

Self-efficacy, or confidence, is a construct within Bandura’s (1986) social cognitive theory, defined as

people’s judgements [sic] of their capability to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but the judgements [sic] of what one can do with whatever skills one possesses. (p. 391)

Self-efficacy was selected as a study variable because students are often anxious and unsure of themselves during clinical experiences. Students frequently express a desire to increase their confidence in performing basic skills (e.g., obtaining and evaluating vital signs), administering intravenous medications, and monitoring oxygen administration. Developing more self-efficacy and confidence through enrichment activities may lead to better performance. For the purpose of this study, the Self-Efficacy for Nursing Skills Evaluation was used.

Learning style represents the resulting observable actions of the mental processes of perception and interaction during the learning situation or in the learning environment (Sandmire, Vroman, & Sanders, 2000). Learning style is a broad concept that incorporates the particular strategies one uses in problem solving and determining answers to difficult questions. How a person learns best
may be labeled his or her preferred learning style. Preferred learning style may influence, either positively or negatively, performance in individual or group learning (Hartman, 1995). Kolb (1999) conceptualized learning as experiential learning and a cyclic process and developed an assessment tool to determine preferred learning styles. Student preferred learning style was selected as a study variable because it may be a moderating factor in student learning in the interactive scenarios with the HPS. For the purpose of this study, the Learning Style Inventory, developed by Kolb (1999), was used.

The objectives of the project were to:

1. determine if differences exist in critical thinking (disposition and skills) between two groups (Group 1, Non-HPS Group, and Group 2, HPS Group) in a sample of undergraduate nursing students
2. determine if differences exist in self-efficacy to perform basic nursing skills in two groups (Group 1, Non-HPS Group, and Group 2, HPS Group) in a sample of undergraduate nursing students
3. determine the moderating effect of students’ preferred learning style on learning during the enrichment activities
4. determine students’ assessment of the enrichment activities.

Theoretical Framework

The employment of a new simulation medium requires a reexamination of teaching strategies since the traditional strategies are not suited to HPS use. After investigation, problem-based learning, which matches the characteristics of the
HPS as an instruction tool, was selected. Problem-based learning is a theoretical framework for education allowing learners to formulate hypotheses, identify the need to know information, retrieve needed information, discuss findings within a group, and develop abilities and knowledge through the process. Barrows (1985) stated:

Problem-based learning is based on the premise that students we educate must acquire (1) an essential body of knowledge, (2) the ability to use their knowledge effectively in the evaluation and care of their patients’ health problems, and (3) the ability to extend or improve that knowledge and to provide appropriate care for future problems which they may face. (p. 3)

In problem-based learning, the teacher functions as a tutor rather than a knowledge disseminator to support students in their knowledge and critical thinking development. The tutor/teacher guides students through the problem-solving processes by challenging them to think and question their decisions. The tutor/teacher does not give answers but rather guides students to find information needed for successful problem solution. Students also learn to rely on each other to help solve the problems and issues related to the experience, which is a useful skill in clinical nursing.

Learning experiences with a HPS are well suited to problem-based learning. Patient histories and scenarios are similar to those students receiving exposure to didactic classes. Students experience actual patient care during their clinical rotation, but they may not have the opportunity to care for patients with every diagnosis or typical complications that can be presented through simulation. The case studies or scenarios with a simulator allow students to identify patient care
issues, formulate plans of care, identify needed information, retrieve information, and implement care. Problem-based learning using the HPS encourages students to contemplate the patient situation, formulate plans for nursing actions, deliver the care, and determine the outcome of their actions. Through problem-based learning, those who manage the HPS activity guide students to find the information needed for successful problem solution, and students learn to function as problem solvers under the tutor’s guidance.

Statement of Research Questions

The questions for this prototype tryout were based on the assumption that undergraduate nursing students can increase their critical thinking and self-efficacy scores through education. The research questions were:

Research Question 1: Do students who engage in the HPS learning experiences, Group 2, show higher overall scores in critical thinking than students who engage in Group 1 (Non-HPS Group)?

Research Question 2: Do students who engage in the HPS learning experiences, Group 2, show higher self-efficacy scores in basic nursing skills than students who engage in Group 1 (Non-HPS Group)?

Research Question 3: Is learning style (determined by the Kolb Learning Style Inventory) a moderating factor in critical thinking and self-efficacy (as measured as a change in the total scale scores) in this study?

Research Question 4: How do students evaluate the enrichment activities?
Operational Definitions

Critical Thinking

For the present study, Facione’s (1990) definition was used:

[Critical thinking is] purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which judgment is based. (p. 2)

Critical thinking was measured by the scores on two scales: (a) California Critical Thinking Disposition Inventory and (b) California Critical Thinking Skills Test.

Group 1 (Non-HPS Group)

Group 1 participated in five enrichment activities consisting of learning experiences with patient scenarios in a classroom setting (see Appendix B for scenarios) led by me. Each learning experience was approximately 90 minutes in length consisting of three sections: (a) an initial information conference when the participants were introduced to the patient—diagnosis and history; (b) discussion of nursing care and interventions, possible complications, and appropriate nursing responses; and (c) a group discussion allowing participants to talk about their successes, failures, insights, and knowledge regarding the scenarios in a safe environment. Group 1 did not spend any time with the HPS.
Group 2 (HPS Group)

Group 2 participated in five enrichment activities consisting of learning experiences using the HPS with patient scenarios (see Appendix B for scenarios) led by me or a research assistant. Each learning experience was approximately 90 minutes in length consisting of three sections: (a) an initial information conference when the participants in the experimental group were introduced to the patient—diagnosis and history; (b) scenario performance on the HPS consisting of assessing the HPS “patient,” determining the appropriate nursing actions and interventions (such as interpreting assessment findings, developing a plan of care, and delivering the care such as positioning the patient, administering medications through appropriate routes, performing invasive procedures such as intravenous catheter placement or nasogastric tube placement, and contacting other health-care team members such as the physician or laboratory personnel), evaluating their actions, revising the plan of care, and documenting the care; and (c) a postscenario group discussion allowing participants to talk about their successes and failures regarding the scenarios in a safe environment. Group 2 spent the majority of the session caring for the patient using the HPS.

Human Patient Simulator

The HPS is a high-fidelity, full-body, computer-driven manikin that utilizes gases and computer programs to simulate medical conditions and the physiological human response to medications, fluids, and treatments (see Appendix A for specifications). The HPS has pulses, gas-exchange respirations, heart sounds,
breath sounds, and reactive pupils, and accurately simulates the output of human
response on a critical care cardiac monitor. Physiological responses are
programmed to respond as an adult patient of either gender.

**Learning Style and Learning Style Type**

Learning style type was calculated with the scores from the Kolb Learning
Style Inventory. According to Kolb (1999), people fall into one of four dominant
learning styles: (a) diverging, (b) assimilating, (c) converging, or
(d) accommodating. Some participants may have a preferred style that enhances
learning in experiential learning situations such as with the HPS. Other participants
may prefer a style that is not enhanced by hands-on experiences.

**Scenarios**

Scenarios are the patient cases used in the enrichment activities. Each
scenario contains the patient’s background and history, physician’s orders,
expected participant’s behaviors and interventions, tutor’s questions, and student’s
study questions.

**Self-Efficacy**

Self-efficacy or self-confidence is defined as

people’s judgments of their capability to organize and execute
courses of action required to attain designated types of
performances. It is concerned not with the skills one has but the
judgments of what one can do with whatever skills one possesses.
(Bandura, 1986, p. 391)
Self-efficacy was measured by the scores on the Self-Efficacy for Nursing Skills Evaluation. Higher scores indicated a higher level of self-efficacy.

**Simulation**

Simulation is the reenactment of a condition or situation by using another system. In this study, the HPS manikin was used to replicate patients, patient physiological responses, and patient cases. Simulation allows students to learn necessary cognitive and psychomotor skills and to develop confidence or the self-efficacy to perform appropriate and correct nursing actions.

**Students and Participants**

The students and potential participants were 64 undergraduate students in the Brigham Young University College of Nursing who were scheduled to graduate in August or December 2004. Those students who agreed to engage in the study and signed a written consent participated.

**Summary**

This chapter introduced the purpose of the study that investigated the effect of two different educational enrichment activities on critical thinking and self-efficacy. Scenarios or patient cases were used in both types of activities: (a) Group 1 discussing the cases and (b) Group 2 actually performing the nursing actions and interventions on the HPS. The pedagogical method of problem-based learning was utilized. The research questions and operational definitions were introduced.
CHAPTER 2

REVIEW OF THE LITERATURE

The following chapter describes the review of literature regarding simulation, critical thinking, self-efficacy, learning styles, problem-based learning, and transfer of learning. Each of these topics was pertinent to this study of two enrichment activities using case or scenario discussion or performance on the HPS. Simulation is an education methodology that may facilitate teaching of many concepts, including critical thinking in a problem-based learning approach. The preferred learning style of students may influence their ability to learn in a variety of environments or settings. As students learn concepts and practice skills, their self-efficacy or self-confidence to perform should also increase. The transfer of learning occurs if students are able to apply information and skills learned in a simulated environment to the real world and actual situations.

Simulation

Simulation is the imitation or reenactment of a condition or situation or the representation of a behavior or characteristic by using another system. Simulation has been used to varying degrees over the past century in education, but little research has been conducted to validate its effectiveness (Roberts, While, & Fitzpatrick, 1992). Researchers and educators have attempted to replicate some or
nearly all of the essential elements of situations. Thus, when situations are encountered in real life, students may respond more quickly to and then successfully manage the situation.

The roots of computer-assisted simulation are in the aviation industry, with aeronautical research and training beginning in the 1950s (Waltman, 2000). With the advent of computers, aeronautical engineers began to develop simulation to study aircraft problems and to train pilots (Fisher, 1999). The philosophy behind the development and use of simulation in aviation is summarized by aeronautical simulation engineers Smith, Schilling, and Wagaer (1989):

Simulation has developed . . . into an integral and essential part of the flight research program. Today pilots, as well as engineers, demand that simulation be included in the flight program. When the manager of one joint NASA/DOD [National Aeronautics and Space Administration/Department of Defense] program first learned the cost of a simulator, he asked, “What did you do before simulators?” The project pilot replied, “We named a lot of streets after pilots [meaning that they died in aircraft accidents]!” This statement reflects the most important value of simulation: flight safety. (p. 1)

The early flight simulations were nothing more than a plywood box for the cockpit, a regular classroom chair for the pilot, and a spring-loaded cut-off broom handle to simulate the aircraft controller (Waltman, 2000). The navigational instruments (connected to the computer) were in a panel at the bottom of a cathode ray tube (elementary television screen) representing the pilot’s view. The computers were large with many, many wires connecting the components.

By the 1960s, research was conducted not only in aircraft problems but also on the training of commercial, military, and private pilots (Chapman, 1966;
In the 1970s and 1980s, aeronautical simulation included training and research in equipment development and pilot training as well as crew performance (Facconti & Epps, 1975; Prophet & Caro, 1974; Sorenson, 1983). As the computer industry exploded, more advanced aeronautical simulators were created. Simulators were created to train, test, and remediate nearly all personnel associated with aviation, including pilots, crew members, and air traffic controllers (Noble, 2002; Treiber, 1994). Studies demonstrated the effectiveness of simulators to teach procedures and safety precautions as well as teamwork skills and confidence (Treiber, 1994). Early in aeronautical simulation history, researchers were concerned about the transfer of learning or training from the simulator to actual situations. Gerathewohl (1969) found that the degree of fidelity (psychological, physiological, and operational realism) of the simulator was closely related to the amount of the transfer of learning.

With the aeronautical industry leading the way in simulation research, scholars documented the advantages and disadvantages of using simulation in health provider education. Some of these advantages include focusing on the intended aspects of the situation, presenting serious or uncommon situations, learning in a self-paced manner, developing higher order thinking skills, and allowing students to err without negative repercussions to learner or patient (Fletcher, 1996; Friedrich, 2002; Helmreich & Davies, 1997; Issenberg, Gordon, Gordon, Safford, & Hart, 2001; Miller, 1987; Morton, 1996; Nehring, Ellis, & Lashley, 2001; Ziv, Small, & Wolpe, 2000). Other advantages are the potential for immediate feedback
and reinforcement and consistent learning opportunities across curriculum. Disadvantages include the lack of realism in the simulation experience and patient responses and the expense of high-fidelity computer-based simulators. Companies such as Laerdal-Medical Plastics Laboratories and Medical Education Technology Incorporated have identified the cost of one adult human simulator to be between $30,000 and $175,000, depending on the desired functionality and intended use.

Nurse educators have used patient care simulations to enhance learners’ experiences believing that when a previously simulated experience is encountered in real life, the student will be able to understand and successfully manage the situation. Simulations should help students learn necessary cognitive and psychomotor skills and allow them to develop confidence or the self-efficacy needed to perform appropriate and correct nursing actions when similar real patient situations are encountered. Across the nation, few schools of nursing are using high-fidelity, full-body, computer-driven manikins that utilize gases and computer programs to simulate physiological responses to medications, fluids, and treatments. The HPS has been designed to simulate pulses, gas-exchange respirations, heart sounds, breath sounds, and reactive pupils, and to closely simulate responses on a critical care cardiac monitor of an adult patient of either gender depending on the scenario.

Clinical simulations in nursing education are used to provide opportunities to practice patient care skills in a nonthreatening and safe environment (Jenkins & Turick-Gibson, 1999; Johnson, Zerwic, & Theis, 1999). More importantly,
simulations may give students the opportunity to learn, practice, and improve higher order cognition processes such as critical thinking and reasoning (Morton, 1997; Rauen, 2001). Historically, nursing education has used static patient care simulations such as a manikin that does not have a heartbeat or respiration and does not respond to the learner's interventions. Nurse educators have also used simulation gaming, which allows students to practice various communication responses prior to actual communication with patients in difficult and trying situations (Atkinson, 1977; Clark, 1977).

A thorough literature search revealed nine quantitative studies on simulation and the effects on education or learning in health-care providers. No quantitative studies regarding the use of HPS for education nursing students were found. Registered nurses, including those working on critical care and medical units and those enrolled in graduate studies, were listed as subjects in four studies (Champagne, Harrell, & Friedman, 1989; Harrell, Champagne, Jarr, & Miyaya, 1990a, 1990b; Howard, 1987). Five studies used medical students and anesthesia residents as subjects (Ewy et al., 1987; Garfield, Paskin, & Philip, 1989; Gilbart, Hutchinson, Cusimano, & Regehr, 2000; Gordon et al., 1980; Woolliscroft, Calhoun, Tenhaken, & Judge, 1987). Ravert (2002) synthesized the data from these studies and found 73% of the studies showed positive effects of simulation on skill or knowledge acquisition. However, future research is needed to determine effective and successful uses of high-fidelity simulations in basic nursing education. This study evaluated enrichment learning activities using a HPS in one group and
Critical Thinking

Critical thinking is a complex concept with no definition consensus, even though most definitions appear similar (Adams, 1999; Bowles, 2000; Colucciello, 1999; Facione, Facione, & Giancarlo, 1996; Frye, Alfred, & Campbell, 1999; Gordon, 2000; Kataoka-Yahiro & Saylor, 1994; Pless & Clayton, 1993; Scheffer & Rubenfeld, 2000; Sedlak, 1997). However, Pless and Clayton (1993), in their synthesis of the literature, found critical thinking skills in nursing to include interpretation, analysis, evaluation, inference, explanation, and self-regulation.

One attempt to develop consensus was sponsored by the American Philosophical Association during a 2-year Delphi project using cross-disciplinary participants to develop a concept of critical thinking (Facione, Sanchez, Facione, & Gainen, 1995). Participants of the study developed the following consensus statement for critical thinking:

We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which judgment is based. (Facione, 1990, p. 2)

Most studies include some characteristics identified in the American Philosophical Association project. According to Facione and colleagues (1996):

[The] ideal critical thinker [is] habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection.
of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and circumstances of the inquiry permit. (p. 1)

As critical thinking is practiced and experienced, it becomes a habit, and people have more of a disposition to use critical thinking in his or her day-to-day activities whether in professional or private life (Facione & Facione, 1996). Nurse educators and researchers agree critical thinking is essential in competent nursing practice (Beckie, Lowry, & Barnett, 2001; Ignatavicius, 2001; Ip et al., 2000; Magnussen, Ishida, & Itano, 2000; Oermann, Truesdell, & Ziolkowski, 2000; Redding, 2001; Spelic et al., 2001). In fact, Mastrian and McGonigle (1999) found that technology-based assignments allow students to develop critical thinking to a greater degree.

Several critical thinking measures exist. The instruments emerging from the American Philosophical Association project are the California Critical Thinking Disposition Inventory and the California Critical Thinking Skills Test. These instruments were developed for use with college-age students and have been used with nurses (Bowles, 2000; Facione, Facione, & Sanchez, 1994; Smith-Blair & Neighbors, 2000; Spelic et al., 2001). The only instrument developed specifically for nursing students is the Critical Thinking in Clinical Nursing Practice/RN Examination (National League for Nursing, 2002). The instrument was developed for students who are “near completion of their coursework” and “requires a sound understanding of theory basic to the practice of nursing” (National League for Nursing, 2002, n.p.).
Self-Efficacy

Self-efficacy or self-confidence is defined as people's judgments of their capability to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but the judgments of what one can do with whatever skills one possesses. (Bandura, 1986, p. 391)

Individuals affected with chronic illnesses have been studied regarding their self-efficacy and actions or behaviors that may help them manage their symptoms such as pain, sleep disturbances, and fatigue. Findings indicate that self-efficacy is a strong predictor of behavior change (Hayes, 1998; Madorin & Iwasiw, 1999; Murdock & Neaisey, 1995; Wassem, 1992, 2001; Wassem, Beckham, & Dudley, 2001).

Few studies of self-efficacy, using nursing students as participants, have been published recently (Hayes, 1998; Madorin & Iwasiw, 1999; Murdock & Neafsey, 1995). Those published have focused on measuring outcomes after continuing education (a pharmacology course), using computer-assisted instruction, and providing a mentoring environment for nurse practitioner students. No studies were located focusing on student nurses' self-efficacy in performing appropriate and correct nursing skills and interventions. Therefore, research regarding self-efficacy of nursing students in performing basic nursing skills after enrichment activities is important.
Learning Styles

Kolb (1999) conceptualized learning as experiential learning and a cyclic process. For example, as people have experiences, they learn. However, people may not have developed all the abilities Kolb (2000) believe are necessary for effective learning. Well-rounded learners cycle through four phases: (a) concrete experience, (b) reflective observation, (c) abstract conceptualization, and (d) active experimentation. According to Kolb (1999), well-rounded learners may also select a learning style that is appropriate to the task. In order to be as effective as possible in learning, people need to be involved, unbiased, reflective, able to integrate observations, and use gained knowledge to make decisions and solve problems. Preferred learning style may be determined by evaluating the learning modes and computing a score that will indicate which one of four learning style preferences is dominant: (a) accommodating, (b) diverging, (c) converging, or (d) assimilating (Kolb, 1999).

Preferred learning style may be a moderating factor in a student’s ability to learn in the scenarios with the HPS, which are designed to be interactive and experiential. Preferred learning style may also influence, either positively or negatively, performance in individual or group learning experiences (Hartman, 1995). In addition, in many occupational and professional settings, employees are encouraged to engage in meetings or workshops where their learning style is determined. In turn, knowing their learning style helps them understand their unique learning needs as well as those with whom they work. Understanding
learning style has helped leaders and managers as well as educators understand the learning process and how preferences for types of educational experiences influence learning. The Learning Style Inventory has been used in many settings, including health care, education, and nursing students in graduate programs (Kolb, 1999).

Studies with occupational therapy students are inconsistent regarding the correlation of learning style preferences with clinical performance. Cunningham and Trickey (1983) found little correlation, whereas Stafford (1986) found learning style predicted clinical performance. Sandmire and colleagues (2000) discovered that the learning style preferences of individual team members do not affect the interdisciplinary team performance, suggesting that background knowledge predicts the team's performance rather than learning style. Learning style preference and methods of education continue to be a discussion in education arenas.

**Problem-based Learning**

Learning occurs in a variety of ways. Learning from people's experiences is a natural result of life. Problem-based learning is a pedagogical method in which problems are presented to a student, and the learning results from the process of working towards an understanding or resolution of the problem (Barrows, 1986; Barrows & Tamblyn, 1980). Problem-based learning requires a student be actively involved in the inquiry and discovery process, discovering new concepts and then applying the learned material in an attempt to solve the problem (Camp, 1996; Greening, 1998; Richardson & Trudeau, 2003). Problem-based learning is intended
to influence many, if not all, aspects of a student’s learning experience (Camp, 1996). In problem-based learning, a student is expected to think critically, use clinical reasoning, search out information, and apply the new information to solve the problem (Barrows & Feltovich, 1987). This pedagogy differs from the traditional didactic format where a student is often required to learn and memorize, and then to apply information in a setting very different from the classroom education setting.

Howard Barrows, a physician and educator, is widely recognized for his work in problem-based learning and the assessment of clinical competence through performance-based testing for physicians. Barrows developed a highly disciplined and clearly defined methodology for using problem-based learning. Many authors, using the title of problem-based learning, do not maintain the discipline that led Barrows to modify the name to “authentic problem-based learning” to distinguish it from undisciplined methods (Barrows, 1998, p. 630). Barrows (1986) defined the methodology of problem-based learning in six steps:

1. The problem or patient case study is introduced first without prior study or preparation.

2. The problem or patient case study is given to the student in a similar way the student would encounter it in an actual patient care setting.

3. The student works with the problem or patient case study, practices critical thinking and reasoning skills, and develops new knowledge and skills.
4. The concepts or information needed are identified in the process of working through the patient case study, and the student studies what is needed.

5. The skills and knowledge are applied to the patient case study. (Learning is evaluated and learning is reinforced.)

6. The learning that has occurred during the work with the problem or patient case study is integrated into the student’s repertoire of knowledge and skills.

The work of Barrows (1986) provided the steps for application of problem-based learning. Savery and Duffy (1995) presented a theoretical structure and purported that problem-based learning is based on a constructivist framework. This philosophical view stems from people’s understanding of their interactions with the environment. What people learn cannot be separated from the process of learning. The driving force for learning is cognitive conflict or “puzzlement” that causes the learner to focus on what needs to be learned in that situation. The social environment challenges and helps the learner test what is understood and determines if an interpretation is viable that supports functioning in the world.

Problem-based learning provides students with a setting where a practical problem can be worked through using feedback from peers and faculty or tutors (Peterson, 1997). In nurse education as in medical education, problem-based learning provides an opportunity for students to practice critical thinking skills as they explore patient case studies.
Medical education began using problem-based learning in the 1960s, beginning at McMaster University in Canada (Camp, 1996). A few other medical schools followed with the problem-based model, and the use increased through the next 2 decades. In the 1990s, many medical schools and other health science fields such as dentistry, occupational health, and pharmacy adopted problem-based curricula (Delafuente, Munyer, Angaran, & Doering, 1994; Richardson & Trudeau, 2003). The problem-based learning literature in medical education report that most participants (students and faculty) found the method enjoyable and nurturing, and graduates usually performed well on clinical evaluations (Albanese & Mitchell, 1993; Vernon & Blake, 1993). However, Albanese and Mitchell reported that a few students scored lower on examinations and felt less prepared than those trained conventionally, contrasting with Vernon and Blake's findings that students' tests of factual and clinical knowledge were similar to conventionally trained students. Albanese and Mitchell also reported a concern that students engaged in problem-based learning showed gaps in cognitive knowledge that may negatively influence their practice.

In the 1990s, the literature revealed nurse educators using case studies with problem-based learning methodology (Amos & White, 1998; Dailey, 1992; Dowd & Davidhizar, 1999; Townsend, 1990) that resembled actual patients nursing students encountered in their studies and clinical experiences. The methodology allowed students to be active participants and to solve real-world problems in the safe environment of the classroom. Recent nurse researchers are supportive of the
move to problem-based learning with patient cases to facilitate active learning (Alexander, McDaniel, Baldwin, & Money, 2002; Baker, 2000; Papastrat & Wallace, 2003; Richardson & Trudeau, 2003; Tomey, 2003; Williams, 2001). Goals for this methodology include encouraging critical thinking, problem-solving, self-confidence, self-directed learning, communication, team skills, interdisciplinary collaboration, and lifelong learning. In an outcome study, White, Amos, and Kouzekanani (1999) found problem-based learning to be an effective teaching strategy for nurse educators. The challenge is for nurse educators to shift in their thinking to a paradigm of effective learning rather than effective teaching (Baker, 2000).

**Transfer of Learning**

The intent of simulation is to contribute to the transfer of learning in actual real-world experiences. Transfer of learning is defined as the measurable effect and extent to which the knowledge, skills, and abilities learned in instruction or training are applied to a new situation, usually in the real performance or job (Alessi, 1988; Payne, 1982; Smith, 1996). Depending on the transfer of learning, learning an instructional event either contributes to or distracts from subsequent problem solving or learning of subsequent events (Renaud & Suissa, 1989).

In the 19th century, many believed mental capacities could be exercised to increase reasoning and memory, and these skills would transfer to many different tasks used in everyday life (Sternberg, 1999). Later, Thorndike and Woodworth (1901) explained transfer of learning through a theory of identical elements
whereby the more closely the training task resembled the actual task, the greater the transfer of learning. Behaviorists interpreted the identical elements as stimuli and responses, and they implemented many training principles including reinforcement schedules, overlearning, and feedback (Sternberg, 1999).

In the early 1900s, the transfer of learning through principles theory focused on learning general principles to apply to a new situation to solve the problem (Goldstein, 1986; Henrickson & Schroeder, 1941; Judd, 1908; Patrick, 1992). The transfer actually occurs because of an individual’s cognitive understanding of the skill. Since principles are learned, transfer occurs with tasks that are not identical to the training.

Cognitive psychologists in the 1960s proposed humans are mental processors. Theories began to emerge regarding how individuals encode, store, and retrieve information. Production rules with “if-then” statements explained the transfer of learning from one environment to another. One of the general principles purported by Ehrenberg (1983) was that simulations with hands-on experiences should incorporate thinking processes as well. An example is algorithms that help chemistry students understand the principles and then transfer the learning to another task (Coscarelli, Visscher, & Schwen, 1976).

In the 1980s, Gick and Holyoak (1980, 1983) proposed that transfer of learning occurs best when there is perceived similarity between the training and the actual environment. Actual identical elements are not necessary, but the similarity is important and may determine the amount of transfer. Early aeronautical research
found that the simulator’s degree of fidelity (psychological, physiological, and operational realism) was closely related to the amount of the transfer of learning (Gerathewohl, 1969). Later researchers stated similarity is important, but the degree of similarity necessary is not well understood (Schumacher & Gentner, 1988). Transfer of learning may also be dependent on other variables, including the support of those around the participants (the team and leader) and the environment (Smith-Jentsch, Salas, & Braanick, 2001).

The education profession, including basic education, medical education, and the airline industry, has used simulation to enhance the transfer of learning. Simulation games, including role playing/group dynamics and modeling/training, can enhance the transfer of learning with kindergarten children (Renaud & Suissa, 1989). In teacher education, videotaping of microteaching sessions to simulate classroom experiences provide adequate transfer of learning to the classroom (Laktasic, 1976).

Many educators, during curriculum revision, are asking for products that teach performance with a shift from informing to the ability to perform (Gibbons, Fairweather, Anderson, & Merrill, 1997). The aviation industry is adamant about successful performance on simulators. Students in many health-care professions use simulators. Nurse midwifery students use pregnancy simulators to learn the abdominal assessment (Lyons, Miller, & Milton, 1998). Nurse midwifery students use the simulator in a group laboratory session and individually until they are comfortable with the assessment.
Products that emphasize the transfer of learning through performance allow participants to see, hear, and do. Participants in virtual reality training often wear headgear and glove-like apparatus to experience the virtual reality of a situation. Outcomes attributed to the use of virtual reality in education are mixed. Kozak, Hancock, Arthur, and Chrysler (1993) found no benefits to virtual reality training for a pick-and-place (moving items in virtual space) task, and those with a virtual reality training experience did no better than those with no training. However, participants with real-world tasks performed significantly better. Tracey and Lathan (2001) also found that with manipulation tasks involving motor tasks and spatial abilities, subjects with initial low spatial abilities benefited from the virtual reality experience, but those with initial high spatial abilities did not improve.

The fidelity of simulation has been studied in relation to the effect on transfer of learning. The fidelity level is defined as to how closely a simulation imitates reality (Alessi, 1988; Choi, 1998). High fidelity is characterized by a high level of scene detail and having motion (Salas, Bowers, & Rhodenizer, 1998). Designers of mechanical simulators assume that increasing fidelity will enhance transfer of learning, but research over the years has shown varying results (Alessi, 1988). Some researchers have found that higher fidelity decreases the time for learning with airplane simulators (Gerathewohl, 1969). It has also been noted that after initial mastery of skills (transfer of learning has occurred), the transfer of learning drops for further skills. Other researchers have found that the level of fidelity does not determine the amount of learning transfer. It is also assumed that
higher levels of fidelity and, thus, more details of reality may elicit attention deficit in participants at lower level abilities at the beginning stages of learning. Finally, Choi (1998) believed that fidelity level should be selected according to the participant’s stage of learning.

Salas and colleagues (1998) expressed concern with the transfer of learning when stating their belief that the simulation industry has three misconceptions or invalid assumptions: (a) Simulation is all you need; (b) more is better (should be dictated by cognitive and behavioral requirements of the task); and (c) if the aviators (or participants) like it, it is good. They also believed that the emphasis should be on actual learning, not on technology, and that there is a need for development of more sophisticated and appropriate measures for simulation-based systems. They recommended the abandonment of the concept that simulation equals training and higher fidelity means better training and transfer of learning. They also suggested that simulation designers must work with behavioral scientists and that simulators must be designed to be trainee centered.

Summary

Simulation has been used in medical education and the aviation industry as well as in nursing education. Nurse educators have used simulation to help students learn necessary cognitive and psychomotor skills and to develop self-efficacy to perform nursing actions in a nonthreatening and safe environment. High-fidelity, full-body, computer-driven HPSs may give students the opportunity to learn, practice, and improve higher order cognition processes such as critical thinking and
reasoning.

Critical thinking is essential to successful nursing education and practice. There is not a consensus for the definition or how to measure critical thinking. Instruments to measure critical thinking disposition and skills are available but are not specific to nursing students during their program of study. Many nurse educators believe that practicing problem solving using simulation of patient cases and scenarios will increase critical thinking, but there is a gap in the research to support this concept. However, simulation, particularly high-fidelity simulation with the HPS, may be a teaching strategy that allows students to practice and improve their critical thinking skills.

The problem-based learning approach and the use of simulation with the HPS in nursing education may be appropriate methods to educate nurses to think critically. However, the preferred learning style of students may influence their ability to learn in this way. Students who prefer an experiential approach may improve their critical thinking more than those who prefer a reflective approach. Whichever approach is used, as students learn concepts and transfer their learning and skills to actual situations in clinical experiences, their self-efficacy or self-confidence to perform should increase. However, there is no research suggesting that the experiential approach increases self-efficacy more than a reflective approach.

Educational activities using HPSs are currently used in some nursing education programs. Research needs to be undertaken to investigate critical
thinking and self-efficacy with nursing students involved in education activities with high-fidelity simulation, such as the HPS, since there are no published studies that investigate these variables in nursing students.
CHAPTER 3

DESIGN AND METHODOLOGY

The purpose of this chapter is to describe the project including the research design, sample and setting, instruments, study procedures, and statistical analysis used to answer the research questions. The research questions are:

Research Question 1: Do students who engage in the HPS learning experiences, Group 2, show higher overall scores in critical thinking than students who engage in Group 1 (non-HPS learning activity)?

Research Question 2: Do students who engage in the HPS learning experiences, Group 2, show higher self-efficacy scores in basic nursing skills than students who engage in Group 1 (non-HPS learning activity)?

Research Question 3: Is learning style (determined by the Kolb Learning Style Inventory) a moderating factor in critical thinking and self-efficacy (as measured as a change in the total scale scores) in this study?

Research Question 4: How do students evaluate the enrichment activities?

Research Design

A pilot instructional development project utilizing enrichment activities was undertaken. The participants were stratified (by learning style) and randomly assigned to one of two enrichment activity groups. Both groups involved the same
patient cases or scenarios and were taught by me and research assistants trained in
the use of both enrichment activities. Group 1 did not use the HPS and instead
used discussions to talk about the patient scenarios and appropriate nursing actions.
Group 2 used the HPS to simulate actual patients and expected the participants to
perform appropriate nursing actions consisting of assessing the HPS patient;
determining the appropriate nursing actions and interventions (such as interpreting
assessment findings, developing a plan of care and delivering the care such as
positioning the patient, administering medications through appropriate routes,
performing invasive procedures such as intravenous catheter placement or
nasogastric tube placement, and contacting other health-care team members such as
the physician or laboratory personnel); evaluating their actions; revising the plan of
care; and documenting the care. All 64 students had a previous experience with the
HPS in the form of a 20-minute interaction passing off a baseline hospital
assessment. Quantitative data were collected at the beginning and end of the
instructional development project. Qualitative data, including taped interviews and
answers to open-ended questions, were collected at the end of the project.

Sample and Setting

The target population was 64 students admitted to the Brigham Young
University College of Nursing in August 2002 and scheduled to graduate in August
or December 2004. These students met all prerequisite requirements and, on
admission to the nursing program, had a grade point average of approximately 3.7
on a 4.0 scale. All 64 students were invited to participate.
In order to determine sample size, a power analysis was conducted. Given the standard deviation from the California Critical Thinking Skills Test manual (Facione & Facione, 1998) and estimating a significant gain in posttest scores, the analysis indicated a sample size of 25 per group was required for a 95% confidence level. Considering ranges of possible values for the California Critical Thinking Disposition Test and the Self-Efficacy for Nursing Skills Evaluation, rough estimates of the standard deviations were obtained. By estimating significant posttest gains in these scores, the power analysis indicated that sample sizes of 21 and 11, respectively, per group were required; thus, the expected number of participants in this study was sufficient.

Prior to data collection, approval for the project was obtained from the Brigham Young University College of Nursing Research and Scholarship Committee and the Institutional Review Boards at the University of Utah and Brigham Young University. Written consent was obtained from all participants, including consent to use the data for educational purposes and presentations/publications to professional audiences (see Appendix C). The identity of all participants remained confidential, and code numbers were assigned. Group data were reported in aggregate and individual data presented without any identifying information. All research documentation and audiotapes were stored in a locked file cabinet in my office. Access to data was given only to personnel associated with the study. I did not and will not share individual data with instructors, and results are not a part of any grade for any class for participants.
The data will be destroyed after 3 to 4 years, which will allow presentation and publication of the results to professional audiences.

Participation in this study was not expected to result in any harmful effect except the demands of time (9 to 13 hours). Possible benefits to the participants may have included personal attention, personal insight, and questions answered during the enrichment activities. The participants' understanding and knowledge base of nursing concepts may have been enhanced through participation with the HPS. Participants who completed all study requirements received compensation of a $40 gift certificate to a local retail store (Wal-Mart) and a chance of winning one of four $250 gift certificates. Two winners of $250 gift certificates were drawn from each group.

This project was not affiliated with any class or coursework at the Brigham Young University College of Nursing. I was not teaching any course in which the participants were enrolled. Participation was voluntary and in no way influenced student grades or standing in the College of Nursing. The participants were asked to participate during the 2nd semester of the nursing program because up to that point all coursework was similar. After the 2nd semester, the nursing curriculum sequence could have been different for each student due to clinical rotations and choice of electives.

The setting was in the Nursing Learning Center at Brigham Young University. Brigham Young University is a private university in the Rocky Mountains area and has a student enrollment of approximately 30,000. The College
of Nursing has approximately 250 to 300 undergraduate students enrolled as juniors and seniors. There is also a Nursing Learning Center where students can practice nursing skills. In the center, there are four exam rooms with a dressing area; two four-bed patient care units; and a pediatric-mother-baby area with birthing bed, isolettes, and pediatric beds. The HPS is located in the Nursing Learning Center. A crash cart, simulated medication area, x-ray viewing area, white board for teaching, cardiac care monitor, and three computers to support the HPS are also found in the simulator room. The College of Nursing employs a computer support staff member who manages the ongoing computer needs and maintenance of the HPS.

Instruments

Seven instruments were used in the project: (a) Demographic Survey, (b) California Critical Thinking Disposition Inventory, (c) California Critical Thinking Skills Test, (d) Learning Style Inventory, (e) Self-Efficacy for Nursing Skills Evaluation, (f) Written Performance-Based Evaluation of Video Scenarios, and (g) Use of Human Patient Simulator Survey. To help account for possible learning bias with the California Critical Thinking Skills Test, one half of the participants were given Version A and the remaining half were given Version B on pretest; this process was reversed on posttesting.
Demographic Survey

The Demographic Survey requested participants provide contact information and indicate their gender, major, year in school, reported grade point average, and previous experience in the health-care field (see Appendix D). The survey also asked participants to document previous experiences with patients who had conditions similar to those used in the scenarios.

California Critical Thinking Disposition Inventory

The California Critical Thinking Disposition Inventory is a 75-item questionnaire on a 6-point Likert scale with agree and disagree as anchors for the response format and takes 15 to 20 minutes to complete. The instrument measures the participants’ disposition in the seven concepts or subscales: (a) truth-seeking, (b) open-mindedness, (c) analyticity, (d) systematicity, (e) critical thinking self-confidence, (f) inquisitiveness, and (g) cognitive maturity. A score for each subscale and a total score are obtained. After participants complete the questionnaire by marking their answers on a response form, the forms are sent to Insight Assessment in California for computer scoring.

The reliability (internal consistency as based on the average sample) is reported as Cronbach’s alpha of 0.90 for the total scale and from 0.72 to 0.80 for the subscales (Facione et al., 1996). Following are example items for the California Critical Thinking Disposition Inventory (available from Insight Assessment at www.insightassessment.com):
Truth-seeking subscale: It’s never easy to decide between competing points of view.

Open-mindedness subscale: It concerns me that I may have biases of which I am not aware.

Analyticity subscale: Getting a clear idea about the problem at hand is the first priority.

Systematicity subscale: I always focus the question before I attempt to answer it.

Self-confidence subscale: Tests that require thinking, not just memorization, are better for me.

Inquisitiveness subscale: When faced with a big decision, I first seek all the information I can.

Maturity subscale: The best argument for an idea is how you feel about it at the moment. (n.p.)

California Critical Thinking Skills Test

The California Critical Thinking Skills Test is a 34-item discipline-neutral, multiple-choice instrument that takes 30 to 45 minutes to complete. The instrument measures the participants’ skills in five core critical thinking skills (analysis, evaluation, inference, deductive reasoning, and inductive reasoning) according to three subscales (analysis, evaluation, and inference). Items are scored dichotomously (right or wrong), and scores are obtained by summing the number of correct answers for each subscale and for the entire scale. Because of the complexity of the critical thinking concept, the subscale scores should not be considered exact indicators of an individual’s ability but rather indicators of overall strengths and weaknesses (Beckie et al., 2001; Facione & Facione, 1998). After participants complete the questionnaire by marking their answers on a response sheet, the response forms are sent to Insight Assessment for computer scoring.
The reliability is reported using the KR-20 (internal consistency) and ranges from 0.70 to 0.84. Correlations with the Graduate Record Examination have been reported from .582 to .719. Correlations with the Scholastic Aptitude Test have also been reported from .44 to .545 (Facione & Facione, 1998). Following is an example item from the California Critical Thinking Skills Test (available from Insight Assessment at www.insightassessment.com):

Ezerinians tell lies, means the same thing as:
A = If anyone is Ezerinian, then that person is a liar.
B = If anyone is a liar, then that person is Ezerinian.
C = There is at least one person who is an Ezerinian who lies.
D = People don’t lie unless they are Ezerinian.
E = All of the above mean the same thing. (n.p.)

Learning Style Inventory

The Learning Style Inventory is a 12-item sentence-completion questionnaire that usually takes 10 minutes to complete. The instrument measures the degree to which the participant displays each of the learning styles as defined by Kolb (1999). Each item asks the participant to rank order four sentence endings that correspond to the four learning modes of concrete experience, reflective observation, abstract conceptualization, and active experimentation. The instrument is scored by adding 12 numbers in each of the four columns, which correspond to the four learning modes. Raw scores range from 12 to 47 (possible range from 12 to 48). The scores are marked on a diagram to indicate how much participants rely on each of the learning modes. Combination scores are obtained by subtracting: Abstract Conceptualization minus Concrete Experience (AC – CE), and Active
Experimentation minus Reflective Observation (AE – RO), which result in scores from +31 to -20 (possible range from +36 to -36). The combined scores are marked on a graph that indicate the participants’ learning style quadrant. The four learning styles are Diverging (Quadrant 1), Assimilating (Quadrant 2), Converging (Quadrant 3), and Accommodating (Quadrant 4).

The reliability (internal consistency as based on $N = 268$) is reported as Cronbach’s alpha from .73 to .88 for each of the scales (Kolb, 1999). Following is an example item from the Learning Style Inventory (available from Hay Resources Direct at http://trgmcber.haygroup.com):

4. I learn by:
   - [ ] feeling
   - [ ] watching
   - [ ] thinking
   - [ ] doing

11. When I learn:
   - [ ] I get involved
   - [ ] I like to observe
   - [ ] I evaluate things
   - [ ] I like to be active. (n.p.)

**Self-Efficacy for Nursing Skills Evaluation**

The 24 items on the Self-Efficacy for Nursing Skills Evaluation were derived from a general Nursing Skills List available from the Brigham Young University College of Nursing (see Appendix E). The instrument was developed for the purpose of this study. The Self-Efficacy for Nursing Skills Evaluation utilizes a 5-point Likert scale ($5 = extremely confident$, $4 = very confident$, $3 = moderately confident$, $2 = slightly confident$, and $1 = not at all confident$).
Instructions tell the participants that the researcher is interested in how confident they feel they are in doing the nursing skills listed. The format and instructions for the Self-Efficacy for Nursing Skills Evaluation have been used in several self-efficacy instruments (Wassem, 1992, 2001; Wassem et al., 2001). An example is given, and the participants are asked to check the column indicating how confident they are that they can do the skill rather than how well they carry out the skill. Responses are numerical; summing the responses yields a total score for the Self-Efficacy for Nursing Skills Evaluation. Higher scores indicate higher levels of self-efficacy or confidence in performing the nursing skill.

**Written Performance-Based Evaluation of Video Scenarios**

The Written Performance-Based Evaluation of Video Scenarios is a pen-and-pencil assessment of the participants' ability to recognize and diagnose a patient problem, identify nursing actions and interventions, and provide rationale (see Appendix F). The instrument was developed for the purpose of this study. The participants were instructed to watch 1- to 3-minute video vignettes, each one depicting a patient, and to identify the patient problem, appropriate nursing actions, and interventions with rationale for each vignette. The participants practiced with the first video vignette, and their responses were discussed. The participants were then shown the remaining four vignettes, pausing for 3 minutes after each vignette to allow participants to record their responses. I and three other expert nursing clinicians defined the correct responses independently. The correct responses were very similar, with only a few additional responses added during the merging of all
responses. From the list of correct responses, points were awarded for each correct response. The assessment is a performance measure of participants’ identification of problems, nursing actions/interventions, and rationale and may indicate transfer of learning from one situation to another (from discussion or simulation to video media and written analysis). After tallying correct responses for each scenario, the scores were summed yielding a total score for the instrument. Higher scores indicate higher levels of ability to identify patient problems, nursing actions and interventions, and rationale for action.

Use of Human Patient Simulator Survey

I developed the 7-item survey, which utilizes a 5-point Likert scale (5 = extremely beneficial, 4 = very beneficial, 3 = moderately beneficial, 2 = slightly beneficial, and 1 = not at all beneficial) for the first 5 items (see Appendix G). The instructions asked participants to indicate how beneficial they thought their overall experience with the HPS learning scenarios was in their nursing education, and what they liked and did not like about using the simulator.

The final group interviews were audiorecorded, transcribed verbatim, and all identifying information removed. Participants were asked to talk about issues related to the enrichment activities and the patient care scenarios, including the difficulties and successes with their experiences. Appropriate follow-up and probing questions were used as needed. The open-ended questions on the Use of Human Patient Simulator Survey provided qualitative data as well.
Study Procedures

Sixty-four students at Brigham Young University College of Nursing scheduled to graduate in August or December 2004 were asked to participate during the fourth and fifth blocks of the nursing program because up to that point all course work was similar. The curriculum of Brigham Young University College of Nursing consists of 6 semesters with two 7-week courses in each semester. After the fifth block, the nursing curriculum may vary for each student based on courses taken. The fourth and fifth blocks consist of two 7-week courses with half of the students taking Nursing 312 (Nursing Core, Maternal Care Nursing) first and the remaining students taking Nursing 314 (Nursing Core, Peri-Operative and Advanced Medical-Surgical Nursing) first. At the beginning of the second 7 weeks, the students switched courses. I was not teaching any course in which the participants were enrolled. I explained the study to the students and requested participation during the beginning of the fourth block. This study occurred over 7 weeks during the fourth and fifth blocks. In the 1st week, participants completed the instruments. From Weeks 2 to 6, participants were involved in five 90-minute enrichment activities (1 per week). After the last enrichment activity, participants again completed the instruments and participated in a group interview. See Table 1 for a time line.

In order to encourage students to participate and to promote a high completion rate, participants completing all study requirements received compensation of a $40 gift certificate to a local retail store (Wal-Mart) and also a
Table 1

Participants’ Time Line

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursing class</td>
<td>Third block course</td>
<td>Nursing 312 or Nursing 314</td>
<td>Nursing 312 or Nursing 314</td>
<td>Fifth block courses (Nursing 380, 382, and 384)</td>
</tr>
<tr>
<td>participants enrolled in</td>
<td>course (Nursing 310)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study activities</td>
<td>Institutional Review Board approval</td>
<td>Participant enrollment into study, initial data collection, group assignment</td>
<td>Participants involved in enrichment activities (five 90-minute activities, one per week), final data collection including interview, $40 gift certificates given to those completing requirements</td>
<td>Data analysis, reporting results, scores to participants, winners of drawings notified</td>
</tr>
</tbody>
</table>

chance of winning one of four $250 gift certificates. (Two winners of $250 gift certificates were drawn from each group.) Those who agreed to participate provided written consent (see Appendix C) and completed the initial four instruments, including the Learning Style Inventory.

Initially, participants were sorted into four groups according to the results of the Learning Style Inventory. Individuals were then randomly assigned to one of two enrichment activity groups by drawing names placed into a hat, alternating between Group 1 and Group 2 so that each learning style was equally represented
in each of the two enrichment groups. All study participants engaged in the standard education process in the College of Nursing consisting of class, regular lab sessions with practice on static manikins (taught by the regular teaching assistant), and clinical experiences. The enrichment activities for the study were in addition to the standard education process and focused on five different patient scenarios (see Appendix B for patient scenario work sheets): (a) a male medical-surgical patient admitted following a motor vehicle accident, (b) a female experiencing a postpartum hemorrhage, (c) an antepartum female experiencing pregnancy-induced hypertension, (d) a male experiencing chest pain, and (e) a male experiencing disseminated intravascular coagulation. The specific procedures for each group are discussed in the following sections.

**Group 1 Procedures**

Those participants randomized into Group 1 spent from 9 to 13 hours completing the following sequential activities:

1. Completion of five instruments (60 to 75 minutes): (a) Demographic Survey, (b) California Critical Thinking Disposition Inventory, (c) California Critical Thinking Skills Test, (d) Self-Efficacy for Nursing Skills Evaluation, and (e) Learning Style Inventory.

2. Participation in five 90-minute enrichment activities with patient scenarios consisting of three sections: (a) an initial information conference when the participants were introduced to the patient, diagnosis, and history; (b) a discussion of nursing care and
interventions, possible complications, and appropriate nursing responses; and (c) a group discussion allowing participants to talk about their successes, failures, insights, and knowledge gained in a safe environment.

3. Completion of four instruments (60 to 90 minutes): (a) California Critical Thinking Disposition Inventory, (b) California Critical Thinking Skills Test, (c) Self-Efficacy for Nursing Skills Evaluation, and (d) Written Performance-Based Evaluation of Video Scenarios.

4. Participation in a final group interview to elicit their evaluation of the enrichment activity. These interviews were audiorecorded.

At the end of the project, participants received a summary of their scores, and those completing all requirements were given a $40 gift certificate to a local retail store (such as Wal-Mart) and also a chance of winning one of two $250 gift certificates. Group 1 participants could schedule experiences with the HPS after study completion.

**Group 2 Procedures**

Those participants randomized into Group 2 spent from 9 to 13 hours completing the following sequential activities:

1. Completion of five instruments (60 to 75 minutes): (a) Demographic Survey, (b) California Critical Thinking Disposition Inventory, (c) California Critical Thinking Skills Test, (d) Self-Efficacy for Nursing Skills Evaluation, and (e) Learning Style Inventory.
2. Participation in five 90-minute enrichment activities with patient scenarios using the HPS consisting of three sections: (a) an initial introduction, in the simulator room, to the scenario including patient diagnosis and patient history; (b) a skill performance on the HPS practicing nursing actions and care, group dynamic experiences, critical thinking, decision making, and leadership skills; and (c) a feedback or debriefing session allowing participants to talk about individual and group successes and performance in a safe environment.

3. Completion of five instruments (75 to 110 minutes): (a) California Critical Thinking Disposition Inventory, (b) California Critical Thinking Skills Test, (c) Self-Efficacy for Nursing Skills Evaluation, (d) Written Performance-Based Evaluation of Video Scenarios, and (e) Use of the Human Patient Simulator Survey.

4. Participation in a final group interview to elicit their evaluation of the enrichment activity including the HPS experience. These interviews were audiorecorded.

At the end of the project, participants received a summary of their scores from the critical thinking instruments. Those completing all requirements were given a $40 gift certificate to a local retail store (such as Wal-Mart) and also a chance of winning one of two $250 gift certificates.
Statistical Analysis

Data were entered into Statistical Products and Service Solutions (SPSS, Inc., 2002) software and analyzed. Descriptive statistics (such as frequencies, means, standard deviations, and correlations) were used to report the demographic characteristics and to compare the two groups. Comparison of the two groups was performed using a general linear model procedure where there were two factors, namely group and learning style quadrant, with the pretest score included as a covariate. The dependent response variables for the general linear model was the gain score for each participant \( (Y = \text{postscore} - \text{prescore}) \). Separate analyses were conducted for each instrument: (a) California Critical Thinking Disposition Inventory, (b) California Critical Thinking Skills Test, and (c) Self-Efficacy for Nursing Skills Evaluation. The overall group effect and the effect of learning style within groups were analyzed. Internal consistency and reliability for the Self-Efficacy for Nursing Skills Evaluation were also reported (coefficient \( \alpha \) estimate).

Responses from the Written Performance-Based Evaluation of Video Scenarios were evaluated by me and three other nurse experts to determine the appropriateness/correctness of the responses. Results were tabulated according to the enrichment groups. Successful identification of problems, nursing actions/interventions, and rationale may indicate transfer of learning from one situation to another (from discussion or simulation to video media and written analysis). Descriptive statistics for the Use of the Human Patient Simulator Survey were calculated, and data from the last two questions were analyzed qualitatively.
The audiorecording from the final group interviews and written data from the Use of the Human Patient Simulator Survey were transcribed verbatim and analyzed by using inductive and emergent processes (Denzin & Lincoln, 2000; Kearney, 2001). Credibility, auditability, fittingness, and trustworthiness were evaluated by me and an experienced researcher with experience in qualitative methods. Descriptive categories were identified, and relevant quotes to each category were selected to illustrate the content.

**Limitations/Approaches**

One limitation of this study design was that participants in both groups had classes and clinical experiences together; therefore, contamination between the groups may have occurred. This design attempted to compensate for the Hawthorne effect in that both groups received personal attention, having their questions answered and being given information and time to investigate patient scenarios (Polit, Beck, & Hungler, 2001). The difference in the intervention for Group 2 was the use of the HPS during the enrichment activities. Even though double-blind studies help control these limitations, they were not possible here. In spite of these limitations, the design was selected because the Brigham Young University College of Nursing baccalaureate program has been revised (began in fall 2003). If different admission groups were utilized, the revised courses would not have been similar to those admitted in fall 2002.
Another limitation is that I was involved in managing the enrichment activities for both groups and the postinterviews. My involvement in the use of the HPS may have influenced participants’ responses to the enrichment activities.
CHAPTER 4

RESULTS

A pilot instructional development project with undergraduate nursing students was undertaken. The participants were stratified (by learning style) and randomly assigned to one of two educational enrichment activity groups. Both groups involved the same patient cases or scenarios. Group 1 did not use the HPS and instead used discussions to talk about the patient scenarios and appropriate nursing actions. Group 2 used the HPS to simulate actual patient problems and required participants to perform appropriate nursing actions. Instruments to measure critical thinking, self-efficacy, learning style, and the benefits of HPS were used. The purpose of the study was to determine if Group 2 participants had higher gain scores in critical thinking and self-efficacy than Group 1 and if learning style was a moderating factor in this project. How students evaluated the enrichment studies was also investigated.

Data Management and Program Used for Analysis

After completion, the response sheets for the California Critical Thinking Disposition Inventory and the California Critical Thinking Skills Test were sent to Insight Assessment for scoring. The quantitative data from other instruments were recorded in SPSS 11.5 for Windows (SPSS, Inc., 2002). Upon receipt of the
scores for the critical thinking instruments, the data were added to the existing SPSS file. The quantitative data analysis was performed using the SPSS program comparing the two groups using a general linear model procedure where there were two factors, namely group and learning style quadrant, with the pretest score included as a covariate. The dependent response variables for the general linear model were the gain scores for each participant ($Y = \text{postscore} - \text{prescore}$).

Separate analyses were conducted for each instrument: (a) California Critical Thinking Disposition Inventory, (b) California Critical Thinking Skills Test, and (c) Self-Efficacy for Nursing Skills Evaluation. The corrected model considered the pretest scores. The overall group effect was analyzed as was the effect of learning style within groups.

The final interview audiotapes were transcribed verbatim by a research assistant, and answers to the open-ended questions were added to the qualitative data. The transcribed data were reviewed with an experienced qualitative nursing researcher and two research assistants. Possible descriptive categories were discussed and submitted to content analysis. The text was analyzed line by line several times, and data were coded for identified descriptive categories. As the data were coded, quotes illustrating the categories were identified. The resulting categories and quotes were shared with the experienced researcher and research assistants for clarification and confirmation.
Description of the Sample

Sixty-four undergraduate nursing students were eligible for the study. Subjects were recruited during March 2003. Twenty-eight students consented to participate. The 36 students who declined to participate stated a variety of reasons, including conflict with work schedule, unwillingness to take on one more activity each week, and too busy. Of the 28 students who consented and completed the initial study documents, 3 students dropped out of the study during the 1st week stating they were too busy to commit to 90 minutes each week through the remainder of the school term. Therefore, 25 students completed the study, 1 male and 24 females. One participant was Asian American and the remaining were Caucasian (as reported on the response sheets for the California Critical Thinking Disposition Inventory and the California Critical Thinking Skills Test). Of the 25 participants who completed the study, there were 12 juniors and 13 seniors. The participants’ ages ranged from 20 to 23, with a mean of 22.96 years. The reported grade point average ranged from 3.5 to 3.92, with a mean of 3.68. Four participants reported having some type of nursing care work experience, 1 as a patient care technician and 3 as certified nursing assistants. See Table 2 for participant characteristics.

The responses from the Learning Style Inventory were plotted for each participant on a grid to determine their learning style quadrant. The results are shown in Table 3. After determining learning style, the names of the participants were sorted into the four learning styles and then randomly assigned to one of two
### Table 2

*Participants’ Characteristics of Groups (N = 25)*

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number in group</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Gender</td>
<td>12 females, 1 male</td>
<td>12 females</td>
</tr>
<tr>
<td>Year in school</td>
<td>4 juniors, 9 seniors</td>
<td>7 juniors, 5 seniors</td>
</tr>
<tr>
<td>Mean age</td>
<td>22.85 years</td>
<td>21.67 years</td>
</tr>
<tr>
<td>Mean reported grade point average</td>
<td>3.67</td>
<td>3.71</td>
</tr>
<tr>
<td>Learning style</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Diverging</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>- Assimilating</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>- Converging</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>- Accommodating</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table 3

*Participants’ Learning Style (N = 25)*

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diverging</td>
<td>5</td>
<td>20.0</td>
</tr>
<tr>
<td>Assimilating</td>
<td>7</td>
<td>28.0</td>
</tr>
<tr>
<td>Converging</td>
<td>8</td>
<td>38.0</td>
</tr>
<tr>
<td>Accommodating</td>
<td>5</td>
<td>20.0</td>
</tr>
</tbody>
</table>
The project centered on the nursing actions and interventions for five different patient scenarios. Participants’ experiences in caring for similar patients (either in nursing school clinical experiences or in a work setting) can be seen in Table 4. The 25 participants reported previous experience with similar patients ranging from 1 (4%) for patients with disseminated intravascular coagulation and 10 (40%) for patients experiencing chest pain.

Group 1 and Group 2 were compared to determine if demographic differences existed. No statistically significant differences were found for age, reported grade point average, year in school, previous work experiences, or previous experiences with patients similar to the study scenario patients.

Table 4

*Participants’ Previous Experience With Caring for Patients With Conditions Similar to Study Scenarios (N = 25)*

<table>
<thead>
<tr>
<th>Type of patient</th>
<th>Experience</th>
<th>No experience</th>
<th>% with experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest pain</td>
<td>10</td>
<td>15</td>
<td>40</td>
</tr>
<tr>
<td>Pregnancy-induced hypertension</td>
<td>8</td>
<td>17</td>
<td>32</td>
</tr>
<tr>
<td>Trauma—motor vehicular accident</td>
<td>5</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Postpartum hemorrhage</td>
<td>2</td>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>Disseminated intravascular coagulation</td>
<td>1</td>
<td>24</td>
<td>4</td>
</tr>
</tbody>
</table>
Assessment of Data Distribution: Normality

The three dependent response variables (total gain scores for the California Critical Thinking Disposition Inventory, California Critical Thinking Skills Test, and Self-Efficacy for Nursing Skills Evaluation) were evaluated for normality with histograms and measures of central tendency and skewness. These variables were normally distributed.

The subscale gain scores for the California Critical Thinking Disposition Inventory were also evaluated for normality with histograms and measures of central tendency and skewness. Only the self-confidence and inquisitiveness subscales of the California Critical Thinking Disposition Inventory were normally distributed. The remaining disposition subscale variables had problems with normal distribution, including multiple modes for the truth-seeking, open-mindedness, analyticity, and systematicity subscales. The systematicity and maturity subscales were slightly negatively skewed.

The subscale gain scores for the California Critical Thinking Skills Test were also evaluated for normality with histograms and measures of central tendency and skewness. The data for four of the five critical thinking skills subscales (evaluation, inference, deductive reasoning, and inductive reasoning) were normally distributed. Only the analysis subscale was not normally distributed due to multiple modes.

The scores for the Written Performance-Based Evaluation of Video Scenarios were evaluated for normality with histograms and measures of central
tendency and skewness. The data were normally distributed.

**Analysis of Reliability for Self-Efficacy Instrument**

Two internal consistency estimates of reliability were computed for the Self-Efficacy for Nursing Skills Evaluation: (a) coefficient alpha and (b) split-half coefficient expressed as a Spearman-Brown corrected correlation. For the split-half coefficient, the scale was split into two halves such that the two halves would be as equivalent as possible. The value for the coefficient alpha (.88) was similar to the split-half coefficient (.94), indicating satisfactory reliability.

Item analyses were conducted on the 24 items of the Self-Efficacy for Nursing Skills Evaluation instrument. Each item was correlated with the total score for self-efficacy. All the correlations were greater than .30 except for 4 items: (a) "assessing vital signs (T, P, R, BP)" \( (r = .03) \), (b) "completing full physical assessment" \( (r = .09) \), (c) "checking uterine fundus" \( (r = .09) \), and (d) "performing uterine fundal massage" \( (r = .10) \). These items were retained because their content did not appear to differ markedly from the content of the other items.

The coefficient alpha for the Self-Efficacy for Nursing Skills Evaluation instrument was .87. Because the same sample was used to conduct the item analyses and to assess coefficient alpha, the reliability estimate is likely to be an overestimate of the population coefficient alpha.
Effect Size

The effect size for the enrichment activities was computed by determining the standard deviation of the pretest scores for each group for critical thinking and self-efficacy instruments. Between one-tenth and two-tenths of one standard deviation increase in the mean postscores indicate a small but meaningful effect. Between three-tenths and five-tenths of one standard deviation increase in the mean postscores indicate a moderate effect. Greater than five-tenths of one standard deviation increase in the mean postscores is generally considered a large effect size. Both groups experienced a moderate effect size in critical thinking disposition scores (California Critical Thinking Disposition Inventory) and a large effect size in critical thinking skill scores (California Critical Thinking Skills Test) and self-efficacy scores (Self-Efficacy for Nursing Skills Evaluation). The results are reported in Table 5.

Analysis To Answer Research Questions

Research Question 1

Do students who engage in the HPS learning experiences, Group 2 (HPS Group), show higher overall scores in critical thinking than students who engage in Group 1 (non-HPS Group)?

California Critical Thinking Disposition Inventory

A one-way analysis of variance (ANOVA) was conducted to examine the relationship between group assignment and learning style with the critical thinking
Table 5

*Effect Sizes for Critical Thinking and Self-Efficacy Scores by Group*

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Critical Thinking Disposition Inventory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Prescore SD</td>
<td>15.63</td>
<td>24.23</td>
</tr>
<tr>
<td>- Postscore mean increase</td>
<td>5.33</td>
<td>9.84</td>
</tr>
<tr>
<td>- Effect size</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>California Critical Thinking Skills Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Prescore SD</td>
<td>8.57</td>
<td>8.94</td>
</tr>
<tr>
<td>- Postscore mean increase</td>
<td>9.29</td>
<td>7.40</td>
</tr>
<tr>
<td>- Effect size</td>
<td>Large</td>
<td>Large</td>
</tr>
<tr>
<td>Self-Efficacy for Nursing Skills Evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Prescore SD</td>
<td>11.30</td>
<td>13.15</td>
</tr>
<tr>
<td>- Postscore mean increase</td>
<td>14.82</td>
<td>22.30</td>
</tr>
<tr>
<td>- Effect size</td>
<td>Large</td>
<td>Large</td>
</tr>
</tbody>
</table>

disposition gain score. The dependent variable, the gain score for the total scale score, was determined for each participant by subtracting the prescore from the postscore. The gain scores ranged from -19 to 31. The dependent variable was used in the analysis with the independent variables of group and learning style quadrant and the prescore as the covariate. The test was not significant, \( F (8, 16) = 2.20, p = .09 \). The results are shown in Table 6.
Table 6

*Analysis of Variance for Critical Thinking Disposition Total Scale Gain Scores*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected model</td>
<td>8</td>
<td>1394.01</td>
<td>174.25</td>
<td>1.20</td>
<td>.36</td>
</tr>
<tr>
<td>Learning style</td>
<td>3</td>
<td>168.30</td>
<td>56.10</td>
<td>.37</td>
<td>.77</td>
</tr>
<tr>
<td>Group</td>
<td>1</td>
<td>10.92</td>
<td>10.92</td>
<td>.08</td>
<td>.79</td>
</tr>
<tr>
<td>Group by learning style</td>
<td>3</td>
<td>786.00</td>
<td>262.00</td>
<td>1.80</td>
<td>.19</td>
</tr>
</tbody>
</table>

California Critical Thinking Skills Test

A one-way ANOVA was conducted to examine the relationship between group assignment and learning style with the critical thinking skills gain score. The dependent variable, the gain score for the total scale score, was determined for each participant by subtracting the prescore from the postscore. The gain scores ranged from -4 to 24. The dependent variable was then used in the analysis with the independent variables of group and learning style quadrant and the prescore as the covariate. The test for the corrected model were statistically significant, $F (8, 16) = 20.74$, $p = .000$, but not significant for learning style or group. The results are shown in Table 7.

California Critical Thinking Skills Test Subscales

A one-way ANOVA was conducted to examine the relationship between group assignment and learning style with the critical thinking skills subscale gain scores. The dependent variable, the gain score for each of the subscales, was
Table 7

Analysis of Variance for Critical Thinking Skills Total Scale Gain Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected model</td>
<td>8</td>
<td>1689.08</td>
<td>211.16</td>
<td>20.74*</td>
<td>.000*</td>
</tr>
<tr>
<td>Learning style</td>
<td>3</td>
<td>20.01</td>
<td>6.67</td>
<td>.66</td>
<td>.591</td>
</tr>
<tr>
<td>Group</td>
<td>1</td>
<td>32.82</td>
<td>32.82</td>
<td>3.22</td>
<td>.09</td>
</tr>
<tr>
<td>Group by learning style</td>
<td>3</td>
<td>30.23</td>
<td>10.08</td>
<td>.99</td>
<td>.42</td>
</tr>
</tbody>
</table>

*Significant $p \leq .05$.

determined for each participant by subtracting the prescore from the postscore. The gain scores ranged from -4 to 12. The dependent variable was used in the analysis with the independent variables of group and learning style quadrant and the prescore as the covariate. The tests for the corrected model were statistically significant for each subscale, but only the inductive reasoning subscale showed a statistically significant difference between the groups. The results are shown in Tables 8, 9, 10, 11, and 12. Descriptive analysis showed Group 1 (non-HPS) had higher mean inductive reasoning scores than Group 2 (HPS). The results are shown in Table 13.

Written Performance-Based Evaluation of Video Scenarios

An independent samples $t$ test was conducted to evaluate if the mean total scores for the Written Performance-Based Evaluation of Video Scenarios differed significantly between the two groups. Higher scores for one group may indicate
Table 8

Analysis of Variance for Critical Thinking Skills Analysis Subscale Gain Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>$df$</th>
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<th>$MS$</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected model</td>
<td>8</td>
<td>159.11</td>
<td>19.89</td>
<td>8.39*</td>
<td>.000*</td>
</tr>
<tr>
<td>Learning style</td>
<td>3</td>
<td>3.00</td>
<td>1.33</td>
<td>.56</td>
<td>.65</td>
</tr>
<tr>
<td>Group</td>
<td>1</td>
<td>3.17</td>
<td>3.17</td>
<td>1.34</td>
<td>.26</td>
</tr>
<tr>
<td>Group by learning style</td>
<td>3</td>
<td>11.68</td>
<td>3.89</td>
<td>1.64</td>
<td>.22</td>
</tr>
</tbody>
</table>

*Significant $p \leq .05$.

Table 9

Analysis of Variance for Critical Thinking Skills Evaluation Subscale Gain Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>$df$</th>
<th>$SS$</th>
<th>$MS$</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected model</td>
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<td>193.51</td>
<td>24.19</td>
<td>6.00*</td>
<td>.001*</td>
</tr>
<tr>
<td>Learning style</td>
<td>3</td>
<td>5.47</td>
<td>1.83</td>
<td>.45</td>
<td>.72</td>
</tr>
<tr>
<td>Group</td>
<td>1</td>
<td>10.37</td>
<td>10.37</td>
<td>2.57</td>
<td>.13</td>
</tr>
<tr>
<td>Group by learning style</td>
<td>3</td>
<td>29.17</td>
<td>9.72</td>
<td>2.41</td>
<td>.11</td>
</tr>
</tbody>
</table>

*Significant $p \leq .05$. 
Table 10

*Analysis of Variance for Critical Thinking Skills Inference Subscale Gain Scores*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected model</td>
<td>8</td>
<td>319.47</td>
<td>39.93</td>
<td>17.49*</td>
<td>.000*</td>
</tr>
<tr>
<td>Learning style</td>
<td>3</td>
<td>13.32</td>
<td>4.44</td>
<td>1.95</td>
<td>.16</td>
</tr>
<tr>
<td>Group</td>
<td>1</td>
<td>.79</td>
<td>.79</td>
<td>.35</td>
<td>.57</td>
</tr>
<tr>
<td>Group by learning style</td>
<td>3</td>
<td>7.80</td>
<td>2.60</td>
<td>1.14</td>
<td>.36</td>
</tr>
</tbody>
</table>

*Significant p ≤ .05.

Table 11

*Analysis of Variance for Critical Thinking Skills Deductive Reasoning Subscale Gain Scores*

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Corrected model</td>
<td>8</td>
<td>490.13</td>
<td>61.27</td>
<td>15.84*</td>
<td>.000*</td>
</tr>
<tr>
<td>Learning style</td>
<td>3</td>
<td>4.28</td>
<td>1.43</td>
<td>.37</td>
<td>.78</td>
</tr>
<tr>
<td>Group</td>
<td>1</td>
<td>6.19</td>
<td>6.19</td>
<td>1.60</td>
<td>.22</td>
</tr>
<tr>
<td>Group by learning style</td>
<td>3</td>
<td>19.90</td>
<td>6.63</td>
<td>1.71</td>
<td>.20</td>
</tr>
</tbody>
</table>

*Significant p ≤ .05.
Table 12

Analysis of Variance for Critical Thinking Skills Inductive Reasoning Subscale Gain Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected model</td>
<td>8</td>
<td>270.04</td>
<td>33.76</td>
<td>22.54*</td>
<td>.000*</td>
</tr>
<tr>
<td>Learning style</td>
<td>3</td>
<td>5.83</td>
<td>1.94</td>
<td>1.30</td>
<td>.31</td>
</tr>
<tr>
<td>Group</td>
<td>1</td>
<td>7.48</td>
<td>7.48</td>
<td>4.99*</td>
<td>.04*</td>
</tr>
<tr>
<td>Group by learning style</td>
<td>3</td>
<td>6.16</td>
<td>2.05</td>
<td>1.37</td>
<td>.29</td>
</tr>
</tbody>
</table>

*Significant $p \leq .05$.

Table 13

Means and Standard Deviations for Critical Thinking Inductive Reasoning Subscale by Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Range</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1, Non-HPS</td>
<td>0 to 9</td>
<td>13</td>
<td>3.31</td>
<td>3.38</td>
</tr>
<tr>
<td>Group 2, HPS</td>
<td>-4 to 7</td>
<td>12</td>
<td>2.67</td>
<td>3.75</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>25</td>
<td>3.00</td>
<td>3.50</td>
</tr>
</tbody>
</table>
more ability to think critically regarding patient care situations. The range of scores for the individual vignette was from 1 to 11. The range for total scores was from 14 to 31. The test for the total scores was not statistically significant, $t(23) = .194, p = .85$. The $t$ tests for the scores for each of the four video vignettes were also not statistically significant. Table 14 reflects the findings.

In summary, no statistically significant difference was found between the two groups in the total scale critical thinking gain scores, as measured by the California Critical Thinking Disposition Inventory and the California Critical Thinking Skills Test. Because of small sample size, there is limited power to detect the effect of group or learning style differences. Both groups increased their critical thinking skill scores, but the participants engaged in the HPS learning experiences did not score higher than those engaged in the classroom discussion group. The gains in critical thinking scores were predicted by prescores, not by group. An analysis of the subscales of the two critical thinking instruments elicited similar findings.

Research Question 2

Do students who engage in the HPS learning experiences, Group 2, show higher self-efficacy scores in basic nursing skills than students who engage in Group 1 (non-HPS)? Responses from the Self-Efficacy for Nursing Skills Evaluation were summed for a total score. The dependent variable, the gain score for the total scale score, was determined for each participant by subtracting the prescore from the postscore. A one-way ANOVA was conducted to examine the
Table 14

*Group Differences in Written Performance-Based Evaluation of Video Scenarios Scores (N = 25)*

<table>
<thead>
<tr>
<th></th>
<th>Group 1 (n = 13)</th>
<th>Group 2 (n = 12)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Total score</td>
<td>20.85</td>
<td>4.18</td>
<td>20.50</td>
<td>4.74</td>
</tr>
<tr>
<td>Vignette 2 score</td>
<td>3.62</td>
<td>1.80</td>
<td>4.08</td>
<td>.90</td>
</tr>
<tr>
<td>Vignette 3 score</td>
<td>5.08</td>
<td>1.04</td>
<td>4.58</td>
<td>1.68</td>
</tr>
<tr>
<td>Vignette 4 score</td>
<td>7.77</td>
<td>1.88</td>
<td>6.67</td>
<td>2.57</td>
</tr>
<tr>
<td>Vignette 5 score</td>
<td>4.38</td>
<td>2.02</td>
<td>5.17</td>
<td>2.20</td>
</tr>
</tbody>
</table>
relationship between group assignment and learning style with the self-efficacy gain score. The dependent variable was used in the analysis with the independent variables of group and learning style quadrant and the prescore as the covariate. The test for the corrected model was statistically significant, $F(8, 16) = 4.33$, $p = .01$, but not significant for learning style or group. The results are shown in Table 15.

Both learning activity groups increased in self-efficacy scores in basic nursing skills, but no statistically significant difference between the groups was found. The participants in the HPS learning experiences group did not show higher self-efficacy scores than the participants in the classroom discussion activity group. The gains in self-efficacy scores were predicted by prescores, not by group.

**Research Question 3**

Is learning style (determined by the Kolb Learning Style Inventory) a moderating factor in critical thinking and self-efficacy (as measured as a change in the total scale scores) in this study? After the participants completed the Learning Style Inventory at the beginning of the project, the instrument was scored as instructed, and the combined scores were marked on a graph indicating the participants’ learning style quadrant. The names of the participants were sorted into the four learning styles according to the results of the Learning Style Inventory. Names from each learning style group were randomly assigned to one of the two groups by drawing names placed into a hat, alternating between Group 1 and Group 2, so that each learning style was equally represented in each of the two
Table 15

Analysis of Variance for Self-Efficacy Total Gain Scores

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected model</td>
<td>8</td>
<td>1312.97</td>
<td>164.12</td>
<td>4.33*</td>
<td>.01*</td>
</tr>
<tr>
<td>Learning style</td>
<td>3</td>
<td>50.42</td>
<td>16.80</td>
<td>.44</td>
<td>.726</td>
</tr>
<tr>
<td>Group</td>
<td>1</td>
<td>146.69</td>
<td>146.70</td>
<td>3.87</td>
<td>.07</td>
</tr>
<tr>
<td>Group by learning style</td>
<td>3</td>
<td>50.90</td>
<td>16.96</td>
<td>.48</td>
<td>.72</td>
</tr>
</tbody>
</table>

*Significant $p \leq .05$.

enrichment groups.

The analyses were conducted to examine the relationship between group assignment and learning style with the critical thinking and self-efficacy skills gain score. The independent variables of learning style quadrant and group assignment were used during the analyses. The results showed no significant learning style effect (see Tables 6, 7, 8, 9, 10, 11, and 12).

Research Question 4

How do students evaluate the enrichment activities?

Use of Human Patient Simulator Survey. The survey asked the 12 participants in Group 2 to indicate how beneficial they thought their overall experience with the HPS learning scenarios are in their nursing education in five areas: (a) understanding the physiology of patient conditions, (b) performing the expected nursing interventions, (c) working as a team in patient care situations,
(d) increasing confidence in their ability as a nurse, and (e) developing critical thinking skills. The means of these items of the Use of Human Patient Simulator Survey ranged from 4.03 to 4.83 (5 = extremely beneficial, 4 = very beneficial, 3 = moderately beneficial, 2 = slightly beneficial, and 1 = not at all beneficial). Most participants rated their experience using the HPS as very to extremely beneficial to their nursing education. Table 16 reports these findings.

All 25 participants who were involved in the enrichment activities completed the interview. Only those students who were involved in Group 2 enrichment activities completed the Use of the Human Patient Simulator Survey. After transcription of the interviews and the open-ended questions from the Use of the Human Patient Simulator Survey, the data were read and analyzed. Interesting to note was that volume of the data from the interviews from Group 2 (HPS) was much lengthier and richer in description than Group 1 (non-HPS). The Group 2 transcript consisted of 756 lines (9,354 words) of data, whereas the Group 1

Table 16

<table>
<thead>
<tr>
<th>Item</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding physiology</td>
<td>12</td>
<td>4.08</td>
<td>.79</td>
</tr>
<tr>
<td>Performing nursing interventions</td>
<td>12</td>
<td>4.33</td>
<td>.78</td>
</tr>
<tr>
<td>Working as a team</td>
<td>12</td>
<td>4.42</td>
<td>.79</td>
</tr>
<tr>
<td>Having confidence in abilities</td>
<td>12</td>
<td>4.58</td>
<td>.67</td>
</tr>
<tr>
<td>Developing critical thinking</td>
<td>12</td>
<td>4.83</td>
<td>.39</td>
</tr>
</tbody>
</table>
transcript was 60% shorter with only 301 lines (3,481 words). During the reading and coding, it was evident that students in Group 2 showed an excitement and enthusiasm for the enrichment activity. Even though participants from Group 1 thought the enrichment activity was helpful, their comments lacked excitement. A typical comment from a participant in Group 2 illustrates the excitement and enthusiasm for the experience.

I think in nursing school I’ve lacked confidence and that’s been the most annoying part of the last 8 months, and I think that’s what the simulator does is that it boosts confidence. And also, as a nurse, there are so many things that you need to take into account. You have to take into account the emotions of the patient, the physiology of the patient, what’s happening to them physically, what the doctor’s orders are that are somewhere in some chart that you need to know if something happens. With the simulator, you’re forced to take all of those things into account, which is the most real situation that you can have, and there is nothing that you can do on paper in any fashion that can make you feel like that. It’s not just sitting in front of you, you have to know where to go. You have to know math; it’s like every single thing you learn is into one experience, and you can’t compensate for that, except for being in the hospital. But if we’re talking about giving students exposure to more stressful situations, the simulator is perfect for that.

Three descriptive categories regarding the enrichment activities emerged during content analysis of the qualitative data. The descriptive categories for each group identified were (a) reasons for volunteering to participate, (b) benefits of the enrichment activity, and (c) drawbacks of the enrichment activity. The two groups differed in some aspects (see Table 17).

Reasons for volunteering to participate. Participants in both groups stated the compensation of a $40 gift card and the possibility of winning one of the $250 gift cards motivated them to participate. Since completing all study requirements
Table 17

*Descriptive Categories Regarding Enrichment Activities*

<table>
<thead>
<tr>
<th></th>
<th>Group 1 (non-HPS)</th>
<th>Group 2 (HPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasons for volunteering to participate</td>
<td>Receiving compensation</td>
<td>Receiving compensation</td>
</tr>
<tr>
<td></td>
<td>Having an opportunity for critical thinking/learning style testing</td>
<td>Having an opportunity for critical thinking/learning style testing</td>
</tr>
<tr>
<td></td>
<td>Increasing knowledge</td>
<td>Increasing knowledge</td>
</tr>
<tr>
<td></td>
<td>Hoping to be in HPS group</td>
<td>Desiring to contribute to nursing research</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Honing clinical skills</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gaining confidence in acute care</td>
</tr>
<tr>
<td>Benefits of the enrichment activity</td>
<td>Stimulated critical thinking</td>
<td>Stimulated critical thinking</td>
</tr>
<tr>
<td></td>
<td>Collaborated with others</td>
<td>Collaborated with others</td>
</tr>
<tr>
<td></td>
<td>Applied theory in discussion</td>
<td>Increased organizational skills</td>
</tr>
<tr>
<td></td>
<td>Integrated learning</td>
<td>Increased ability to prioritize</td>
</tr>
<tr>
<td></td>
<td>Provided relaxed, stress-free learning environment</td>
<td>Increased confidence in working with patients and physicians</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased knowledge of medications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provided hands-on learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Thrown into real situation”</td>
</tr>
<tr>
<td>Drawbacks of the enrichment activity</td>
<td>Time, scheduling</td>
<td>Time, scheduling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inconsistent research assistants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HPS not real (e.g., breath sounds not realistic and “hard to simulate reality”)</td>
</tr>
</tbody>
</table>
was mandatory to be eligible for the gift cards, several participants stated the promise of a gift card kept them coming to the weekly educational activities.

Several participants from both groups expressed their feelings regarding the testing. "I liked the tests at the beginning." "How we learn." "I have never been very good about knowing how I best learn." The results of the pretesting and posttesting were given to each participant after completion of the study.

Participants from both groups mentioned increasing their knowledge as a reason to volunteer. Typical of their responses were: "I just wanted to learn more. I thought it would help me to learn better." "To learn more, to have different kinds of learning opportunities."

Only participants in Group 2 mentioned they wanted to contribute to nursing research. One participant volunteered because she had started helping another professor with research and realized that studies with a "bigger number of people, the better it was, . . . so I started thinking, oh, they need more people."

The HPS participants (Group 2) stated they had volunteered so they would have the opportunity to practice their clinical skills and to gain more confidence. One participant said, "I did it to help me further my nursing skills." Another stated, "I really hoped I would be in the simulator group because when I get to the hospital, I'm really nervous. . . . I felt like if I practiced a little, once I get to the hospital, I would know what to do."

Participants said they volunteered hoping they would have the opportunity to work with the HPS. Only 1 of the HPS participants (Group 2) did not want to
work with the simulator. “I think there were a few minutes of ‘timidness’ to be doing hands-on with the simulator with people there watching you . . . . After I got into it and after the 1st week, I didn’t even think about that anymore.” One participant expressed the sentiments of most participants of the groups who did not use the simulator. “I signed up for the study because I wanted a chance to work with SAM [name given to simulator by students], but it was OK I didn’t, because I learned a lot in the discussions.”

**Benefits of the enrichment activity.** Participants from both groups expressed benefits to participating in the enrichment activities. All agreed that the activities were worthwhile and that they would participate again if given the opportunity.

Participants in both groups also spoke about critical thinking. A participant from Group 1 (non-HPS) stated, “It taught me how to think because you break it down into step by step—and analyze what you do, what you could do, and what the doctors expect you to do.” Group 2 (HPS) participants expressed similar thoughts: “We learn so much and not just in performing the skills, but in critical thinking or how to handle a situation.” During the interviews, other participants agreed with these comments and expressed similar opinions.

Collaborating with others was mentioned as a benefit by both groups. The non-HPS participants (Group 1) related that “being able to discuss the case studies . . . rather than just do book work” was beneficial to learning. Another participant mentioned, “In here we got to talk to you and the other students and discuss the different priorities or nursing actions that would take place” for the patient.
Participants in Group 2 (HPS) spoke about working together as a team, as illustrated by 1 participant.

I also liked working with other people because, as a nursing student, usually it’s just you and your nurse, and you don’t have full responsibility, but we had full responsibility and we were also a team, which is an experience that I don’t think in nursing school you get very often.

Both groups expressed that they were able to learn from each other by discussing and asking each other questions.

The Group 1 (non-HPS) participants expressed their views. They thought the sessions helped them use information from theory lectures, and they also thought the information could be used in their clinical rotations. This belief was illustrated by 1 participant. “I think that even in clinical I would use stuff from these sessions even more than lecture. . . . Those who didn’t have it don’t know as much what to do.” The comments demonstrated that they think the sessions helped them integrate theory into practice and facilitated learning the profession of nursing by “putting together what we learn in class to what the nurses do and why they do what they are doing.”

Many comments from the participants in Group 2 (HPS) revealed that the HPS sessions helped them improve in their organizational and prioritization skills. “We learned a lot of organizational skills, critical thinking, and how to apply doctors’ orders, . . . what was going on in that moment. I really thought it helped to perform better in clinical.” When asked about the benefits of the HPS session, 1 participant commented, “I think for me it is prioritizing the different patients that
have different problems. . . . We made sure we looked around, checked I&Os [intakes and outputs], . . . prioritizing the different situations.” Another participant stated, “I think it was a well-rounded experience, and we had practice on the things that we learned the 1st week of nursing school from basic assessment, all the way up to what we learned a few weeks ago.”

The HPS group also discussed how the session helped increase their confidence in working with patients and physicians. Two participants’ comments illustrate this concept. “We learned so much and not just performing the skills, . . . building up our confidence and courage to call the doctor or say something to the patient.” “It gave me experience. . . . I think that I’ll be more comfortable and have a clearer head when the situation really comes along.” Another participant summed it up with the following comment: “I’ve lacked confidence, and that’s been the most annoying part of the last 8 months, and I think that’s what the simulator does is that it boosts your confidence.”

Both groups mentioned learning about medications and drug calculations. The classroom discussion group stated that the discussion on medications and calculations was not very helpful, as illustrated by the following comments: “I had a hard time when we’d go over medication calculation. . . . Just picturing doesn’t work for me.” “I kind of need to see and do calculations instead of just talking about them.” Several participants from Group 2 (HPS) said they knew more about medications and calculations than fellow students in clinical because “we had practiced them, . . . learned it in our research project.”
Many of the HPS participants spoke about the benefits of hands-on experience. “I just think the hands-on practical experience is going to help me in the future.” Some felt they learn better with actual practice. One participant commented:

I’m a person that likes to learn with hands-on and watching things, not really being lectured. But, if I get in there, I will learn it and remember it more if I can actually get my hands on it and have to make the decisions and do it myself, then I’ll remember it.

Group 1 participants said they enjoyed the stress-free learning environment during the classroom discussion. One participant’s comment exemplified this observation. “I like that it’s relaxed, and you can ask any random question that you have.” This stress-free learning environment was not mentioned by the HPS participants. Most of the Group 2 participants felt that the sessions were stressful at times because they had to deal with issues as if in an actual situation. The reality of the sessions is illustrated with the following comments:

It took us a while to get used to him [simulator], but by the end, we all felt like he was a real patient, and we would go in and act like we really would. I think the simulation and the whole setting was really realistic.

“I think it is the next best thing to clinical. It’s as close as you can get and so beneficial.” The reality of the simulation sessions and being “thrown into [a] real situation” is exemplified by 1 HPS participant.

With the simulator, you’re forced to take all of those things into account, which is the most real situation that you can have, and there is nothing that you can do on paper in any fashion that can make you feel like that. . . . but if we’re talking about giving students exposure to more stressful situations, the simulator is perfect for that.
Drawbacks of the enrichment activity. Both groups felt the time involved and scheduling of enrichment activities were drawbacks. One participant noted, "The only problem that I had was the time." Another stated, "I kind of had the impression that I could have it fit in my schedule, not scheduled for me."

Participants from both groups stated that they are very busy and trying to add one more activity each week was difficult at times.

Some of the HPS participants felt the research assistants running the scenarios were inconsistent. One comment illustrates this sentiment.

Sometimes they'd give us direct feedback and sometimes they'd just kind of sit there, and you weren't sure if you were doing it right or not, so I felt like that wasn't always consistent. . . . Sometimes they'd help you, so you'd kind of wait for them to help you, and then other times you'd kind of wait for them to help you, and they wouldn't help you, and then you didn't know if it was right or wrong, so then you were like, am I right or wrong? That inconsistency was a little hard.

Several of the HPS group participants stated that even though the simulator is quite realistic, the breath sounds were not. One participant's statement exemplified many other participants' opinions. "I just remember trying to listen to his breath sounds and thinking that he had all these problems, but really he was normal because of all the noises inside of him." Along with this drawback, several participants noted that it is "hard to simulate reality." All the participants in one interview agreed when 1 participant declared:

I think that as good as SAM is, it's really hard to simulate reality. I mean, it's definitely better than a group discussion, but it's kind of hard because you dress him up as a really ugly woman, and the whole time you're just laughing because he's so ugly. So that's the
hardest part about it. Even though it’s more real and you get more practice, it’s still hard to make it as real as it needs to be.

In summary, both HPS and non-HPS participants stated they felt the enrichment activities were beneficial. Whether classroom discussion style or HPS experience, most agreed that this type of activity ought to be added to the nursing curriculum.
CHAPTER 5

DISCUSSION

Nursing Education Implications

Because nurse educators have used patient care simulations to enhance the learners’ experience, it is important to study the efficacy of simulation, especially because in the last few years, some schools and colleges of nursing have started using HPS as part of the curriculum. Education activities using the HPS may help meet the need for creative methods to educate nursing students by creating experiences for clinical learning without increasing the number of clinical sites or nurses to mentor students. Nurse educators in Colorado and Florida are currently exploring the possibility of replacing some clinical hours with simulation experiences (T. Doyle, personal communication, March 4, 2004).

This project attempted to determine if there was a difference in critical thinking and self-efficacy of basic nursing skills scores between two enrichment activity groups. One group participated in weekly classroom discussions of patient cases and the other group participated in weekly sessions using HPS to experience the nursing care and interventions for specific patient scenarios. Both groups used the same patient cases or scenarios for the enrichment activities.

Similar to other health-care education studies on the effectiveness of simulation (Champagne et al., 1989; Ewy et al., 1987; Garfield et al., 1989;
Gilbart et al., 2000; Gordon et al., 1980; Harrell et al., 1990a, 1990b; Howard, 1987; Woolliscroft et al., 1987), this project determined there were positive effects on the results of the study instruments for the group using HPS (see Table 5). The classroom discussion group also experienced similar findings with a moderate effect size for critical thinking disposition and a large effect size for critical thinking skills and self-efficacy. Both groups increased in the mean instrument scores after the enrichment activities.

Participants using HPS in this project articulated many of the same advantages of high-fidelity simulations cited in the literature (Fletcher, 1996; Friedrich, 2002; Helmreich & Davies, 1997; Issenberg et al., 2001; Miller, 1987; Morton, 1996; Nehring et al., 2001; Ziv et al., 2000). During the interviews, participants stated that the activities were beneficial because they stimulated critical thinking, encouraged collaboration with others, increased their organizational skills and confidence in nursing skills, and required hands-on learning. They also stated that the feedback and encouragement to think for themselves was beneficial. This was validated through observations and field notes of the HPS group activities as indicated by four behavioral changes. The first change noted was in organizational skills. For example, during the 1st week, participants were unorganized and had a difficult time carrying out a complete assessment and gathering all supplies needed for a procedure. However, by the 5th week, the participants were able to conduct a timely and complete assessment and rarely forgot a needed supply. The second behavior change noted was in prioritization skills. Initially the participants could
not decide which cares or interventions to do first, and when calling the physician did not prioritize the data the physician would need to make a decision. However, by the last week of the intervention, the participants were able to prioritize care and needed data quickly, even sometimes using the white board to facilitate prioritization. The third behavioral change noted was in confidence. During the first session, participants were unsure of their assessment findings and essential actions. They commonly asked each other, with puzzled looks, what the correct decision to make was. By the last session, the participants showed confidence in themselves and only occasionally asked for a consultation with fellow participants or discussed ideas with each other. The fourth behavioral change noted was in leadership skill. During the 1st week of the project, even when a participant was assigned to be the primary nurse, that participant did not assume the role. However, by the fifth session most participants functioned well in their assigned leadership roles. The participants also stated they liked changing roles each week because it gave them a chance to practice different skills. The participants also spoke of similar disadvantages of simulators as cited in the literature, including the lack of realism in the simulator and simulator responses.

Nurse researchers have found that case study discussions encourage critical thinking, problem solving, self-confidence, self-directed learning, communication, team skills, interdisciplinary collaboration, and lifelong learning (Alexander et al., 2002; Baker, 2000; Papastrat & Wallace, 2003; Richardson & Trudeau, 2003; Tomey, 2003; Williams, 2001). The participants in the classroom discussion
groups cited similar benefits from the enrichment activities, including stimulation of critical thinking, collaboration with others, and application and integration of theory learned in class into patient cases.

Both enrichment groups showed an increase in critical thinking skill scores and self-efficacy scores. However, analysis of the gain scores for the critical thinking and self-efficacy instruments revealed no statistically significant difference between the two groups.

Possible reasons for the nonsignificant statistical results may be the small sample size, limiting the power to detect the effect of group or learning style differences. Another explanation may be that the HPS experience does not add to an in-depth classroom case study discussion. The HPS educational activity may also place participants into a different environment than case study discussion, thus requiring different attention priorities such as completing the tasks of assessing the patient and intervening appropriately before the patient condition worsens.

Another possible reason for nonsignificant statistical results is that the problem-based learning methodology for both groups was similar. As noted by some participants during the interviews, there were also issues with inconsistent feedback during the HPS sessions. Authentic problem-based learning, as described by Barrows (1986, 2000), is a disciplined methodology of problem-based learning that was not strictly adhered to during the enrichment activities. Finally, another possible explanation for nonsignificant statistical results is that there may be unmeasured dimensions in the educational activities, particularly in the HPS
experience that the project instruments do not capture.

Even though there were no significant statistical differences found, the results of the study indicate participants involved in these enrichment activities thought they were beneficial to their nursing education. The participants also thought these types of activities should be included in the regular nursing curriculum. The qualitative data indicate that the participants using the HPS were more verbal and more enthusiastic than those involved in the classroom discussion group.

Limitations of the Study

The limitations of this study can be divided into three areas: (a) sample issues, (b) HPS issues, and (c) instrument issues. The limitations specific to each area are discussed.

Sample Issues

One limitation of this project was that participants in both groups had classes and clinical experiences together; therefore, there may have been contamination between the groups. Another limitation was that participants in both groups received personal attention, had their questions answered, and had time to learn about the patient scenarios.

The sample size was another limitation of this study. The sample size of 25 did not meet the required sample sizes for the California Critical Thinking Disposition Inventory and the California Critical Thinking Skills Test but was met
for the Self-Efficacy for Nursing Skills Evaluation. Because of the small sample size, there was limited power to detect the effect of group or learning style differences.

A fourth limitation, related to the sample, was that all participants were from one college of nursing and, therefore, may not be representative of most nursing students. The students also had high grade point averages and were younger than the national average for nursing students.

HPS Issues

The HPS has limitations as well; it is not a real patient. There are human factors or conditions that are difficult to simulate such as color of skin, swelling, or changes in appearance. However, many participants noted that the HPS is “as close to the real thing as possible” even though it cannot simulate everything.

In addition, at times, the simulator would not respond as expected, sometimes because of how it was programmed but occasionally because of a mechanical or software failure. These situations had to be addressed during the session by stopping the scenario and rebooting the computer. The stopping and restarting of the HPS decreased the reality of the scenario. This situation may have affected the project outcomes and needs further investigation.

Instrument Issues

The instruments used in this study may not be measuring the concepts of the project as related to the profession of nursing. Even though the critical thinking
instruments have been used with nursing students in the past, there have been conflicting reports of significant findings (Bowles, 2000; Smith-Blair & Neighbors, 2000; Spelic et al., 2001). Perhaps another measure may be more sensitive in detecting differences in critical thinking between two different educational interventions for nursing students. The Learning Style Inventory has also been used with many disciplines and is intended to help people determine which style they are most likely to use while learning. However, in this project, learning style did not seem to be a moderating factor on critical thinking or self-efficacy. Perhaps learning style is not as important a moderating factor in critical thinking and self-efficacy as another variable. Finally, I developed the self-efficacy instrument for this prototype tryout and may not be useful to other researchers. This instrument needs further testing with other nursing students to determine if it is an appropriate measure for self-efficacy.

Recommendations for Future Research

The first recommendation would be to replicate the project with a larger, more diverse sample from a variety of geographic areas. By doing so, the findings may be validated or new findings may emerge showing a difference between educational interventions on critical thinking and self-efficacy.

Future research should also include participants who do not participate in enrichment activities and who complete only the regular course work. Because this project did not include such a group, it cannot be determined if time in nursing school increases the critical thinking and self-efficacy scores or if enrichment
activities increase the scores.

Third, future research ought to explore the opportunities to learn the dimensions (e.g., organization, prioritization, confidence, and leadership) the HPS may offer that the classroom discussions do not offer. A qualitative observational study with a concerted effort to videotape or make vigilant field notes during observation of students during HPS sessions may allow future researchers to examine variables that more accurately capture the learning provided by each enrichment activity. Such a study may yield information necessary to select appropriate instruments for nursing education studies. If instruments do not exist, researchers may need to develop appropriate measures.

Fourth, future explorations should examine the ways HPS adds to the problem-based learning methodology. Nurse educators are using problem-based learning (Alexander et al., 2002; Baker, 2000; Papastrat & Wallace, 2003; Richardson & Trudeau, 2003; Tomey, 2003; White et al., 1999; Williams, 2001), but the challenge is determining how best to use HPS in this methodology.

Fifth, after replication studies are completed to increase sample size, schools and colleges of nursing owning an HPS should undertake a multisite study on the efficacy of simulation in nursing education. Finally, a study developed to examine outcome measures such as NCLEX-RN (National Council Licensure Examination for Registered Nurses) pass rates may be difficult but could shed light on simulation.
Conclusions

The purpose of this prototype tryout was to determine the effects of two different educational enrichment experiences on critical thinking (disposition and skills) and self-efficacy (being able to perform basic nursing skills) in a sample of undergraduate nursing students. Findings indicate that there was an increase in critical thinking skill scores and self-efficacy scores for both groups, but there was no difference between the two groups. The preferred learning styles of the participants were not a moderating factor in the scores. Even though the quantitative data did not demonstrate differences between the groups, the qualitative data indicate a difference. The HPS group increased in organizational, prioritization, and leadership skills as well as in their confidence. The results of the study indicate participants involved in both enrichment activities thought the activities were beneficial to their nursing education and a positive experience recommending the activities for future students. Perhaps schools of nursing ought to expand the use of case studies and discussions because students found them helpful in stimulating critical thinking, collaborating with peers, and applying the didactic knowledge from class into actual patient cases. In addition, if programs have the resources to purchase a human simulator, they need to use it in as many courses as possible so students will have the opportunity to actually practice caring for a variety of patients.

This pilot instructional development project is a beginning point for research regarding high-fidelity simulation with nursing students. Those in
education using human simulators need to continue documenting changes in student behaviors and achievements both quantitatively and qualitatively. In addition, as these data are gathered and analyzed, results need to be shared with the profession since there is paucity in the literature.
APPENDIX A

HUMAN PATIENT SIMULATOR SPECIFICATIONS
Pulmonary

The simulator shall physically consume oxygen, produce carbon dioxide consistent with the selected pathology and uptake, or excrete nitrous oxide, sevoflurane, isoflurane, enflurane, and halothane in accordance with the principles of uptake and distribution.

Airway resistance, lung compliance, and chest wall compliance shall be variable and independently controlled for the right and left lungs, and their values shall be controlled automatically by the scenario in process. The instructor shall also have the capability to override.

Ventilation results in the appropriate production of expired CO2, which registers correctly on external monitoring equipment such as a capnograph or respiratory gas analyzer.

The three modes of ventilation (spontaneous, assisted, and mechanical) can be superimposed on one another. (For example, a patient receiving mechanical ventilation can breathe spontaneously, creating the clinical condition of fighting the ventilator.)

The respiratory system shall be capable of triggering a ventilator. (For example, in SIMV or assist-control modes, the simulator allows ventilator weaning to be realistically rehearsed.)

Symmetric and asymmetric lung ventilation shall be automatically supported in response to bilateral and unilateral variable compliance and resistance changes, proper or incorrect intubation and pathophysiologic states such as tension pneumothorax without the need for instructor intervention.

The mannequin’s upper chest shall rise and fall synchronously with the inflationary state of the underlying lungs. This movement shall be synchronized with the inspiration and expiration of spontaneous, manual, and automatic ventilation of the lungs and combinations thereof.

In the case of endobronchial intubation, breath sounds and chest excursion shall be automatically absent over the lung that is not ventilated. In the case of esophageal intubation, breath sounds, chest excursion, and CO2 output shall be automatically absent.

Pulmonary response to intravenously injected drugs shall be automatically appropriate and dose dependent without the need for instructor intervention.
The patient’s arterial blood gases and pH shall be automatically consistent with the appropriate pathology without the need for instructor intervention and continuously calculated with the capability of being displayed on the main system computer and the instructor’s hand-held remote PC (personal computer).

The patient’s alveolar gas concentrations shall be automatically appropriate and consistent with the patient’s pathology without the need for instructor intervention.

**Cardiovascular**

The hemodynamic response to the arrhythmias shall be physiologically correct. Myocardial oxygen balance and cardiac ischemia shall automatically influence the cardiac rhythm resulting in a realistic response of the rhythm to hypoxemia without the need for instructor intervention.

The mannequin shall have palpable carotid pulses as well as left and right radial, brachial, femoral, popliteal, and pedal pulses. A pulse deficit shall automatically occur if the systolic arterial blood pressure falls below the specified thresholds.

The left and right radial, brachial, femoral, popliteal, and pedal pulses shall be independently controllable by the scenario in process and by the instructor for presence and absence in the case of trauma to a specific extremity.

An invasive hemodynamic monitoring package shall provide the capability to measure and monitor the following: arterial blood pressure, left and right ventricular pressure, central venous pressure, right arterial pressure, pulmonary artery pressure, pulmonary artery occlusion (wedge) pressure, and thermodilution cardiac output.

Wedge pressure shall be obtained by using the inflation syringe on the end of an actual pulmonary artery catheter inserted in the simulated right jugular vein of the mannequin.

A pulmonary artery catheter shall allow for the thermodilution cardiac output value to be displayed on the monitor emulator that correctly responds to changes in the patient’s cardiovascular physiology.

The introduction and progressive insertion of a Swan-Ganz catheter, synchronous with the appropriate waveforms, shall be simulated and displayed on the monitor emulator.
The patient’s cardiovascular response to intravenously injected drugs or inhaled anesthetics shall be automatically appropriate and dose dependent without the need for instructor intervention.

**Pediatric**

METI is the only company that makes a Pediatric Human Patient Simulator (Pediatric HPSTM).

**Difficult Airway**

Right or left main stem endobronchial intubation shall automatically result in unilateral breath sounds and chest excursion.

Esophageal intubation shall automatically result in the absence of breath sounds, chest excursion, and CO2.

A laryngospasm actuator shall automatically result in a cannot ventilate, cannot intubate situation.

**Neurologic System**

The right arm of the mannequin shall include electrode attachments for a peripheral nerve stimulator (PNS). The simulator shall automatically detect the PNS stimulus pattern (single twitch, train of four, and tetanus). Based upon the stimulus pattern detected, the level of neuromuscular blockade and the type of neuromuscular blockade administered (depolarizing or nondepolarizing), the simulator shall automatically generate the appropriate twitch response.

**Trauma Features**

**Reactive Eyes**

The pupils of each eye shall constrict and dilate automatically in response to changing light stimuli in a consensual manner. To simulate neurological trauma, the size of each pupil shall be set independently to a fixed diameter ranging from 2 mm to 9 mm. Additionally, the eyelids shall open and close spontaneously or can be fixed in a closed position. When closed, the student shall be able to manually open the eyelids for clinical inspection.
Pericardiocentesis

Subxyphoid needle pericardiocentesis shall be able to be performed to resolve acute cardiac tamponade. Students shall be able to insert the pericardiocentesis needle directly into the mannequin, and if the needle is properly placed, pericardial fluid shall be withdrawn that is automatically reflected by the dynamic improvements in cardiac filling, cardiac output, and blood pressure. If the needle is advanced too far, simulating entry into the right ventricle, excess fluid shall be able to be withdrawn. Furthermore, ECG Lead V shall be able to be monitored for injury patterns resulting from cardiac irritation when attached to the needle.

Needle Decompression of Tension Pneumothorax

Decompression of a tension pneumothorax shall be performed by inserting a needle at the mid-clavicular line of the second intercostal space on the left side of the mannequin. Proper needle placement shall result in a rapid decompression, a rush of air exiting the proximal end of the needle, and automatic improvement in pulmonary mechanics and gas exchange.

Diagnostic Peritoneal Lavage

The simulator contains a diagnostic feature for trauma to verify internal bleeding. This feature is Advanced Trauma Life Support approved.

Pharmacology and Drug Recognition System

The patient shall appropriately and automatically respond to incorrect medications with no user intervention necessary. Likewise, over- and underdose response shall be automatic and appropriate.

Patient Monitoring

The simulator shall be able to be connected to standard patient monitoring equipment produced by all major manufacturers providing the student with the ability to learn to use and interact with the actual equipment used in a clinical setting. The physiological models with the simulator shall generate the appropriate signals that drive patient monitoring equipment in a realistic manner via the standard transducer inputs.
APPENDIX B

SCENARIO WORK SHEETS
**Scenario:** Patient with trauma following Motor Vehicle Accident (MVA)

**Background/Patient History:**
Charlie Jones, 61 y/o male, involved in MVA accident today. History of hypertension, MI 5 years ago. TURP 3 years ago. Smokes 2½ packs per day. Alcohol – 3-4 beers each night. Medications, Vasotec, Lasix, and occasionally Nitro SL for chest pain.

**Physician Orders:**
- Admit to Medical
- NPO
- Start IV with D5LR at 125 cc/hr
- I & O
- VS q 4 hours
- Run EKG strip
- Start O2 at 2 liters/min if sats< 90
- CBC, Admission Chemistries
- Call me when patient admitted

<table>
<thead>
<tr>
<th>STATE</th>
<th>EVENTS</th>
<th>EXPECTED PARTICIPANT BEHAVIORS/INTERVENTIONS</th>
<th>QUESTIONS FOR PARTICIPANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Admit</td>
<td>Foley placed in ER, IV blown, uncomfortable</td>
<td>Full assessment&lt;br&gt;Determine abnormal findings&lt;br&gt;Response to abnormal (pt. position, further investigation, saturated leg dressing)</td>
<td>1. What may the abnormal finding represent?&lt;br&gt;2. Is this a new or existing abnormal?</td>
</tr>
<tr>
<td>Initiate Orders</td>
<td>Pt. complains of chest pain</td>
<td>Start IV&lt;br&gt;Connect EKG leads&lt;br&gt;Start O2 if needed&lt;br&gt;Meds----Nitro?</td>
<td>1. What do you do if patient has his own medications?&lt;br&gt;2. What does the EKG indicate?&lt;br&gt;3. What are normal sat levels? When is oxygen appropriate?&lt;br&gt;4. Routine nitro orders</td>
</tr>
<tr>
<td>Increase in Patient Complaints</td>
<td>Pt. c/o headache and leg pain</td>
<td>Neuro assessment Cardiovascular assessment</td>
<td>1. What may the findings indicate?</td>
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<tr>
<td>Notify MD</td>
<td>Follow-up on orders and future orders</td>
<td>Call MD Report findings Request Nitro order Order 12-lead EKG Ask when MD will be in?</td>
<td>2. What should be reported to the MD? 3. How should the information be given?</td>
</tr>
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</table>

**Study Questions for Students to Complete Prior to Scenario:**

1. What is the difference between a full assessment and a focused baseline assessment?
2. When is it appropriate to perform a focused assessment?
3. How are standing orders, national protocols, and unit protocols utilized?
Scenario: Post-partum hemorrhage (PPH)

Background/Patient History:
Mrs. Hemmy Rhage is a 23 yo wf 16 hours postpartum following nvd of twins at 37 wks gestation. The twin boys are her first children. Hemmy suffered from PIH/c BP readings reaching 155/90 before delivery. Labor began spontaneously and she was able to deliver vaginally, but only after 16 hours of labor. BP was carefully monitored during labor. A pit drip was used to augment labor. Pt now in mother/baby unit /c husband, babies in nursery. Hx- pt is healthy young woman, married two years. No major medical complications. Patient's mother had six children with minimal complications.

Physician Orders:
VS- routine, notify physician if BP>150/100, temp>102F, HR>120, RR>25
Diet- reg
Admit Labs- notify physician if WBC>18000, Hct<30, Hct in AM
Peri care- ice pack to perineum, epifoam, tucks
Bladder care- foley if unable to void
Bowel care- Doxidan PO x6 @ bedside, 1 BID PRN
Pain- Darvocet N-100 Q3H, Motrin 800 mg PO Q6-8H x18 @ bedside
Nausea- Phenergan 25-50mg IM Q3-4H PRN
Sleep- Dalmane 30mg PO HS PRN
Routine PPH protocol- begin protocol/notify MD
1000cc D5/LR /c 10-40 U Pitocin, titrate as necessary
Add Pitocin 10-40 U to current IV, titrate as necessary
Methergine 0.2mg PO Q4H x6 doses PRN to control bleeding (Do not give /c PIH)
<table>
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<tr>
<th>Scenario</th>
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<tbody>
<tr>
<td>STATE</td>
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<tr>
<td>---------------------------------------------------------------</td>
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<tr>
<td>Baseline/Admitting</td>
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</table>
| Pt uncomfortable, increased bleeding found.                    | Boggy uterus at 2 cm above umbilicus upon assessment HR 110, BP 92/61, | 1. Massage uterus at fundus and express any blood clots.  
|                                                               | RR 22, Sats 92%                                                        | 2. Observe lochia for reduction in bleeding.  
|                                                               | Loss of 500cc blood /c lochia                                          | 3. Start PPH protocol                         |
|                                                               | -two peri pads soaked                                                  | 4. Notify physician (take CBC, type and cross-match for blood) | Why massage the uterus?  
|                                                               |                                                                       |                                               | How is the correct method to massage the uterus? |
|                                                               |                                                                       |                                               | What does the presence of lochia mean? |
|                                                               |                                                                       |                                               | What do her vital signs mean? |
|                                                               |                                                                       |                                               | Why give pitocin? |
|                                                               |                                                                       |                                               | What will you tell the physician? |
|                                                               |                                                                       |                                               | How often should you check this pt? |
| Pt light headed, bleeding increased                            | Uterus remains boggy following massage and active bleeding persists HR | 1. Increase pitocin drip                        | Why are her Sats falling? |
|                                                               | 130, BP 84/56, RR 28, Sats 88%                                         | 2. Continue to massage uterus                 | How would you know what type of blood to request? |
|                                                               | Loss of 1000cc blood                                                    | 3. Give O2                                    | What is bimanual compression |
|                                                               | -two more pads soaked                                                  | 4. Assess continued bleeding                  | of the uterus and who would |
|                                                               |                                                                       | 5. Get blood units ready                      | do this procedure? |
|                                                               |                                                                       | 6. If bleeding persists, get physician’s orders for continued treatment. |                             |
| Pt still a little light headed, but feeling better             | Uterus firm Bleeding slows HR 88, BP 104/70, RR 18, Sats 96%            | 1. Change chux/sheets                         | How would you feel following this incident? |
|                                                               |                                                                       | 2. Provide comfort, reassurance                |                             |
Study Questions for Students to Complete Prior to Scenario:
1. What factors increase a woman's risk for PPH?
2. What are the differences between early and late hemorrhage?
3. Why is the nursing assessment so vital with postpartum women?
4. What is uterine atony and how does it cause PPH?
5. How is PPH treated?
Scenario: Patient with Pregnancy Induced Hypertension

Background/Patient History: Mrs. Hillary Fox is a 35 yo female, currently 36 wks pregnant with her first child; was transferred to the floor 3 days ago for close observation and magnesium sulfate administration. She presented at the Dr.'s office 4 wks ago feeling lethargic and more irritable than usual. She also stated she was not urinating as frequently as usual and that her legs and hands were swelling up. Upon the Dr.'s examination her BP was 147/93 (baseline 106/75), RR 18, HR 85, & temp. 98.1F. Her UA showed 2+ proteinuria on dipstick. She was sent home on strict best rest and dietary modifications. Mrs. Fox's vital signs and proteinuria remained stable until 3 days ago when she was admitted to the unit with a BP of 158/100 rising occasionally above 160/110. Urine output in the last 24 hrs. was 365 ml & proteinuria of 5+ on the dipstick, DTR's 3+, edema 4+. Patient c/o leg discomfort. Upon admission the fetal L/S ratio was 1.8 & PG absent. The Dr. ordered 2 IM doses of 12.5mg Betamethazone 12-24 hrs apart after which another L/S ratio was measured at 2.0 & PG present.

Physician Orders:
VS Q hr., BP Q 30 min.
I & O
Daily Hct, liver enzyme testing (SGOT, SGPT, & LDH), uric acid & BUN.
Platelet count Q 2 days
Check DTR's Q 2 hr
Magnesium Sulfate 25gm in 200cc D5W: Loading dose 4gm IVPB over 30 min.
Maintenance dose: 2gm/hr IV pump
Notify physician if urine output less than 30 cc/hr, DTR's 1+, BP greater than 170/110
Left or right lateral position
Seizure precautions
LR 100 ml/hr
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<tr>
<th>Scenario</th>
<th>EVENTS</th>
<th>EXPECTED PARTICIPANT BEHAVIORS/INTERVENTIONS</th>
<th>QUESTIONS FOR PARTICIPANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM assessment</td>
<td>BP 194/106</td>
<td>1. Perform head to toe assessment.</td>
<td>1. This pt is exhibiting S/Sx of what?</td>
</tr>
<tr>
<td></td>
<td>RR 23/regular</td>
<td>2. Discuss nursing plan of care &amp; perform needed nursing care.</td>
<td>2. What are the overall goals of nursing management for this pt?</td>
</tr>
<tr>
<td></td>
<td>HR 93</td>
<td>3. Call Dr.</td>
<td>3. What should you tell/teach pt &amp; husband about at this point?</td>
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<tr>
<td></td>
<td>T 99.1F (37.1C)</td>
<td>4. What rate should MgSO4 be running (ml/hr)?</td>
<td>4. What rate should MgSO4 be running (ml/hr)?</td>
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<tr>
<td></td>
<td>DTRs 3+</td>
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<tr>
<td></td>
<td>Awake, alert, &amp; oriented x4</td>
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<tr>
<td></td>
<td>SaO2 93%</td>
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<tr>
<td></td>
<td>Pitting edema 4+</td>
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<td>PEERLA</td>
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<td>CRT ≤ 3 sec. all extremities excep RLE ≥ 3</td>
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<tr>
<td></td>
<td>MgSO4 2gm/hr</td>
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<tr>
<td>Begin labor</td>
<td>BP 200/124</td>
<td>1. Start Pitocin induction; &amp; increase MgSO4.</td>
<td>1. What is standard protocol for initial administration of Pitocin? Calculate IV rate for Pitocin?</td>
</tr>
<tr>
<td>induction</td>
<td>T 99.3F (37.4C)</td>
<td>2. Head to toe assessment—check edema, HR, RR, temp., pain, pulses, etc.</td>
<td>2. What is the purpose of administering MgSO4?</td>
</tr>
<tr>
<td></td>
<td>DTRs 3+</td>
<td></td>
<td>3. What should you watch for with increasing the dosage of MgSO4? Pitocin? Can Pitocin &amp; MgSO4 run into the same IV site?</td>
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<td></td>
<td>SaO2 91%</td>
<td></td>
<td>4. Would it be a good idea to administer an antihypertensive?</td>
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<tr>
<td></td>
<td>MgSO4 2gm/hr</td>
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101
| **Tx of DVT** | BP 192/103  
HR 91  
RR 17  
T 99.0°F (37.1°C)  
SaO₂ 93%  
DTRs 3+  
Pitocin 2mU/min | 1. Find hospital protocol for Heparin administration and administer.  
2. Continue assessing VS, DTRs, edema, etc.  
3. Assess rate, intensity, duration of CXNs if any. | 1. What should be done before administering Heparin?  
2. Mrs. Fox weighs 70 kg, how much Heparin should she be given after the bolus? |
| **PE** | BP 184/117  
HR 124  
RR 35/shallow, difficulty breathing, pain in chest  
SaO₂ 86% | 1. Identify S/Sx of pulmonary embolism.  
2. Perform nursing care for pt. c/ a PE. | 1. What are the complications of a PE in an antepartum woman?  
2. If unnoticed and untreated what is the prognosis for pts. with PE? |
| **Stabilization** | BP 192/103  
RR 15  
SaO₂ 94%  
HR 80  
T 99.0°F (37.1°C)  
MgSO₄ 8gm/hr  
DTRs 2+  
Pitocin 6mU/min  
aPTT 58 sec. | 1. Monitor changes & pain.  
2. Look up continuous heparin infusion rate. | 1. What are the most important things to continue assessing and observing on your pt.? |

**Study Questions for Students to Complete Prior to Scenario:**

1. What are the major differences between mild preeclampsia and severe preeclampsia?  
2. What are the signs and symptoms of a DVT? Is Homan’s sign always present with a DVT?  
3. What are the possible ante-partum and post-partum effects of Heparin administration for mother and baby? Is it safe to administer Heparin to a pregnant woman?  
4. What are the possible complications of an undetected and untreated DVT (fetus & mom)? What are other nursing actions for a pt with DVT?
5. Identify other medications, besides Heparin, that can be administered for treatment of DVT → PE. (Hint: Thromboembolics & fibrinolytics.) What are standard doses, contraindications, special nursing consideration? Are they safe during pregnancy?
Scenario: Patient with Chest Pain

Background/Patient History:
Mr. Ian Blue is a 45 y/o male who developed substernal, crushing chest pain that radiated to his left shoulder while doing strenuous yard work, which was quickly relieved by rest. Upon arrival of the paramedics at his home, he denied any further pain and VS were WNL. After much coaxing, he was transported to the ED at UVRMC. Work up in the ED included a 12-lead ECG, which was normal; cardiac enzymes, which were all WNL; and a CXR, which was clear. Mr. Blue’s medical and surgical history is fairly insignificant with the exception of hypercholesterolemia, 20 pounds overweight, and a 25-pack year history of smoking. He quit smoking 5 years ago. He attempts to exercise by walking and swimming a minimum of twice per week, sometimes more frequently. Mr. Blue has a strong family history of CAD and hypercholesterolemia. Both his grandfathers died of AMI and his father had an anterolateral AMI 12 years ago with subsequent CABG x4. Despite negative medical findings at this time, based upon the strong family history and lack of recent medical work-up or having been seen by a physician, he is admitted to the Cardiac Intermediate Care/Telemetry Unit with a diagnosis of Angina, R/O MI. The medical plan is to take Mr. Blue to the cardiac catherization lab for diagnosis, intracoronary thrombolytic therapy, and possible revascularization in 3 hours from the time of admission.

Physician Orders:
Continuous cardiac monitor
12 lead EKG per RN discretion according to policy
Diet: low sodium, low cholesterol
O2 2-4 liters/min prn per cannula or 6 liters/min per mask
If SaO2 <93% notify physician
Aspirin enteric coated 325 mg po QD
Metoprolol 50mg po q12hours; hold for heart rate <60 or SBP <110
Quinapril 20mg po QD
Captopril 12.5mg po q8hours; hold for SBP <110
Nitropaste 1" topically tid; hold for SBP <110
Nitroglycerine .5 mg/250cc D5W intravenously at 5 mcg/min; may titrate for chest pain with SBP >90
Diltiazem 30mg po q6hours
Heparin 7500 units SQ q12hours
Nitroglycerine 0.4 (SL) for chest pain PRN; may repeat x3 at 5 minute intervals. For chest pain unrelieved by NTG or recurrent chest pain CALL PHYSICIAN.
Atropine Sulfate 1mg (IVpush) for bradycardia, complete heart block, or escape rhythms with symptoms of hemodynamic compromise & NOTIFY PHYSICIAN.
Lidocaine 1mg/kg (IVpush) for sustained recurrent bursts of ventricular tachycardia. After bolus, start continuous infusion of Lidocaine 2g/500ml D5% in water at rate of 2mg/minute (30ml/hr). NOTIFY PHYSICIAN. May repeat bolus of 0.5 mg/kg q5-10 minutes up to total loading dose of 3mg/kg if needed.
MSO4 1-4 mg IVpush q5min for angina not relieved by NTG; hold for SBP <90.

**Scenario**

<table>
<thead>
<tr>
<th>STATE</th>
<th>EVENTS</th>
<th>EXPECTED PARTICIPANT BEHAVIORS/INTERVENTIONS</th>
<th>QUESTIONS FOR PARTICIPANTS</th>
</tr>
</thead>
</table>
| Baseline/Admitting  | NSR @ 72 BPM
BP 116/52
RR 14 min/regular
Temp 37.1
PEERL 4 mm → 2mm
Awake, Alert & Oriented
x4
SO2 >94%
BrS clear
Adequate U/O
No c/o pain or angina
Weight of 75 kg | 1. Perform head to toe assessment
2. Request additional data including lab values of blood work done in ED
3. Discuss nursing plan of care appropriate for this newly admitted patient. | 1. What are important subjective components of the nursing assessment?
2. What are important objective components of the nursing assessment?
3. What are the overall goals of nursing management of this patient?
4. How should patient education begin in this patient and proceed. |
### Onset of Angina

- **NSR @ 88 BPM**  
  - BP 146/84  
  - RR 18/min  
  - SO2 90%  
  - C/O substernal, radiating chest pain similar to that which brought him to seek medical care: 7/10  
  - BrS clear

1. Identify need for 12 lead ECG STAT
2. Identify need for ABG’s STAT
3. Interpret ABG’s & take appropriate action.
5. Identify need for O2 support and institute
6. Identify need to notify MD of acute changes.

1. How long can cardiac cells withstand ischemic conditions before necrosis occurs?  
2. How does MSO4 relieve angina.  
3. Why is MSO4 given IVPB?  
4. How does nitroglycerine relieve angina?  
5. How do we ask the patient to rate their chest pain?

### Increasing Angina

- **ST @ 130 BPM**  
  - BP 106/68  
  - SO2 88%  
  - RR 24/min  
  - BrS clear but diminished C/O substernal, radiating chest pain 10/10 not relieved after nitroglycerin 0.4 mg (SL) x3; MSO4 4mg IVPB

1. Change O2 delivery method to mask from nasal cannula.  
2. Institute nitroglycerin drip and calculate/titrater per order.  
3. Identify need for frequent assessment, intervention, and documentation of hemodynamic parameters with nitroglycerin IV administration.  
4. Notify MD of changes/status.

1. Why is the HR increased?  
2. What is the most common complication with nitroglycerine intravenous administration? Why?  
3. How does intravenous nitroglycerin work?
### Study Questions for Students to Complete Prior to Scenario:

1. What is the difference between a transmural MI and a subendocardial MI?
2. Correlate the location and area involved with the part of the coronary circulation involved:
   - A. Right coronary artery
   - B. Left anterior descending artery
   - C. Left circumflex artery
3. Why is it common for the temperature to rise in the first 24 hours following an AMI?
4. What is the most common complication following an AMI? Why?
5. Correlate the area of infarction and the side effects/complications most commonly seen:
   - A. Inferior wall damage
   - B. Anterior wall damage

### AMI

<table>
<thead>
<tr>
<th>AMI</th>
<th>Bigeminy @ 108 BPM BP 94/56 RR 20/min SO2 92% BrS - rales S3/S4 heart sounds No c/o pain or angina</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1. Administer Lidocaine IVPB &amp; begin continuous infusion.</td>
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<td></td>
<td>2. Notify physician of change in condition.</td>
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<td></td>
<td>3. Institute Heparin drip as new order from MD.</td>
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<tr>
<td></td>
<td>1. PVCs may precede which rhythms?</td>
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<tr>
<td></td>
<td>2. What does the change in heart sounds suggest?</td>
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<tr>
<td></td>
<td>3. Why is it necessary to begin a continuous Lidocaine drip after bolusing the patient?</td>
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<tr>
<td></td>
<td>How does Heparin work?</td>
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</tbody>
</table>

### Improvement

<table>
<thead>
<tr>
<th>Improvement</th>
<th>NSR @ 90 BPM with no ectopy BP 96/58 SO2 92% RR 17 BrS with rales No c/o angina</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1. Prep for cardiac catheterization.</td>
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<td>2. Complete patient teaching r/t cardiac cath &amp; revascularization.</td>
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<tr>
<td></td>
<td>3. Anticipate the physician ordering thrombolytic therapy.</td>
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<tr>
<td></td>
<td>4. Identify nursing interventions associated with thrombolytic therapy.</td>
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<tr>
<td></td>
<td>1. What other medical measures may we anticipate the physician ordering in this patient to improve cardiac function?</td>
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<tr>
<td></td>
<td>2. If the physician were to order thrombolytic therapy to be initiated before going to the cath lab, what nursing measures would be initiated?</td>
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<tr>
<td></td>
<td>3. How would you handle patient teaching r/t the cardiac cath &amp; revascularization?</td>
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</tbody>
</table>
6. What are the serum cardiac markers used in diagnosing an AMI? When do their levels peak? When do their levels return to normal?

7. CK-MB Bands greater than what percentage are indicative of an AMI?

8. Thrombolytic therapy should be instituted within how many hours of the onset of pain to be of most benefit? What are the nursing implications and management of the patient receiving thrombolytic therapy?
**Scenario:** Patient with disseminated intravascular coagulation (DIC)

**Background/Patient History:**
Mr. J. is a 62-y-o male who sustained a significant Acute Myocardial Infarction (AMI) three days ago and was found down by his coworkers in the men's restroom when he did not return from his lunch break. His only significant history includes an inguinal hernia repair at age 49 years and he was recently diagnosed with mild hypertension for which he was on an ACE inhibitor. Upon finding him down, CPR was attempted by two of his co-workers but they were not that proficient at it. Upon arrival of the paramedics, he was found to be in asystole and Advanced Cardiac Life Support was initiated and continued in route to the ED at Utah Valley Regional Medical Center. Finally after 50 minutes of work by the team in the ED a pulse was obtained. He was transferred to the ICU and put on Dopamine, Dobutamine, and Amiodorone drips. His neurological status at that time indicated sluggish reaction of his pupils bilaterally to light, but equal at 4mm-6mm and he withdrew from painful stimuli. After 36 hours of vasopressor therapy, his hemodynamic state was stabilized and the Dopamine was weaned off. He remains on Dobutamine at a renal perfusion dose. Last night he began decerbrate posturing to painful stimuli and the family requested no further acute intervention. He was transferred out to the telemetry floor and discharge planning to an acute long-term care facility is underway.

**Physician Orders:**
- NO CODE BLUE
- IV of D5/.45NS with KCl 20 meq @ 125 cc/hr
- CBC, Chem 7 in the AM
- ABG's prn sO2 <92%
- Cefazolin 500mg IV q 8 hours
- Famotidine 20mg IV q12 hours
- Dobutamine Drip at 3mcg/kg/minute for renal perfusion
- Notify the physician for:
  - Heart rate >140 or <60
  - Systolic BP <100 or >180
  - Urine output <30cc/hr x2hrs
  - Temp >101.5
  - O2 saturation <92%
<table>
<thead>
<tr>
<th>STATE</th>
<th>EVENTS</th>
<th>EXPECTED PARTICIPANT BEHAVIORS/INTERVENTIONS</th>
<th>QUESTIONS FOR PARTICIPANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline/Begins to bleed</td>
<td>HR 72 BP 112/60 RR 18 Temp 37.5 C SO2 98%  U/O 100cc/hr → red in color BrS- clear Weight: 95 kg Height 5’11”</td>
<td>4. Head-toe assessment 5. Note bloody urine 6. Notify MD of changes 7. Anticipate orders for Hgb&amp;Htc, PT/PTT, INR, and PLT count STAT 8. How will you draw the blood from this patient</td>
<td>5. What could account for the bloody urine? 6. Why is the MD ordering hematological &amp; coagulation testing at this time? 7. Why can’t the patient have a venipuncture done for the blood draw?</td>
</tr>
</tbody>
</table>
| Increase in bleeding | HR 114  
BP 88/54  
RR 22  
Temp 37.5  
SO2 94% & dropping  
U/O 200 cc/hr → red in color  
BrS- rales  
Tell the students: Bloody oral secretions now present  
Oozing from IV sites /Venipuncture sites |
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<tbody>
<tr>
<td></td>
<td>1. Reassess- note crackles</td>
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<td>2. Assess all mucus membranes &amp; IV/puncture sites with reassessment</td>
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<tr>
<td></td>
<td>3. Patients sputum is bright red tinged</td>
</tr>
</tbody>
</table>
|                      | 4. Request labs and notify MD:  
Hgb 8.2  
Hct 26  
PT 29 sec  
PTT 44 sec  
PLT 100,000  
FSP 360-250 mcg/L (<40 mcg/L normal)  
INR 3.5  
5. Anticipate order for 2 units PRBC, 10 units of PLTS, 2 units of FFP STAT & initiate blood product transfusion  
6. Discuss nursing implications with blood transfusion.  
7. How will you manage the bleeding from IV sites and old puncture sites?  
8. Implement padded side rails (rationale: in case of seizures)  
9. How will you provide oral care to this patient?  
10. Should the patient need an IM injection, how will you manage this?  
11. What are some possible explanations of the changes in respiratory status? |
### Increased bleeding/Acute renal failure

| HR 128 | BR 78/46 | RR 28 |
| Temp 37.5 C | SO2 92% | U/O 15 cc/hr → red in color |
| BrS- rales |

Tell the students: Huge bloody stool now found

1. Reassess – note decrease in U/O
2. Notify MD of changes & new site of bleeding
3. Anticipate order for more blood products including cryoprecipitate
4. Anticipate order to titrate Dobutamine to increase BP
5. Anticipate MD ordering Heparin drip & initiate

4. What is a possible explanation for the decrease in U/O? Why has ARF occurred?
5. Should this patient continue to be managed on the telemetry unit? Why or why not?
6. What is cryoprecipitate?

### Slight Improvement After Transfusions

| HR 110 | BR 92/60 | RR 22 |
| Temp 37.5 C | SO2 94% | U/O 15 cc/hr → red in color |
| BrS- rales |

Tell the students: Bleeding has slowed/stopped at most sites.

4. Reassess
5. Notify MD of response to collaborative care.
6. Anticipate order for additional STAT lab work.
7. Notify family of the acute change in their family member.

1. How aggressive should the team be in the care of this patient?

### Study Questions for Students to Complete Prior to Scenario:

1. Is DIC a disease? Explain your answer.
2. Flow chart the pathophysiological events that occur in DIC:
3. Explain what fibrin split products (FSPs) or fibrin degradation products (FDPs) are:

4. Identify the indications for use in each of the following blood products and any special nursing considerations:
   A. Packed RBC
   B. Platelets
   C. Frozen Fresh Plasma
   D. Cryoprecipitate

5. What is the rationale behind the physician potentially ordering a heparin drip to be started on this patient?

6. What is the Amicar (epsilon amincaproic acid) and why may the physician order this to be utilized in caring for this patient?

7. Identify at least two nursing diagnoses for the patient in the acute bleeding stage.
APPENDIX C

CONSENT TO BE A RESEARCH SUBJECT
BACKGROUND:
You are being invited to participate in a research study. The Principal Investigator is Patricia Ravert, and the study is her doctoral dissertation. The Principal Investigator does not teach any class or lab that you are or will be enrolled in during the study.

You were selected because you are currently enrolled in Nursing 312 or Nursing 314 at Brigham Young University. Before you decide to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Ask us if there is anything that is not clear or if you would like more information.

Across the nation, few schools of nursing are using human patient simulators. They are high-fidelity, full-body, computer-driven manikins that utilize gases and computer programs to simulate physiological responses to medications, fluids, and treatments. The purpose of this pilot project is to determine the effect of enrichment learning activities using the Human Patient Simulator on critical thinking (disposition and skills) and self-efficacy on the performance of basic nursing skills in a group of undergraduate nursing students. The way you learn (learning style) may be a moderating factor and will be investigated as well. The researcher is also interested in your evaluation of the enrichment learning activities.

STUDY PROCEDURE:
The study is an instructional development project with learning enrichment activities. It is a pilot project. If you agree to participate, you will be randomly assigned to 1 of 2 groups: Enrichment Activity Group 1 or Enrichment Activity Group 2.

Following is a timeline (the bold indicates when you will be asked to participate in the study) and description of the procedures for both groups. You will be involved in the study for 7 weeks. The first and last week, you will complete the research instruments and during the intervening weeks you will participate in an enrichment learning activity once each week. You will be given an opportunity to sign up for a time that does not conflict with any of your regularly scheduled classes, labs, or clinical times.

<table>
<thead>
<tr>
<th>Dates</th>
<th>March - April 2003</th>
<th>May - June 2003</th>
<th>July - October 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursing class you are enrolled in</td>
<td>Nursing 312 or Nursing 314</td>
<td>Nursing 312 or Nursing 314</td>
<td>Nursing 380, 382, &amp; 384</td>
</tr>
<tr>
<td>Project activities</td>
<td>You will be asked to participate. If you agree, you will complete instruments (60-75 minutes). You will be assigned to a group.</td>
<td>You will be involved in enrichment learning activities (five 90-minute activities - one per week). Then you will complete the final study instruments (60-90 minutes) and participate in a group interview. If you have completed all project requirements, you will be given a $40 gift certificate</td>
<td>After data analysis, your scores will be given to you via letter in your College of Nursing file in the Nursing Learning Center. Notification of drawing winners will be via e-mail and a letter in your file.</td>
</tr>
</tbody>
</table>
Enrichment Activity Group 1 Procedures: If you are placed in this group, you will spend 9-13 hours completing the following activities:

1. Completion of four instruments at the beginning of the study (60-75 minutes): a) California Critical Thinking Disposition Inventory, b) California Critical Thinking Skills Test, c) Self-Efficacy for Nursing Skills Evaluation, and d) the Learning Style Inventory.
2. Participation in five 90-minute enrichment activities with patient scenarios consisting of three sections: 1) an initial information conference when the you will be introduced to the patient, diagnosis and history, 2) discussion of nursing care and interventions, possible complications, and appropriate nursing responses, and 3) a group discussion allowing you to talk about your successes, failures, insights, and knowledge gained in a safe environment.
3. Completion of four instruments at the end of the study (60-90 minutes): a) California Critical Thinking Disposition Inventory, b) California Critical Thinking Skills Test, c) Self-Efficacy for Nursing Skills Evaluation, and d) the Written Performance Based Evaluation of Video Scenario.
4. You will be asked to return for a final group interview to elicit your evaluation of the enrichment activity. These interviews will be audio-taped. If you complete all requirements you will be given compensation of a $40 gift certificate to a local retail store (such as Wal-Mart) and also a chance of winning one of two $250 gift certificates.
5. At the end of the project, you will receive a summary of your scores.
6. As a Group 1 participant you may schedule experiences with the HPS after study completion.

Enrichment Activity Group 2 Procedures: If you are placed in this group, you will spend 9 – 13 hours completing the following activities:

1. Completion of four instruments at the beginning of the study (60-75 minutes): a) California Critical Thinking Disposition Inventory, b) California Critical Thinking Skills Test, c) Self-Efficacy for Nursing Skills Evaluation, and d) the Learning Style Inventory.
2. Participation in five 90-minute enrichment activities with patient scenarios using the human patient simulator (HPS) consisting of three sections: a) an initial introduction, in the simulator room, to the scenario including patient, diagnosis and patient history, b) a skill performance on the HPS, practicing nursing actions and care, group dynamic experiences, critical thinking, decision making, and leadership skills, c) a feedback or debriefing to allow you to talk about individual and group successes and performance in a safe environment.
3. Completion of five instruments at the end of the study (75-110 minutes): a) California Critical Thinking Disposition Inventory, b) California Critical Thinking Skills Test, c) Self-Efficacy for Nursing Skills Evaluation, d) Written Performance Based Evaluation of Video Scenario, and e) the Use of the Human Patient Simulator Survey.
4. You will be asked to return for a final group interview to ask about your evaluation of the enrichment activity including the HPS experience. These interviews will be audio-taped. If you complete all requirements you will be given compensation of a $40 gift certificate to...
a local retail store (such as Wal-Mart) and also a chance of winning one of two $250 gift certificates.

5. At the end of the project, you will receive a summary of your scores.
RISKS:
Participating in this study is not expected to result in any harmful effect except the demands of time.

BENEFITS:
We cannot promise any benefits from your being in the study. However, possible benefits include personal attention, personal insight and the possibility of having questions answered during the enrichment activities. Your understanding and knowledge base of nursing concepts may be enhanced through participation in the enrichment activities.

PAYMENT:
If you complete all study requirements, you will receive compensation of a $40 gift certificate to a local retail store (such as Wal-Mart) and also a chance of winning one of four $250 gift certificates (two winners of $250 gift certificates will be drawn from each group). There will be no costs incurred by you as a result of this study.

ALTERNATIVE PROCEDURES:
There are no alternative procedures for the enrichment learning activities in this study.

VOLUNTARY PARTICIPATION:
It is up to you to decide whether or not to participate in this research project. Participation in this research is voluntary. If you do decide to participate you will be asked to sign a consent form. If you decide to participate you are still free to withdraw at any time and without giving a reason. You have the right to refuse to participate and the right to withdraw without any jeopardy to your grades or status in the Brigham Young University College of Nursing.

CONFIDENTIALITY:
All information, which is collected, will be kept strictly confidential and only group data will be reported. No individual data will be shared with any of your instructors and data will not be part of any grade for any class. All data will be stored in a secure area, and access will only be given to personnel associated with the study. The data are used for educational purposes or in presentations/publications to professional audiences.

PERSON TO CONTACT:
The researcher, Patricia Ravert, can be reached at 135 SWKT, Brigham Young University, Provo, UT, 84602; Phone (801) 422-1167 or through pager (801)329-8355 and will answer any questions you may have at any time concerning the details of this study.

INSTITUTIONAL REVIEW BOARD/INFORMATION REGARDING RIGHTS OF RESEARCH PARTICIPANTS:
If you have questions regarding your rights as a participant in a research project, you may contact Dr. Shane S. Schulthies, Chair of the Institutional Review Board, 120B RB, Brigham Young University, Provo, Utah 84602; phone, (801) 422-5490.
RIGHT OF INVESTIGATOR TO WITHDRAW:
You may withdraw from the study at any time without penalty. Principal Investigator, Patricia Ravert, can stop the project without your approval such as if technical difficulties with the human patient simulator occur. If the project is terminated early by the Principal Investigator, you will receive pro-rated compensation according to your time spent.

NUMBER OF SUBJECTS:
We expect about 50 or 60 people from Brigham Young University College of Nursing will be in this study. This study is only being done at BYU.

CONSENT:

Please initial box

1. I confirm that I have read and understand this consent document and have had the opportunity to ask questions.

☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.

☐

3. I understand that sections of any of my information may be looked at by responsible individuals from Brigham Young University and/or the University of Utah or from regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to my records.

☐

4. I agree to take part in the above study and that I will be given a signed copy of the consent form to keep.

Signature of Participant ___________________________ Date __________

Signature of Witness ___________________________ Date __________

Researcher or staff ___________________________ Date __________
APPENDIX D

DEMOGRAPHIC SURVEY
Code #________

Name: ________________________________________

Phone number: ____________________________________

E-mail address: ____________________________________

Demographics

____ Male  ____ Female

Age: _____

Major: ________________________________________

Minor: ________________________________________

Year in school:

____ Senior
____ Junior

GPA: _____

Number credit hours completed: _________

Previous degree obtained: ___________

Work experience in health-care field:

____ LPN
____ CNA
____ PCT
____ Other: ______________________________________

Have you cared for a patient experiencing any of the following conditions?

____ Yes  ____ No  Trauma from motor vehicle accident

____ Yes  ____ No  Postpartum hemorrhage

____ Yes  ____ No  Antepartum pregnancy-induced hypertension

____ Yes  ____ No  Chest pain

____ Yes  ____ No  Disseminated intravascular coagulation
APPENDIX E

SELF-EFFICACY FOR NURSING SKILLS EVALUATION
# Questionnaire

## Self-Efficacy for Nursing Skills Evaluation

**DIRECTIONS:** Individuals do many different things to help themselves perform well in different situations. I am interested in how confident you are in performing each of the following skills. For example for the skill: I can run a marathon, I would rank my confidence as very confident as I have trained for 6 months but this is my first marathon. I am interested in your **first reaction:** do not spend a lot of time thinking about how well you do the skill- just how confident you are that you can do it. Please check the appropriate column indicating your level of confidence to perform the skill.

<table>
<thead>
<tr>
<th>Skill</th>
<th>5 = Extremely Confident</th>
<th>4 = Very Confident</th>
<th>3 = Moderately Confident</th>
<th>2 = Slightly Confident</th>
<th>1 = Not At All Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assessing Vital Signs (T, P, R, BP)</td>
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<td>2. Assessing pulses</td>
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<td>3. Completing full physical assessment</td>
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<td>4. Computing Intake &amp; Output</td>
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<td>5. Completing urinary catheter care</td>
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<td>6. Administering IV push medication</td>
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<td>7. Administering Intravenous piggyback (IVPB) medication</td>
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<td>8. Monitoring O2 saturation</td>
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<tr>
<td>9. Applying O2 cannula</td>
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<td>10. Applying O2 mask</td>
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<td>11. Initiating and following embolus precautions</td>
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<td>12. Monitoring fluid levels</td>
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<td>13. Hanging IV solutions</td>
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<tr>
<td>14. Changing IV tubing</td>
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<td>15. Initiating IV therapy</td>
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<td>16. Administering blood products</td>
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<tr>
<td>17. Checking uterine fundus</td>
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<td>18. Performing uterine fundal massage</td>
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<td></td>
<td>5 = Extremely Confident</td>
<td>4 = Very Confident</td>
<td>3 = Moderately Confident</td>
<td>2 = Slightly Confident</td>
<td>1 = Not At All Confident</td>
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<td>19. Opening sterile supplies</td>
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<td>20. Managing Disease/Condition of Trauma Patient Admission</td>
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<tr>
<td>21. Managing Disease/Condition of Post Partum Hemorrhage</td>
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<tr>
<td>22. Managing Disease/Condition of Ante-Partum Patient with Pregnancy Induced Hypertension (PIH)</td>
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<tr>
<td>23. Managing Disease/Condition of Chest Pain in Medical/Surgical Patient</td>
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<tr>
<td>24. Managing Disease/Condition of Disseminated Vascular Coagulation</td>
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</tbody>
</table>

Comments-
APPENDIX F

WRITTEN PERFORMANCE-BASED EVALUATION
OF VIDEO SCENARIOS
**Written Performance Based Evaluation of Video Scenario**

**Instructions:** After viewing the video vignette, identify or diagnose the patient problem and determine the appropriate nursing actions and interventions. Be as thorough as possible. Document your rationale for the actions and interventions. You will have a chance to practice with an example before completing the actual patient vignette.

<table>
<thead>
<tr>
<th>Vignette #</th>
<th>Patient Problem or Diagnosis</th>
<th>Nursing Actions, Interventions</th>
<th>Rationale for Actions and/or Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vignette #1 Example</td>
<td>Mr. Johnson, 70 year old male Hx of hypertension and myocardial infarction.</td>
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<tr>
<td></td>
<td>Vital Signs: Temp 98.2°F, Pulse 114, Respirations 42, BP 100/52, SpO2 86%</td>
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<td>Vignette #2</td>
<td>Max Stern, 66 year old male Hx of transient ischemic attacks (TIAs)</td>
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<tr>
<td></td>
<td>Vital Signs: Temp 99.4°F, Pulse 98, Respirations 22, BP 184/96, SpO2 90%</td>
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<tr>
<td>Vignette #3 Patient</td>
<td>Patient Problem or Diagnosis</td>
<td>Nursing Actions, Interventions</td>
<td>Rationale for Actions and/or Interventions</td>
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<tr>
<td>Mrs. Wilson, 75 year old female Widow, lives alone, fell.</td>
<td>Vital Signs: Temp 97.8F, Pulse 94, Respiration 22, BP 112/62, SpO2 92%</td>
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</table>

<table>
<thead>
<tr>
<th>Vignette #4 Patient</th>
<th>Patient Problem or Diagnosis</th>
<th>Nursing Actions, Interventions</th>
<th>Rationale for Actions and/or Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mrs. Harper, 32 year-old female, Admitted with fever of unknown origin.</td>
<td>Vital Signs: Temp 38.2C, Pulse 124, Respiration 32, BP 80/42, SpO2 87%</td>
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</tbody>
</table>
Vignette #5

Vital Signs:
Temp 100.5F, Pulse 82, Respiration 18, BP 110/68, SpO2 92%
APPENDIX G

USE OF HUMAN PATIENT SIMULATOR SURVEY
Use of Human Patient Simulator Survey

Instructions: Please indicate how beneficial you think learning scenarios with the Human Patient Simulator (HPS) in nursing education are.

<table>
<thead>
<tr>
<th></th>
<th>1 Not At All Beneficial</th>
<th>2 Slightly Beneficial</th>
<th>3 Moderately Beneficial</th>
<th>4 Very Beneficial</th>
<th>5 Extremely Beneficial</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understanding the physiology of patient conditions</td>
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<td>2. Performing the expected nursing interventions</td>
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<td>3. Working as a team in patient care situations</td>
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<td>4. Increasing your confidence in your ability as a nurse</td>
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<td>5. Developing critical thinking skills</td>
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</tbody>
</table>

6. What **did you like** about using the Human Patient Simulator (HPS)?

7. What **did you not like** about using the Human Patient Simulator (HPS)?
REFERENCES


