TOWSON UNIVERSITY
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# EVALUATION OF HIGH FIDELITY SIMULATION WITHIN A HEALTH ASSESSMENT COURSE

By

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*DISSERTATION APPROVAL PAGE*

*This is to certify that the dissertation prepared by Beverly June Davis Bye, entitled Evaluation of High Fidelity simulation within a Health Assessment Course has been approved by this committee as satisfactory completion of the requirement for the degree Doctor of Education in **Instructional Technology** in the department of Reading, Special Education and Instructional Technology.*

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ABSTRACT

EVALUATION OF HIGH FIDELITY SIMULATION WITHIN A HEALTH ASSESSMENT COURSE

Beverly June Davis Bye

The purpose of this quasi-experimental research was to investigate the impact of high fidelity simulation on knowledge and confidence levels among undergraduate baccalaureate nursing students within a Health Assessment course. Due to the decrease in nurse educators and limited clinical placements in hospital settings, innovative teaching methodologies to teach clinical and assessment skills need to be integrated within nursing programs. The participants in this study were first semester junior level nursing students from three baccalaureate level Health Assessment classes. Two classes of approximately 15-20 students each were exposed to simulation- an actor (standardized patient) or a high fidelity simulator while the third group experienced a traditional classroom and lab -not simulation. A pre and post test was designed to measure knowledge and a survey instrument was used to measure student confidence levels before and after the learning experience. Results of the study have implications on the development and integration of innovative teaching pedagogies for nurse educators.

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# CHAPTER I: INTRODUCTION

The purpose of this chapter is to explore the context of the challenges nurse educators are facing in the 21st century amidst the nursing shortages found both on the medical units and within academia, and the relationship between these challenges and instructional techniques in nursing education. This chapter will include a presentation and discussion of the research problem, problem statement, research design, and definitions.

Both clinical nurses on patient care units and nurse educators in academia are facing shortages. Nursing graduates need to pass the National Certifying Licensure Examination (NCLEX) in order to practice as a registered nurse on the unit. In order to pass the certifying examination, nursing graduates need to successfully master an increasingly complex body of nursing knowledge. Nurse educators from the "baby-boom generation" are expected to retire in record amounts over the next decade (Lowenstein & Bradshaw, 2001). In 2005, the average age of nursing faculty was 51.5 years in both baccalaureate and graduate programs (Tanner, 2006). According to Broome (2002), between 200 and 300 doctorally-prepared faculty will be eligible for retirement every year from 2003 to 2012 while between 220 and 280 master's-prepared nurse faculty will be eligible for retirement between 2012 and 2018. This represents approximately 46% of faculty retiring in the five year period between 2005 and 2010. The number of nurses currently enrolled in graduate programs is insufficient to keep up with the expected nurse educator demand (Tanner, 2006). Nurse educators are teaching in both undergraduate and graduate programs. Nationwide there is a deficit of 118,000 nurses currently. This deficit is expected to increase 10 fold by 2020 (Bishop, 2007). In essence both the nursing shortage and the nursing educator shortage will be directly affected by the retirement of nursing faculty. Most institutions of higher education will be impacted by this dilemma.

According to Joyce Griffin-Sobel (2006), other challenges facing the nursing profession include the limited number of experienced nurse educators and the change of health delivery to the community where nurses function independently and need to rely on their own knowledge and judgment to solve critical problems. As a result, nurse educators need to focus less on task oriented instruction, and more on critical thinking and knowledge (Donley, 2005). The integration of simulation in the nursing curriculum can assist nursing students to retain knowledge and develop and refine their critical thinking skills. According to Griffin-Sobel (2006), simulation provides an opportunity for students to practice both cognitive skills (critical thinking), such as knowing what to do when a patient's blood pressure is low, and psychomotor skills, such as giving baths and listening to lung sounds. There is a plethora of technology that surrounds everyone, both in academia and the work environment, and certainly nursing is no exception. Within the nursing profession, technology is used in multiple media such as PDAs (personal digital assistants), bedside computers, and continuous monitoring equipment in acute and community based settings (Simpson, 2003). Therefore, it is imperative that nursing students gain proficiency performing clinical skills, in addition to retaining factual knowledge.

The integration of effective instructional techniques into nursing curriculum is imperative so that nursing students can acquire baseline medical knowledge and know what to do and how to act in emergent situations. For the past forty years, the nursing profession has relied on "apprenticeship" models to assist nurses to gain critical knowledge and skills. The apprenticeship model uses clinical instructors to teach eight to ten students at a time on hospital units or in other clinical settings. Staff nurses on the units assist in providing instruction and guidance. Unfortunately, the apprenticeship model does not provide for consistency in learning outcomes. Student experiences depend on what type of patients are at the facility during their clinical experience.

Lack of clinical placements for nursing students and decreased faculty have created a void in nursing education that could possibly be filled with the integration of innovative technology (Donley, 2005). One such innovation is the use of high fidelity simulation within the classroom and on campus in a nursing lab environment. Simulation as an instructional technique can provide a learning environment in the classroom that is as realistic as possible to the clinical setting (patients on nursing units at the hospital). There are several nursing schools throughout the country that are investigating the use of simulation to replace or enhance clinical experiences at health care facilities (Donley, 2005). Nurse educators around the country are engaged in debate over the issue of simulation replacing clinical instructional time for students at hospitals and clinical settings (Donley, 2005). The purpose of this study was to determine whether or not there was any difference between three instructional techniques (simulation with use of *VitalSim*™ or actor and traditional classroom learning) in terms of knowledge acquisition and confidence among undergraduate baccalaureate students in a Health Assessment class.

The following section explores the challenges facing nursing academia in preparing nurses for professional practice and in assisting students to attain basic nursing knowledge and skills (i.e. administering medications, performing assessments, changing dressings, and bathing). Simulation experiences may assist nursing students to learn information necessary to practice nursing while decreasing the need for clinical sites. Simulation can also be an effective pedagogical tool for new nurse educators. Its pre-scripted and pre-programmed format can actually promote consistency and teaching effectiveness.

*Setting*

A Mid-Atlantic State University was the setting for the study. This suburban, public university educates over 19,000 students and offers over 100 bachelor's, master's and doctoral degree programs. The University houses a nursing program offering baccalaureate and graduate nursing programs. Currently the nursing program has 243 undergraduate and 75 graduate nursing students with 20 full time and 40 part time faculty. Of the 20 full time faculty, only six are tenured and four other full time faculty have been there for more than four years. The average age of the faculty who have been there four or more years is approximately 52 years. Within the last year, 10 new faculty without teaching experience have been hired in clinical positions, including four who completed their master’s degrees at the university while teaching in the nursing program. Essentially there has been a fifty percent turnaround of new faculty due to retirements over the past two years.

This Mid-Atlantic State University’s Department of Nursing (DON) is confronted with several major challenges. Perhaps its greatest challenge is the lack of nurse educators. By the fall 2009 the undergraduate student enrollment will increase from 243 to 288 on the main campus; thereby increasing the need for nursing faculty. The second problem is the decrease in knowledge as seen in clinical and demonstrated by the low pass rate on the nursing board exam (NCLEX), that nursing graduates take upon graduation to become certified as registered nurses. The nursing students and overall nursing program could benefit from effective teaching and learning strategies. Additionally, nurse educators need to develop proficiency in the use of a wide range of teaching strategies including the effective integration of technology. Many current nurse educators do not use technology, but still create an interactive learning environment by using discussion and other active learning techniques to enhance student learning.

## Statement of the Problem

Nursing education is facing many challenges. One challenge is to assist nursing students to successfully function as nurses upon graduation in the midst of a nurse faculty and clinical placement shortage. Due to the shortage of clinical settings, there is a need to integrate instructional strategies that emulate real-world experiences in the classroom setting in order for students to acquire basic assessment techniques. To what extent can simulation as an instructional technique assist nursing students in learning basic nursing knowledge? Many studies have shown positive relationships between the integration of simulation in the medical and nursing arena and the acquisition of basic knowledge and skills (Good, 2003; Rogers et al., 2000; Scherer et al., 2003; Hendricks et al., 2002). Unfortunately, few studies in nursing have provided data on simulation and assessment knowledge acquisition.

### *Significance*

This study investigated whether simulation technologies increased nursing students' knowledge and confidence. Simulation can provide consistent learning scenarios in which every student experiences a variety of "patients" and is guaranteed similar learning experiences. In this way, students may be better prepared academically and more likely to gain knowledge. Simulation can assist in promoting consistent learning and supplementing or replacing clinical placements in hospitals and clinics. These placements are becoming increasingly difficult to locate as more schools of nursing are expanding enrollments and there is increased competition for sites. At the same time the demand for nurses in the workforce is growing. As many of these health care facilities are dealing with nursing shortages, it is becoming more difficult for them to accommodate large numbers of students (Donley, 2005). Moreover, nursing programs have increased their enrollment of nursing students, and therefore need more patient care units to teach the students in the hospitals. Simulation is an effective instructional technique that can promote teaching consistency, reduce the need for clinical placements, and provide a less stressful environment to prepare students for actual patient care. The results of this study may be useful for nursing schools in the improvement of instructional techniques in nursing education and assist with the clinical learning environment that are becoming more difficult to find.

## Research Design

This study was conducted in the fall 2007 semester and used a sample of convenience. The participants in the study consisted of approximately 51 students attending a mid-sized Mid-Atlantic comprehensive university. The course, from which the sample was drawn, is a 15-week, three-credit course, consisting of a lecture and laboratory component. Students attended class one day a week for five hours while simultaneously attending a four-hour clinical day with another instructor at a facility off-campus, but within a ten-mile radius of the university. The course entitled, “Health

Assessment across the Lifespan" is a requirement that every first semester nursing student must take and pass in order to progress in the program. There are three sections of the course, each with an enrollment of approximately15-20 students. The class is offered to current first semester nursing students in the junior level of college every fall and spring semester. Students are enrolled in this course, along with five other courses taken concurrently in the first semester, totaling 17 credits.

The design specifically used in this research was a nonequivalent control group design. Three different classes of Health Assessment were used in this research. The groups were formed by the administrative assistant who assigned students to classes based on when they sign up for classes. She assigned students to different groups and that determined which classes the students attend. While the class assignments are not random, students are placed alternately in Health Assessment sections based on when they see the administrative assistant to register for classes. The administrative assistant does not take requests for students to be in specific classes. The instructional treatment was assigned randomly to the three groups by tossing a coin to determine which group specifically received the specific learning intervention.

A pre-post test was developed and reviewed by six experienced faculty members in the area of content, testing and evaluation. The pre-test was administered prior to the content being taught, and the post-test was administered within one week of the case study experience, whether it is the simulation or non-simulation experience. At the time of the post-test, the students were asked to complete a confidence survey. The study was approved by the University's Institutional Review Board (IRB) for Research Involving the Use of Human Participants granted under the Exemption Number 04-1X09 on December 12, 2006 (Appendix A).

## Research Hypotheses

In order to understand the impact of simulation on knowledge acquisition and confidence levels, the following hypotheses will guide the research:

1. There will be no difference in student knowledge based upon the instructional treatment – integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning. $p < .05$
2. There will be no significant difference in student learning retention (one month) based upon the instructional treatment – integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning. $p < .05$
3. There will be no difference in students' confidence levels based upon the instruction treatment - integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning. $p < .05$

## Limitations

This study was conducted with the following limitations acknowledged:

1. The selection of participants was limited to 51 eligible students taking a nursing course in the fall 2007. The sample was one of convenience and therefore, introduced bias. Results of this study were not generalizable beyond the sample.
2. The high fidelity simulator that was used is one of many, but was selected for its ease of use. A limitation of this system was that only selected lung sounds are available for use with this high fidelity simulator.

3. There are several other simulators on the market. Since the study was limited to the integration of the one simulator, results can only be generalized to the integration of the selected simulator.
4. While each class had the same instructor who used the same text book, lesson plan, and syllabus, it is possible that the instructor employed different teaching methods within each class on the specific day that the lecture was presented.
5. The research used student self assessment of self confidence levels. Although it is assumed that students will be truthful to themselves, students might not have taken the time to read questions, and this might have caused variation in some of the results.

## Definition of Terms

Throughout this study several terms were used that are relevant to the study. The definitions as listed below will provide a better understanding of how the terms were used throughout the dissertation research. It is not the intention of the researcher to provide a general definition of each term, and it is possible that other explanations are used in a variety of contexts.

**Simulation.** Simulation can be incorporated in a variety of instructional methodologies from online scenarios, to role play, to the use of computerized mannequins. The term simulation is defined throughout the literature as the integration of mannequins, models, and scenarios to imitate an authentic problem and/or condition (Bearnson & Wiker, 2005), or the representation of a behavior through the use of another system (Ravert, 2002). For the purposes of this research, simulation is the purposeful replication of the clinical environment designed to demonstrate a variety of skills including clinical, decision-making, and critical thinking (Jeffries, 2002).

**Fidelity.** Is an adjective used to describe simulation and how closely it relates to real-world situations (Gaba, 2004).

**High Fidelity Simulator.** One instructional methodology of incorporating simulation is via the use of high fidelity simulators, which is a computerized life-size mannequin with realistic lung, cardiac, and bowel sounds. High-fidelity simulators encompass a wide range of simulators including *Meti-man,* developed by the Medical Educational Technologies, Incorporated in Florida, and *Sim-Man*, *Sim-Baby*, and *VitalSim*™ all developed by Laerdel (Nehring, Ellis, & Lashley, 2001). This study will incorporate the integration of *VitalSim*™ for a variety of reasons, mainly its ease of use and cost.

**Actor simulation.** Throughout this paper, actor or actor simulation, will refer to the use of a person who is portraying a patient with a medical condition. The most recent literature refers to an actor frequently as a standardized patient (Bosek, Li, & Hicks, 2007). The standardized patient is defined as a person portraying a patient.

**Learning achievement.** The result of the learning experience as measured by the differences between the pre and post test scores on the knowledge instrument. This is one of two dependent variables measured in this study.

**Clinical experiences.** An instructional methodology where nursing students practice nursing skills on actual patients in a hospital or rehabilitation setting

**Patient care units.** Floors on a hospital or rehabilitation center where patients are cared for by nurses, physicians, nursing students, and other healthcare personnel.

**NCLEX.** A national certifying examination where the acronym NCLEX stands for National Licensure Examination. There are two types NCLEX tests (NCLEX -LVN and NCLEX-RN). Throughout this paper NCLEX is referring to the examination that the nursing undergraduate students will take upon graduation from the program, which is the NCLEX-RN.

# CHAPTER II: REVIEW OF THE LITERATURE

This chapter will explore the literature on simulation and learning in a variety of settings, including nursing and medical education, education, business settings, and aviation. By investigating a variety of settings that integrate simulation, the researcher is able to examine different methodologies for incorporating simulation in nursing education. Obviously, reviewing the education literature, would demonstrate how simulation has been successful within education overall, including higher academia, and could therefore potentially be useful for nursing education. For example, in business, simulation is used to predict market strategies. This idea can be applied to the medical arena to assist students in managing potential health problems. It can also be used to examine future trends in nursing, such as caring for patients in the community and in non-traditional settings outside of the hospital. Additionally, theoretical perspectives supporting the use of simulation in education will be explored. The discussion will begin with the theoretical perspective followed by background information on nursing education. This will be followed by the historical overview of nursing education and a review of current approaches to simulation and learning.

## Theoretical Perspective

Knowles (1975), Merrill (2002), and Bandura (1997) are three authors that have proposed theoretical frameworks which have been applied to research on nursing simulation. According to Knowles (1975), adults, including nursing students, are engaged in self-directed purposeful learning. “Andragogy” is the term used to describe the study of adult learning. Researchers from this perspective make the following assumptions about adult learners: 1.) need to know why they need to learn something; 2.) need to learn experientially; 3.) approach learning as problem-solving; and 4.) learn best when the topic is of immediate value (Carlson, 1989). These principles are particularly relevant in nursing education. Strategies such as role-playing, simulations, and self-evaluation promote critical thinking and active learning.

Merrill (2002) describes five principles of instructional design that promote adult learning: 1). learners are engaged in problem solving in an authentic learning environment; 2). pre-existing knowledge is activated; 3). new information is embedded; 4). learners integrate new knowledge. The literature on simulation learning is also based on Bandura's theory which is adapted from Vygotsky (1978). Bandura (1997) asserts the following premises: 1.) observing and modeling behaviors and attitudes from others facilitates learning; 2.) coding behavior is learned; 3.) interaction occurs among students; 4.) retention, performance, and motivation enhance learning; 5.) transferability occurs through imitation; and 6.) behavior is adopted based on positive outcomes and social interaction.

*Instructional Design*

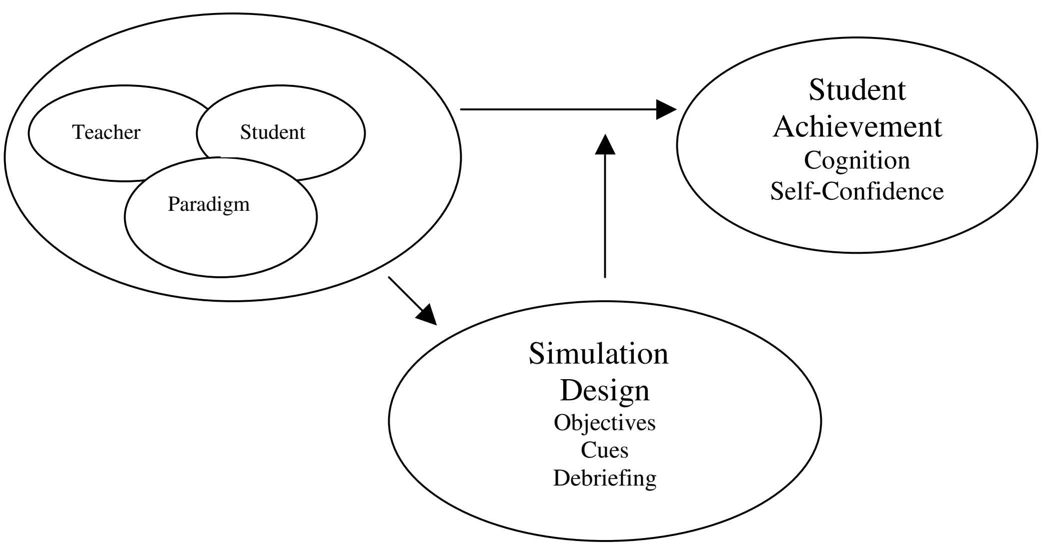


*Figure 1***.** Simulation Model as adapted from Jeffries (2002).

Jeffries (2002) proposed the simulation model in Figure 1 which suggests a framework upon which to build a simulation. This framework provides a mechanism by which teachers can design their own simulation scenarios. The teacher's ability to program the simulation, along with the student's ability and level in the program, are important considerations in framing the interactive educational paradigm. The design of the simulation needs to be based upon objectives, and the instructor may or may not provide cues during the interaction. Debriefing, or reviewing content post simulation, has been shown to be an effective modality for students to review content learned in the simulation scenario. The experience can be evaluated based on outcomes such as learning, skills, satisfaction, critical thinking, transferability to clinical practice, and confidence (Jeffries, 2002). This study examined the integration of three different instructional treatments and how it related to student learning and confidence levels.

It is important to investigate learning and simulation to determine whether or not simulation can facilitate student learning. If this study can prove that simulation assists students with learning, then both students and nursing schools can benefit from this research. By improving learning outcomes through the integration of simulation into the classroom, academic success is enhanced. Students are more likely to experience success while in the nursing program and may be more successful working as nurses upon graduation. The nursing school benefits by improving their NCLEX pass rates, while purchasing necessary cost containing equipment that will assist students in learning. The literature contains a number of studies documenting the effectiveness of simulation in promoting critical thinking, skill attainment, transferability, and satisfaction with simulation (Jeffries, 2002; Rauen, 2001; Garrett & Callear, 2001; Gay, Mills, & Airasian, 2006; Fletcher, 1998; Feingold, Calaluce, & Kallen, 2004). Additionally, students who are more confident in the performance of skills perform better in the clinical setting (Koerner, 2003; Hendricks, Keeling, & Ramos, 1995). The writer was unable to locate any recent studies investigating the impact of simulation on both student learning and confidence levels. Therefore, it seems prudent to investigate the impact of simulation experiences on both learning and confidence levels to address this gap in the research literature.

Simulation provides a learning environment where Knowles' and Bandura's theoretical frameworks can easily be applied. For example, simulation in the proposed study will allow for: immediate feedback through the debriefing sessions post simulation. A case study will be used so that students have an opportunity to work together as a team to solve a clinical problem. This method promotes experiential learning in an authentic learning situation (Knowles, 1975; Bandura, 1997); Moreover, students have an opportunity to transfer skills (auscultating lung sounds as demonstrated by the instructor) learned to the situation while interacting with other students (Bandura, 1997).

*Background*

Historically, nursing was taught in the hospital using a traditional classroom learning environment and clinical practice on nursing units (formerly known as "wards"). Nursing students practiced skills directly on patients under the supervision of a nurse. Skills included bathing, changing dressings, taking blood pressures, and assessing patients, among other skills learned throughout the nursing program.

The importance of focusing on the history of nursing education may not be as apparent to the general public, but to nurse educators, it is extremely significant. By becoming aware of the history of nursing education, current and future nurse educators will have a better perspective of the traditional framework for nursing education. This chapter will discuss the importance of integrating innovative teaching-learning strategies, more specifically simulation, into nursing education.

Nursing students sat in traditional classrooms passively note taking while the instructor, originally a physician, presented a topic (Simpson, 2003). The first formalized nursing training program originated in the 17th century. This one year program, offered by the French Sisters of Charity, emphasized traditional nursing where nurses followed doctors orders and were not encouraged to make suggestions regarding taking care of the patient. Later nursing curriculum was developed by the Lutheran Deaconesses in Germany where Florence Nightingale observed healthcare (Bevis, 1989). Florence Nightingale then formed the original framework of nursing education in the late 19th century (Rice, 1986). Preparation and training of nurses over the years has moved from diploma (hospital-based programs) to Associate of Arts degrees from community colleges and Bachelor of Science degrees from 4 year university programs (Ruby, 1999).

Since the inception of the landmark Flexner Report to the Carnegie Foundation in 1910 which set the paradigm for 20th century health care education (Lowenstein & Bradshaw, 2001; Flexner, 1910) and the Standard Curriculum in 1917 (Keeling, & Ramos, 1995), the challenge in nursing education has been the integration of traditional and nontraditional instructional methodologies within a standardized educational framework. In 1924, nursing was built upon a 2 year liberal education degree. The foundation for this degree was the concept of critical thinking (Hanson, 1991). In 1980, the American Nurses Association (ANA) published their social policy statement which articulated the need for nursing education to change toward a nursing diagnosis framework versus a skill focused curriculum (McBride, 1999). Over the past twenty years, nursing programs moved into the university setting, while hospitals closed their doors, opening up more clinical settings for the colleges to place their nursing students for clinical practice. The Health Professions Training and Nurse Education Improvement and Reauthorization Act of 1991 supported the training and education of professional health personnel, including nurses (Simpson, 2003).

Another challenge in nursing education is balancing clinical practice with classroom instruction. With the explosion of technology, nursing educators have become more innovative and have been challenged to pursue alternatives to traditional clinical experiences where students practice nursing skills on the patient care units in hospitals and rehabilitation centers. According to Simpson (2005), the use of new technologies, such as simulation could be used as alternatives to the clinical teaching. Nursing education has essentially gone from the traditional setting in the hospital classrooms and patient care units to the virtual learning environment with distance learning and simulation technologies in order to transcend geographical and staffing (nurse educators) barriers (Simpson, 2005).

## Historical Perspective of Simulation

Simulators have been used for years among a variety of disciplines. Simulation was used as early as the 17$^{th}$ century. In the early 17$^{th}$ century, primitive medical simulations existed in the form of basic anatomic mannequins (Loyd, Lake, & Greenberg, 2004). In the 1930's, the aviation industry incorporated simulation in its training of pilots. Pilots had to pass the flight portion of their training using a simulator that imitated potentially dangerous scenarios (Scherer, Bruce, Graves, & Erdley, 2003). Between 1990 and 2000, simulation has entered the healthcare arena. Simulation learning has been reported in the curriculum for training dieticians (Rosen, 2004) to medical residents (Rogers et al, 2000) to graduate level nursing students including nurse anesthetists and nurse practitioners (Scherer et al., 2003). Throughout the history of health care education, simulation was performed integrating a variety of forms including live actors, written scenarios, games, computer simulations via interactive CD-ROM, and simple mannequins (Bearnson & Wiker, 2005).

Simulation is based upon the concept of problem-based learning. Originally problem-based simulation was done using pen and paper to test clinical problem-solving skills (de Tornyay, 1968). Problem-based learning requires deductive decision-making and learning by discovery. It is student centered and uses highly structured scenarios to stimulate learning (Garrett & Callear, 2001).

Human patient simulation (HPS) in medicine was modeled from the aviation industry (Rosen, 2004). Aviation research has demonstrated how problem-based scenarios can be reenacted with the use of simulation (Rosen, 2004). This opened up the use of simulation within nursing academia. Three landmark reports appeared in the nursing education literature which addressed the importance of simulation training in nursing***:*** Fletcher (1998)**;** Monti, E. J., Wren, K., Haas, R., & Lupien, A. E. (1998); and O'Donnell, J., Fletcher, J., Dixon, B., & Palmer, L. (1998). Fletcher (1998) demonstrated the application of simulation in training nurse anesthetists how to manage an anesthesia crisis. Monti et al. (1998) described the use of simulators for undergraduate and graduate level students to learn physiology, pathology, and pharmacology via the use of case-based scenarios. O'Donnell et al (1998) described the use of simulation to teach graduate nurse anesthesia students' basic anesthesia skills. These three studies demonstrate out how simulation can be used to teach critical thinking and psychomotor skills via the incorporation of case-based scenarios. Historically, simulation has provided a framework for teaching nursing students from basic to advanced critical thinking skills within a safe environment. The current literature demonstrates a variety of learning contexts where simulation has been an effective instructional tool within nursing academia.

## Current Use of High Fidelity Simulators in Education, Healthcare, and Nursing Education

Simulation has been used in a variety of educational settings from elementary to higher education. Even preschool and younger school age children have benefited from simulation programs. One such program for preschool and young school age children is a program that teaches students pedestrian safety, *Walk Smart*, which is an interactive simulation for students that can be completed in groups (Glang, Noell, Ary, & Swartz, 2005). Elementary music teachers integrated a variety of simulated programs to reinforce music concepts, such as tempo markings, note values, music notation, and music symbols (Casey, 2005). Literacy was taught to elementary school students via a simulation software package (Walton, 2007).  Math and science departments have integrated various programs to assist students in gaining specific concepts. High school students have incorporated a program known as "Critters," which assisted students with gaining evolutionary biology concepts (Lahan & Scully, 2008).

Much of the research on simulation for attainment of psychomotor skills was conducted within medical schools, graduate nursing, and critical care programs. The use of the human patient simulator (HPS) has been shown to assist critical care nurses to learn psychomotor skills (Good, 2003) and medical students to learn psychomotor and critical thinking skills (Rogers, Jacob, Thomas, Harwell, Willenkin, & Pinsky, 2000; Marks et al., 2006). Several simulation studies have been conducted in master's level nursing education (Scherer, Bruce, Graves, & Erdley, 2003; Hendricks, Rule, Grady, & Ellis, 2002; and Nunning, 2004). Scherer et al (2003) demonstrated the effectiveness of HPS in assisting acute care nurse practitioner students to perform psychomotor and critical care skills. Hendricks et al. (2002) demonstrated that simulation improves critical thinking and decision-making skills, the ability to administer anesthesia, and confidence levels of students. Simulation provides students with an opportunity to learn in a constructive, realistic, highly participatory, and authentic learning environment (Nunning, 2004).

Research was conducted on the use of simulation with both undergraduate and graduate nursing students. Nehring, Ellis, and Lashley (2001) emphasized the advantages and disadvantages of using simulators in nursing curricula, research, and evaluation specifically undergraduate and graduate nursing students with the use of the *Metiman*. In 2002, the same group analyzed the integration of simulation experiences for learning critical care nursing management. They demonstrated the value of simulators for building critical thinking skills in graduate nursing students (Rauen, 2001). More recently, a study was conducted investigating the integration of standardized patients and skill attainment in an undergraduate nursing program (Bosek, Li, & Hicks, 2007). This study found that the use of standardized patients assisted undergraduate nursing students in skill attainment since this simulation was closer to a real world learning situation as is found on patient care units in a hospital.

Nehring and Lashley (2004) demonstrated an increase in learning retention, critical care skills, clinical nursing skills, and confidence levels of undergraduate nursing students with the integration of simulation. Simulation enhances the quality of information, communication, and performance among health professionals by providing immediate feedback in a safe learning environment while expanding the learner's knowledge (Koerner, 2003). The most recent literature suggests the use of high fidelity patient simulators for use in evaluating skills and possibly using the simulation experience as an alternative to the clinical setting for undergraduate nursing students (Nehring, 2008). Grant and Horwath (2008) agree about the use of simulation as alternatives to the clinical setting for baccalaureate nursing students but have encouraged the use of case-based scenarios that need to be academically developed which may be time-consuming for educators. Additionally, simulation could potentially assist to free up time for educators (Issenberg & Scalese, 2008).

Simulation assists students to learn skills in a safe environment and enables them to learn to manage a large array of clinical problems. Once the student experiences the simulation, the next step is for the student to be able to transfer the knowledge to a similar case in the real world clinical setting. This is referred to as transferability (Hanson, 1993). Feingold, Calaluce, and Kallen (2004) investigated the use of simulation and confidence levels, satisfaction, and self-reported transferability of psychomotor skills among baccalaureate nursing students. There is a gap in the literature in the area of simulation in undergraduate nursing programs and learning acquisition and transferability based on the instructor's perspective (Ravert, 2002).

Simulation is not just related to healthcare and aviation. The business arena has also incorporated the use of simulation. One such program is the simulated managerial experience known as Celemi Decision Base, where participants compete in teams of four to win potential customers and production orders from other teams (Ausburn, 2006). Each team is expected to develop a business strategy that is used for 10 business cycles, representing 10 years. Throughout the course of the simulation, the participants are engaged in making purchases based on financial, accounting, marketing, and sales decisions. They are expected to monitor customer needs and major market trends in order to provide the best strategy (Ausburn, 2006).

Another study conducted in the business arena emphasized decision-making using an international business simulation based on leadership and locus-of-control (Boone, Van Olffen, & Van Witteloostuijn, 2005).The simulation, known as the International Management Competition (IMC) is an "in company" training device used as a professional game company for training young managers in management development programs. The participants are paid by their company to participate in the simulation, and an all expense paid trip is the award for the winning team. The simulation is based on a multifaceted business environment where small teams run fictitious firms (Boone, Van Olffen, & Van Witteloostuijn, 2005). In the healthcare arena, nurses need to work together just as business men and women to resolve situations. Often solutions that work in the business world may lend assistance to healthcare problems.

Simulation has been used in a variety of ways in diverse environments. Business and education have incorporated the idea of simulation as problem-based case scenarios within a realistic setting whereas, in healthcare, simulation adds the benefit of a device, such as *VitalSim*™ that students integrate within a case-based scenario in order to assess a patient. The literature review has shown that simulation has been linked with learning basic knowledge, skills, and critical thinking, in addition to increasing students' confidence levels.

Types of Simulators

There are a variety of simulators on the market produced by different companies that have been identified throughout the nursing and medical education literature as being integrated for research purposes. There were two studies that were located (Scherer, Bruce, Graves & Erdley, 2003and Scherer, Bruce, & Runkawatt, 2007)) that integrating a full-size mannequin known as the Med-Sim Eagle with a group of graduate acute care nurse practitioner students demonstrating how students learned critical care advanced skills more proficiently. Many nursing studies incorporated the use of *SimMan*, especially due to the research that was sponsored by Laerdal and the National League of Nursing (NLN). Yaeger et al (2004) integrated high fidelity simulation using Laerdal's SimMan and PediSim that showed an increase in skill and knowledge acquisition with graduate level nurse practitioner students while Brett-Fleegler et al (2008) and Good (2003) integrated *SimMan* to evaluate a positive learning outcome for medical residents acquiring advanced skills. Nehring, Ellis, and Lashley (2001) conducted research integrating *Metiman* with both graduate and undergraduate nursing students. Rauen (2004) demonstrated advanced nurse practitioner students acquiring critical care skills such as intubation with the use of *Metiman* while Lynch (2004) demonstrated that the HPS assisted medical students in acquiring skills. There are several studies that did not identify the specific simulator that was integrated (Decker, Sportsman, Puetz, & Billings, 2008; Marks, Shekhter, Gallagher, & Lewis, 2005; Murray, Grant, Howarth, & Leigh, 2008; Radhakrishnan, Roche, & Cunningham, 2007; Waldner & Olson, 2007; Shepherd, Kelly, Skene, & White, 2007). Two studies (Massias & Shimer, 2007; Bosek, Li, & Hicks, 2007) incorporated the use of actor simulation with undergraduate nursing students and showed a positive relationship with skill acquisition. To date, there was one study that incorporated the use of *VitalSim*$^{TM}$ and *SimMan* with undergraduate nursing students skill acquisition and the results showed that both simulators showed the same amount of skill acquisition; neither was superior over the other (Starkweather & Kardong-Edgren (2008).

Summary

Throughout the review of literature, simulation has been shown to provide an effective learning design for nursing students to acquire new concepts and perfect skills within a safe environment (Laerdal, 2006; Monti et al., 1998; Nehring, Ellis, & Lashley, 2001; Nehring & Lashley, 2004; Scherer et al., 2003; Jeffries, 2001; and Ravert, 2002). The purpose of this research was to investigate whether or not simulation increases students' learning and confidence levels. The works of Knowles and Bandura served as the theoretical framework for this research (Knowles, 1975; Bandura, 1997). Bandura's principles are incorporated in this research as the social aspect of students working as a team is also explored (Bandura, 1997). Adult learning principles were adapted from Knowles' theory and incorporate the need for adult learners to be able to integrate what they learn (Knowles, 1975). The expectation is that this research will provide information to support the effectiveness of high fidelity simulation within an undergraduate nursing curriculum. This research explored questions surrounding the impact of simulation on undergraduate nursing students' learning confidence levels.

Simulation research has investigated transferability to realistic situations (Hanson, 1993; Ravert, 2002) and critical thinking (Feingold, Calaluce, & Kallen, 2004). In addition, a research study was recently conducted using "standardized patients," or actors to create a simulated environment for skill acquisition (Bosek, Li, & Hicks, 2007). In a similar fashion, it was the researcher's intent to implement a high fidelity easy to use simulator so that nurse educators were able to learn the technology easily. This research was unique with regards to investigating whether or not one or both types of simulation (actor or *VitalSim*$^{TM}$) affected students' learning and confidence levels. Additionally, the current study was integrating three instructional designs; an approach that is unique to the simulation literature. Simulation can provide a safe learning environment for students to gain experience prior to entering the clinical setting where life and death issues must be faced with confidence and the ability to perform skills safely (Ravert, 2002).

# CHAPTER III. METHODOLOGY

Nursing students are adult learners who are learning complex concepts essential to professional practice. Simulations and self evaluations contribute to active learning (Carlson, 1989). This research investigated the relationship between simulation and selected student learning outcomes (knowledge, confidence) within a nursing course. A quasi-experimental design was used. The administrative assistant placed students in each of the nursing classes at the junior and senior level. Students were placed in classes in an alternating systematic fashion according to when their appointment was with the administrative assistant to register for classes. For example, the first student was placed in Health Assessment, section one, and then the second student was placed in Health Assessment, section two and so on until all students are placed in classes. Chapter three describes the research methods used in this study including: sample, description of the research setting, procedures, research questions, selection of participants, instruments used, limitations and assumptions, IRB approval, and summary.

*Sample*

The sample used in this research was a sample of convenience. The sample consisted of 51 undergraduate junior level nursing students in a health assessment course from a mid-sized, comprehensive Mid-Atlantic metropolitan university. Data collected in the study was obtained from students enrolled in the three sections of the required first semester junior level nursing assessment course. This was the first semester of the nursing program for these participants and the first class that students were exposed to the simulator (*VitalSim*™) in the classroom. Participation in the study was completely voluntary and had no affect on student grades.

## Research Setting and Procedures

The course, Health Assessment across the Lifespan, is a required course for all nursing students and is offered in the first semester junior level in the nursing program, which occurs every spring and fall. The enrollment for the course varies each semester. During the fall semester of 2007, two sections of the course were offered on Monday and one section on a Thursday. The course was a 15-week, three-credit course in the nursing program and consisted of a combined lecture and lab component. The students met weekly on the same day (either Monday or Thursday) for a five-hour block of time. Students learned assessment skills such as observation, palpation (touching), and auscultation (listening with a stethoscope). The course used a web-enhanced learning platform where content was placed by the instructor on the BlackBoard course site for students to review and enhance learning. The course site was used to provide lecture notes, class material, and assessment videos.

Students in the health assessment course attended a five-hour class in the afternoon, usually from 12 noon to 5 pm. Although each class was taught by a different faculty member, the same course syllabus, text book, classroom, online quizzes, and lab materials were used. The online course site for each section was set up similarly with learning modules and videos for students to review for each class. The researcher assisted the other instructors with setting up content on the Blackboard course sites. Students enrolled in the Health assessment class met face-to-face four hours every week, with one hour provided for students to watch the online videos and prepare for class.

### *Participants*

Nursing students in the first semester of their junior year take five other required nursing courses concurrently with the Health Assessment course: Pathophysiology, Pharmacology, Skills and Technology, Health Promotion, and a writing course. Students must pass each course in order to progress to the next level in the nursing program. Students learn about the various body systems, including the respiratory system, in the Pathophysiology class. The Skills and Technology class taught the students basic nursing skills such as giving baths, administering medications, and making beds. Health Promotion consisted of a clinical component where students gave baths to patients, made beds at the hospital, and when ready after the appropriate module, incorporated skills, such as auscultation, learned from the assessment class. The writing course deals mainly with nursing theory. The Health Assessment course taught students how to assess a patient's health status by incorporating principles learned in Pathophysiology. Students learned how to listen (auscultate) heart, lung, and bowel sounds, as well as palpate for tenderness on the chest, abdomen, etc. Additionally, students applied their knowledge to real-life case scenarios in a majority of courses throughout the nursing program.

The participants consisted of 51 students from three first semester entry junior level nursing students in a course entitle Health Assessment Across the Lifespan. Approximately 94 percent of the students were females, leaving 6 percent (3 students) that were males. Approximately twenty percent (10) of the students had earned previous bachelor's degrees and one student had an associate arts degree. Out of the ten students that previously earned a bachelor's degree, two had business degrees, and three had degrees in biology. Ten percent of the students were not born in the United States and their first language was not English. Approximately 75% of the participants in this study were single unmarried Caucasian female between the ages of 20 and 30 (see Table 1).

Table 1

*Participant Demographics*

| Demographics | Gender | | Race | | | Previous Bachelors | | Single / Married | | Children | | Total N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | C | AA | A | Yes | No | S | M | Yes | No | |
| Actor | 1 | 15 | 11 | 3 | 2 | 2 | 14 | 15 | 1 | 1 | 15 | 16 |
| VitalSim™ | 1 | 19 | 16 | 2 | 2 | 4 | 16 | 19 | 1 | 0 | 20 | 20 |
| Traditional | 1 | 14 | 12 | 3 | 0 | 4 | 11 | 13 | 2 | 1 | 14 | 15 |
| Total | 3 | 48 | 39 | 8 | 4 | 10 | 41 | 47 | 4 | 2 | 49 | 51 |

(C = Caucasian; AA = African American; A = Asian)

*Selection of Content*

The respiratory content was selected as the content to base the research on for several reasons. First, the respiratory content was presented during the middle of the semester when students have gained a better understanding of the respiratory system through their pathophysiology course. Secondly, this was a system that could incorporate the use of a case study, simulator and real patient. Thirdly, the skills that students learned in this module were expected to carry over to the clinical setting and are one of many basic skills necessary to practice as a nurse upon completion of the nursing program.

## Research Design

The design used in this research was a nonequivalent comparison group design. Participants were not randomly assigned to groups, but rather the groups were randomly assigned to the treatments (Gay, Mills, & Airasian, 2006). The treatment was decided by tossing a coin to determine which treatment was assigned to each group. This research involved the use of three different Health Assessment classes where the respiratory content was taught by the same instructor to all three classes, but the interventions were randomly selected the following week for each group.

The variables for this study included the aforementioned three groups (the independent variables) and student self-perceived confidence ratings and student knowledge as the dependent variables (see Figure 2 below).

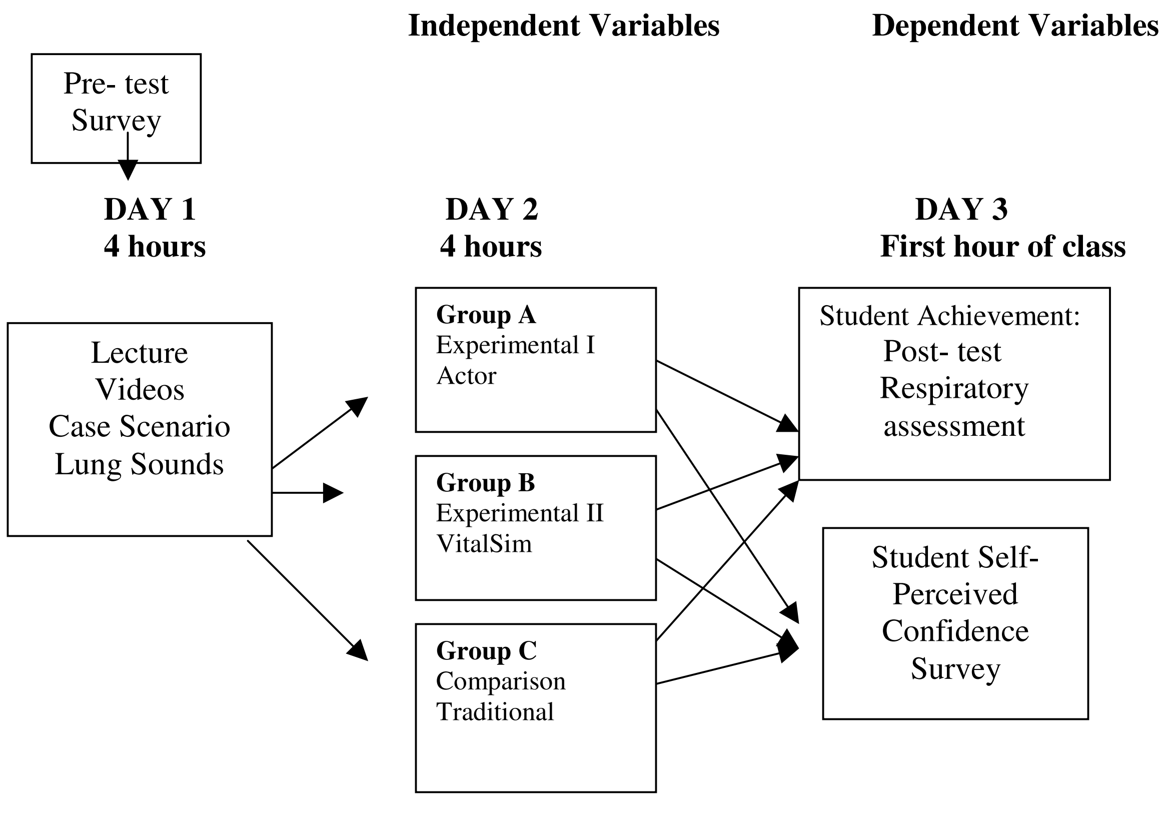


**Figure 2.** Independent and Dependent Variables.

*Groups and Procedures*

All three groups were given the pre knowledge test and confidence survey prior to being exposed to the respiratory content which occurred one week prior to day one since students prepare for class by reviewing the textbook and notes before the content was presented. Students received a Power Point in class lecture, had access to videos online, presented with a case study pertaining to the material, and listened to audio tapes containing lung sounds. The post test (Appendix B) and confidence survey (Appendix C) was given to all students the week after the instructional treatment was administered. The confidence survey is based on Ravert’s tool to determine perceived confidence level. This tool consisted of a scale from 1 (not confident at all) to 5 (extremely confident). Students were made aware that completing the pre test post test and confidence survey had no effect on the student grade or status within the nursing program.

*Respiratory module day 1.* The respiratory learning module occurred over two class periods of five hours each which were each separated by one week and consisted of a PowerPoint lecture (the same given to each group), audio tapes with lung sounds, practice sessions where students listened to each other’s lung sounds, and a video of a respiratory assessment that students watched during class (Barbara Bates respiratory video that was purchased through the nursing school). Students could download the lecture notes from the online course site at any time prior to or after class (see Appendix D). Prior to coming to the second session which was one week after the first five hour session, all groups were instructed to do the following: 1.) review the audio lung assessment CD included with their course textbook; 2.) review the respiratory assessment DVD located on the Blackboard course site; and 3.) review the case study (see Appendix E). Students were encouraged to develop questions needed to ask the case study patient in preparation for respiratory class two session. All students continued to attend their remaining five classes during the two weeks of the respiratory module, including clinical rotations within health care facilities, either at a hospital or rehabilitation center.

Prior to the first day, students were given a pretest consisting of a twenty question multiple choice test (see Appendix B). Additionally students were given a confidence level survey to complete (see Appendix C). The first day was the same for all three groups of students who were instructed by the same educator. Students were provided with an outline of the PowerPoint presentation to follow during the class lecture (Appendix D). The class period lasted five hours. Students listened to lung sound tapes and watched a twenty minute respiratory assessment video (Barbara Bates respiratory video) in class. Students were provided with an opportunity to practice performing lung assessments on each other. Students were assigned to groups for the following week.

The students that were in the simulation groups (actor and *VitalSim*™ *VitalSim*™) were given a time to report to the lab that did not contain the simulators on week two of the module in order to prepare them for the simulation process. Each group of four students was separated by thirty minutes so that the groups were exposed to the simulation individually versus all groups observing the simulation prior to going themselves. Each student was provided with the case study scenario and encouraged to review the scenario during the next week prior to the second class session in order to be acquainted with the information in the scenario (Appendix E). For an overview of the respiratory module and case scenario, please see Appendix F.

*Respiratory module day 2.* The group using the actor consisted of nursing students enrolled in the undergraduate Health Assessment class that were randomly selected to participate in this group. These students were involved with simulation using a live patient, or actor, during the second session of the respiratory module. The second day of the respiratory module consisted of beginning the class with each group of four to five students arriving at their designated time in the lab without the simulators for preparation, including any clarifications of the case scenario. Once the students arrived to the lab, they were arbitrarily assigned any one of five roles (recorder, previous shift nurse, current nurse, nursing student, and nursing instructor) by blinding taking a piece of paper out of a hat with their role written and defined on it. This process took about twenty minutes to enable the students to review as a group their roles and the case scenario once again.

Students were then escorted to the lab where the simulation occurred. They were given report on the patient as if they were in a clinic. Next the students were introduced to the patient and family member by the instructor. The care of the patient was then turned over to the students and the actor simulation was begun. At that time, students needed to assist the patient, the actor, with his condition. The simulation experience with the actor lasted approximately twenty minutes. During the twenty minute actor simulation experience, the actor became progressively worse with his breathing, mimicking abnormal breathing known as wheezing. The students attempted to assess and assist the patient. The patient's wife, played by the graduate student, provided cues to the students to keep them on track so that the students continued to assess and assist the patient. At the end of the twenty minutes, students were then instructed to report off to the instructor and then sit down in with their group in order to document their assessment and discuss their findings as a group.

Once students completed their documentation on their patient, they discussed their findings with the instructor and analyzed what could have been done better, how they felt, and final results of what they think was happening with the patient. For a more detailed look at the simulation experience, including the checklist that was used, please see Appendices G and H. While students were waiting for the rest of the class to complete the simulation, they were instructed to take a break and return at a specified time. It was at that time, that the actor discussed with the students how he felt during the process. The students openly discussed the case as a class with the actor.

The *VitalSim*™ group consisted of nursing students enrolled in the undergraduate Health Assessment class that were randomly selected to participate in this group. These students used the *VitalSim*™ simulator. These students were involved with simulation using *VitalSim*™ during the second session of the respiratory module. The second day of the respiratory module consisted of beginning the class with each group of four to five students arriving at their designated time in the lab without the simulators for preparation, including any clarifications of the case scenario. Once the students arrived to the lab, they were arbitrarily assigned any one of five roles (recorder, previous shift nurse, current nurse, nursing student, and nursing instructor) by blinding taking a piece of paper out of a hat with their role written and defined on it. This process took about twenty minutes to enable the students to review as a group their roles and the case scenario once again.

Students were then escorted to the lab where the simulation occurred. They were given report on the patient as if they were in a clinic. Next the students were introduced to the patient and family member by the instructor. The care of the patient was then turned over to the students and the simulation was begun. At that time, students needed to assist the patient with his condition. The simulation experience lasted approximately twenty minutes. During the twenty minute actor simulation experience, the patient became progressively worse with his breathing demonstrating abnormal breathing known as wheezing. The students attempted to assess and assist the patient. The patient's wife, played by the graduate student, provided cues to the students to keep them on track so that the students continued to assess and assist the patient. At the end of the twenty minutes, students were then instructed to report off to the instructor and then sit down in with their group in order to document their assessment and discuss their findings as a group.

Once students completed their documentation on their patient, they discussed their findings with the instructor and analyzed what could have been done better, how they felt, and final results of what they think was happening with the patient. For a more detailed look at the simulation experience, including the checklist that was used, please see Appendices G and H. While students were waiting for the rest of the class to complete the simulation, they were instructed to take a break and return at a specified time. It was at that time, that students openly discussed the case as a class.

The traditional learning group consisted of nursing students enrolled in the undergraduate Health Assessment class that were randomly selected to participate in this group. These students used the traditional learning strategies with the case scenario. The second day of the respiratory module all students in the class arrived at the same time. At the beginning of the class, students were provided with an opportunity to ask questions regarding the case scenario. Then students were placed in their groups of four students which were assigned the week before and prepared to discuss the case scenario. Students worked together in their assigned groups to determine the best interventions for the patient discussed in the case scenario. The discussion lasted approximately twenty minutes. During the twenty minutes, the students discussed with each other the patient's overall condition and interventions that could assist the patient.  Students were then instructed to document their findings as if they were done with assessing their patient and preparing to report off to the next nurse. Following the initial twenty minute experience, students completed their documentation and reported on their patient to the instructor. After their report, the students were debriefed with the instructor discussing what could have been done better, how they felt, and final results of what they think was happening with the patient. A class discussion occurred following the debriefing period where all groups openly discussed the scenario.

*Respiratory module day 3*. At the beginning of the following class, day three, students in all three groups had an opportunity to ask questions and clarify any respiratory information. This session was followed by the post test and confidence survey. After completion of the post test and the confidence survey, the researcher thanked the class for their assistance and the next learning module was presented by the course instructor.

All three groups interacted with each other as suggested by Bandura's theory. The comparison group was not exposed to the simulation experience, but interacted among their group to solve the problem. The actor group integrated a person portraying a patient with a medical condition that the students needed to assess while *VitalSim*™ group was provided the simulation scenario by incorporating the high fidelity simulator, known as the *VitalSim*™. The same scenario lasting 20 minutes was given to all of the experimental groups followed with a debriefing period where students shared their experiences with each other and discussed other interventions that could have been integrated to potentially change outcomes that occurred during the simulation.

*One month post the instructional treatment.* A post-post test was administered to all three groups one month post the instructional treatment was completed. The post-post test, or post test two, was given at the beginning of a class held one month after the first post test was administered. The purpose of the second post test was to determine if learning retention had occurred in the groups.

## Threats to Validity

There were several threats to validity due to the inability of the researcher to assign the participants to random groups. The threats to validity include: 1.) regression; 2.) maturation; 3.) history; 4.) testing; and instrumentation (Campbell & Stanley, 1963). More specifically, in this study, the threats to internal validity can incorporate interactions among variables such as selection, history, and testing (Gay, Mills, & Airasian, 2006). If there was a difference between pre –test post- test scores, then the rationale could possibly be due to history versus the intervention (Campbell & Stanley, 1963). A pretest – posttest gain specific to the experimental group could be attributed to such variables as history and testing (selection-history or selection-testing interaction) as opposed to the intervention and could pose threats to internal validity (Campbell & Stanley, 1963). Additionally, there was a concern that participants learn from the pre-test versus the effect of the intervention. A threat to external validity occurs when the participants are aware of being “guinea pigs” and realize that certain participants are actually part of the experiment. By being a part of the experiment, students may feel like they have to do well or possibly that they really do not care about the content or performing well. Participants might not feel like answering questions honestly or even at all since it does not reflect on their grade.

## Research Hypotheses

Based upon the literature review and purpose of this study, the following hypotheses have been proposed:

1. There will be no significant difference in student knowledge based upon the instructional treatment – integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning.
   a. Ho1: There will be no significant difference in post-test scores of the simulation group with the actor and the group using traditional learning techniques. $p < .05$.
   b. Ho2: There will be no significant difference in post-test scores between the simulation group using the High Fidelity Simulator and the group using traditional learning techniques (Comparison Group). $p < .05$.
   c. Ho3: There will be no significant difference in post-test scores in any of the groups. $p < .05$.
2. There will be no significant difference in student learning retention (one month) based upon the instructional treatment – integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning.
   a. Ho4: There will be no significant difference in post-test scores at one month of the simulation group with the actor and the group using traditional learning techniques. $p < .05$.
   b. Ho5: There will be no significant difference in post-test scores at one month between the simulation group using the High Fidelity Simulator and the group using traditional learning techniques (Comparison Group). $p < .05$.

c. Ho6: There will be no significant difference in post-test scores at one month in any of the groups. $p < .05$.

3. There will be no difference in students' confidence levels based upon the instruction treatment - integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning.

    a. Ho7: There will be no difference in confidence levels between the simulation group with the actor (Experimental Group I) and the group using traditional learning techniques (Comparison Group). $p< .05$.

    b. Ho8: There will be no difference in confidence levels between the simulation group using the High Fidelity Simulator (*VitalSim*™ - Experimental Group II) and the group using traditional learning techniques (Comparison Group). $p < .05$.

    c. Ho9: There will be no difference in confidence levels in any of the groups. $p < .05$.

## Data Collection: Instruments

Data was collected using several tools. The pretest – post test tool was used to evaluate learning gained from the simulation- case-study experience. The pre-test post-test tool (see Appendix B) was developed and tested for construct validity through the use of six expert nurse educators. After revising the tool based on the nurse educators' comments on the test, a Cronbach coefficient alpha was measured (0.74) and a content validity index (CVI) was conducted. A content validity index (CVI) was conducted on this tool as described by Soeken (2004). The purpose of the CVI was to determine the extent to which the quiz represents the content domain. The CVI for the instrument is the percentage of total items that are rated by the experts as three or four. The procedure for the CVI involved three experts who were asked to judge the specific items and/or behaviors included in the tool in terms of their relevance, sufficiency and clarity in representing the concepts. All three experts were asked to rate each item on a scale of one to four. The CVI was then used to quantify the extent of agreement among the experts. A CVI of 0.8 or better indicates good measurement reliability (Polit & Hunger, 1999). The CVI for this instrument was 0.93.

The judges used for this index are both nurse educators who have taught Health Assessment at other universities. None of the judges participated in reviewing the original pre test / post test. Judge 1 is an adjunct professor at the University of Maryland, Baltimore (UMB) teaching undergraduate and graduate level Health Assessment, in addition to working at a clinic as a nurse practitioner. She is masters prepared with her degree as a family nurse practitioner. Judge 2 is full time professor at Jefferson College and has taught undergraduate Health Assessment in the past, in addition to primarily teaching pediatrics to undergraduate nursing students. This judge has a Master's degree in nursing with an emphasis on nursing education from UMB and is considered an advance practice nurse in pediatrics. Judge 3 is a doctoral prepared professor and family nurse practitioner at Johns Hopkins University teaching undergraduate and graduate level Health Assessment classes, in addition to working at a clinic as a family nurse practitioner. For results of the CVI, please see figure 3.

| Judge | Scale | | | | Total |
|---|---|---|---|---|---|
| | 1 or 2 not/somewhat relevant | | 3 Quite Relevant | 4 Very Relevant | |
| Judge 1 | 0 | | 8 | 12 | 20 |
| Judge 2 | 0 | | 2 | 18 | 20 |
| Judge 3 | 1 | 3 | 7 | 9 | 20 |
| Total | 4 | | 17 + | 39 | 60 |

*Figure 3***.** CVI ratings from 3 expert judges where the CVI = 0.93 with an overall rating of 3.57 out of 4.

Students enrolled in the three Health Assessment courses were already placed into three groups according to their arbitrary pre-assigned course schedule. The assignment was completed by one of the nursing administrative assistants within the nursing department. The pre-test, post test was reviewed and modified based upon six experienced nurse educators. The second tool, the perceived self-efficacy survey, was originally developed by Ravert (2002). Ravert used the survey to determine if the use of the simulator assisted students in becoming more confident with a particular skill. This tool is based on a scale from 5 (extremely confident) to 1 (not confident at all). Permission was granted from Ravert (2002) to use the instrument in this study. A Cronbach alpha of 0.76 had previously been established, which demonstrates that the tool overall has internal reliability and validity. The students completed the confidence survey at the conclusion of the study. Data was collected and analyzed using SPSS software and compared with the post test that was given immediately after the experience.

The case study was developed and reviewed by expert educators for completeness (see Appendix E). Each group received a copy of the case to preview.

*Instrumentation: Selection of Simulator*

There were several types of high fidelity simulators on the market including *Meti-man,* developed by the Medical Educational Technologies, Incorporated in Florida, and Sim-Man, Sim-Baby, and *VitalSim*™ all developed by Laerdel (Nehring, Ellis, & Lashley, 2001). This study incorporated the integration of *VitalSim*™ for a variety of reasons, mainly its ease of use and cost.

*VitalSim*™ is much more cost effective than the other two simulators with a cost of between $1900 - $2000 versus $29,000 for *SimMan* and up to $85,000 for *MetiMan* based on recent information from Laerdal (2006). In training nurse educators, *VitalSim*™ is less cumbersome, and took only ten minutes to train the average tech-focused nurse educator and about thirty minutes to train a non-tech nurse educator. This compares with the unsuccessful three-day workshop training for MetiMan that ended in no one understanding how to use the *MetiMan* (J. Breitenbach, personal communication, August 1, 2006). The *VitalSim*™ enables students to auscultate respiratory, cardiac, and bowel sounds while palpating pulses and taking vital signs. *MetiMan* and *SimMan* add another realm of realism, but are based on a more complicated programming computer versus the simplicity of the *VitalSim*™ computer. Overall, *VitalSim*™ is less cumbersome, less complicated, easier to use, and less costly. The Chair of the Nursing Department stated that she was willing to purchase several more *VitalSim*™ if necessary so that more students may be able to integrate simulation in the laboratory setting (Chair, personal communication, November 1, 2006).

*Actor (Standardized Patient)*

The actor is a colleague from the same Mid-Atlantic State University, who has played patient roles previously. He has performed in Health Assessment videos years ago. Currently he is not in any of the videos that are shown in this course. The cost for the actor is gratis. He is donating his time to the research study.

## Data Collection and Analysis Plan

Data collection for this study was conducted using a hand written pre-post test and survey collection tool. The data was entered into a statistical analysis package (SPSS) for analysis. A dependent t test was used to look at the difference between the post-test scores among the three study groups. An analysis of variance (ANOVA) was used to determine the difference between study groups on the student confidence survey composite scores. A one-way ANCOVA was used to equalize the groups since the groups were not the same at the beginning as demonstrated by the preknowledge test results (see Appendix I for a summary of data collection and analysis plan). Figure 4 shows an analysis plan for student achievement while Figure 5 shows an analysis plan for student's confidence levels.

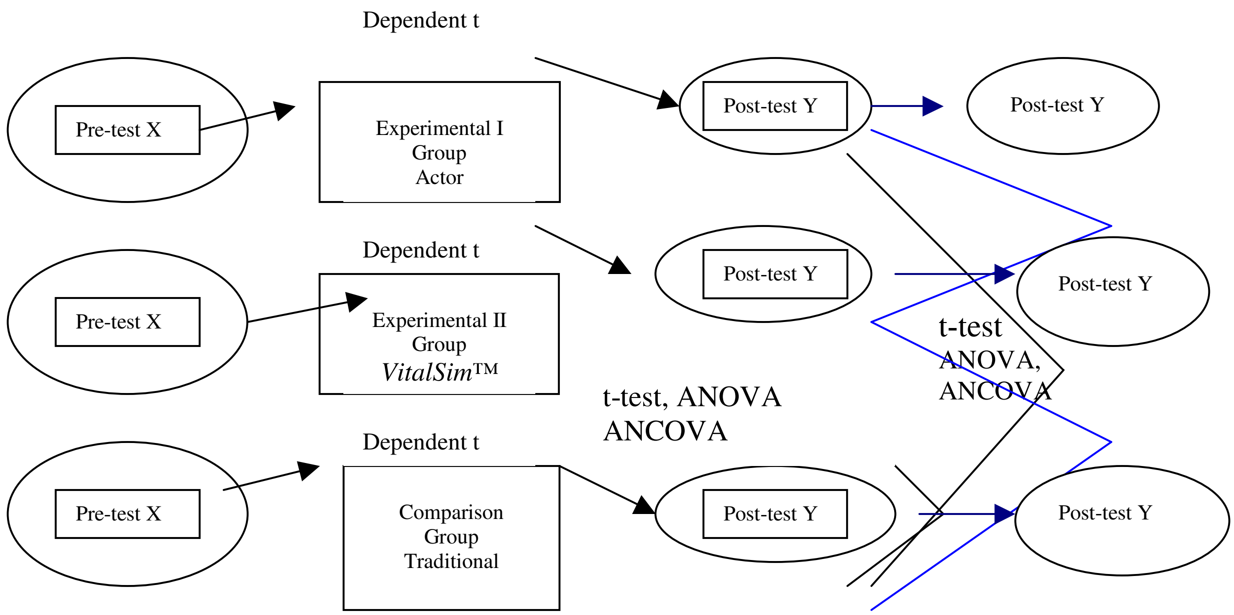


*Figure 4*. Plan for analysis of student achievement.

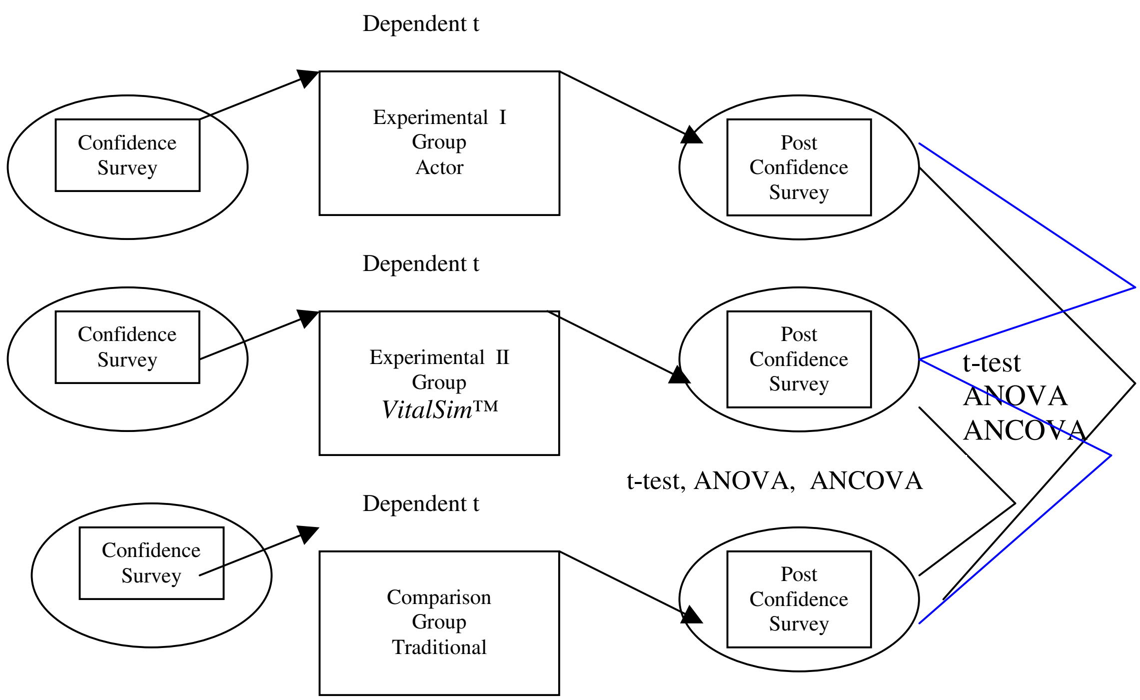


*Figure 5*. Plan for analysis of student perceived confidence level.

## Limitations and Assumptions

The research was conducted acknowledging several limitations and assumptions. The participants were limited to 51 eligible students among three different Assessment classes in the fall 2007 semester at the Mid-Atlantic State University. The sample is one of convenience and introduced bias. Therefore, the results are not generalizable beyond this sample of 51 students in the three Assessment courses. It is assumed that all students will agree to participate, but they do not have to. Students were informed that whether they choose to participate or not, there grade will not be affected for the course. The respiratory module was taught by one instructor. Although the same instructor taught all three sections and did not determine which group was to receive which treatment until after the lectures were completed, the study was limited to the possible variances in the teaching style among the three classes. Researcher bias may impact the study because of pre-existing beliefs by the researcher of the effects of simulation on learning retention. The researcher conducted the entire respiratory module for the three classes. There was a specific simulator that was used, so the study was limited to the capabilities of the simulator and results therefore, are only generalizable to this specific simulator. This research incorporated a student confidence level report. Although it is assumed that students answered questions truthfully and honestly, the study was limited to the individual differences in student self perception. It is assumed that students honestly answered the pre and post test questions by themselves and were not informed of questions by students completing the quizzes on earlier days. All three classes completed the same quizzes, and for example the Monday class could have informed the Thursday class of the questions. It is assumed that students collaborated equally in the case scenarios whether the simulator, standardized patient, or the case study alone was used.

## Summary

This study evaluated the differences between three learning environments on student learning acquisition and confidence levels in a junior level nursing Health Assessment class. There is a significant body of research demonstrating the integration of high fidelity simulation in graduate nursing programs, but there is a gap when it comes to research in undergraduate nursing programs. Additionally, no research has been found in the literature demonstrating the integration of a standardized patient, or actor, and learning.

Two tools were used in this research. The first tool was the pre-test post-test that was developed for this study based on six expert nurse educators. Reliability testing was performed and study approval was already granted from the Mid-Atlantic State University. The second tool, the self-efficacy survey, was developed and reliability testing has been reported in the literature (Ravert, 2002). This chapter has proposed a study in which three learning environments were compared in order to determine the impact of a simulation as an experimental treatment on learning outcomes, as measured by a pre-post-post test and the impact on student confidence as measured by a self-efficacy level survey.

# Chapter IV. RESULTS AND FINDINGS

This study gathered data from three different learning environments as depicted by the knowledge pretest - post test and the confidence level survey. Three groups were analyzed with regards to learning and confidence before and after the respiratory module were taught in a junior level health assessment nursing class. All students were provided an opportunity to listen to the lecture, to review the videos, and to practice time with respiratory assessment by practicing on each other. Students were then provided with a case study. The first group integrated an actor as the patient in the case scenario and worked together to assist the patient with his diagnosis. The second group integrated the VitalSim™ as the patient and the students worked through the assessment and developed a plan of action for the patient. In both the actor and VitalSim™ groups there was a graduate nursing student portraying the patient's wife who prompted the students with what was happening with the patient as the students worked through the assessment and intervention for the patient. For example, when the patient was becoming worse, she would raise her voice at the students stating that something was wrong with her husband. The third group integrated a traditional teaching pedagogy where students were able to assess and develop a course of action with interventions by working in groups within the classroom setting. For this study, the following groups and conditions have been defined: Actor Simulation group (Experimental Group I), VitalSim™ group (Experimental group II), and the Traditional group (Comparison Group). This chapter consists of the following sections: participant demographics, data overview, research question 1, research question 2, research question 3, and a summary of the findings.

## Data Overview

In this study, two tools were administered to the participants at three intervals: at the start of the teaching module, at the conclusion of the teaching module, and one month post the conclusion of the teaching module. The first tool was a knowledge test based on twenty multiple choice questions. The second tool was the confidence level survey which consisted of twenty questions incorporating a five point Likert scale.

*Knowledge*

The week before the respiratory module was taught, 51 first semester junior nursing students took the knowledge quiz and the confidence survey as described previously in Chapter three. The pretest – post test tool was used to evaluate learning gained from the simulation- case-study experience. The pre-test post-test tool (see Appendix B) was developed and tested for construct validity through the use of six expert nurse educators. After revising the tool based on the nurse educators' comments on the test, a content validity index (CVI) was conducted as described by Soeken (2004). The purpose of the CVI was to determine the extent to which the quiz represented the content domain. The CVI for the instrument was the percentage of total items that were rated by the experts as three or four. The procedure for the CVI involved three experts who were asked to judge the specific items and/or behaviors included in the tool in terms of their relevance, sufficiency and clarity in representing the concepts. All three experts were asked to rate each item on a scale of one to four. The CVI was then used to quantify the extent of agreement among the experts. A CVI of 0.8 or better indicates good measurement reliability (Polit & Hunger, 1999). The CVI for this instrument was 0.93.

One method of measuring reliability of a tool is by using the Cronbach coefficient alpha. Using the Cronbach coefficient alpha, the internal consistency of the knowledge prequiz was 0.74. The internal consistency showed that this tool is acceptable to use for the study. According to Nunnaly (1978), a Cronbach coefficient alpha of 0.7 or above indicates an acceptable reliability coefficient and shows internal consistency.

Table 2

*Knowledge Descriptive Statistics*

| Dependent Variable | Pre Knowledge Mean | SD | Post 1 Knowledge Mean | SD | Post 2 Knowledge Mean | SD | N |
|---|---|---|---|---|---|---|---|
| Actor | 8.12 | 3.64 | 11.68 | 1.74 | 12.18 | 1.75 | 16 |
| *VitalSim*™ | 10.45 | 2.43 | 13.15 | 2.25 | 13.00 | 3.82 | 20 |
| Traditional | 8.66 | 2.43 | 13.8 | 1.78 | 13.20 | 2.30 | 15 |
| Total | 9.19 | 3.00 | 12.88 | 2.14 | 12.80 | 2.85 | 51 |

There were 15 to 20 students in each group, totaling 51 students that participated in the study. The groups were analyzed using a one-way ANOVA with the method of instruction as the factor to determine consistency of the groups at the beginning of the study using prequiz scores. The groups were significantly different at the pretest (see Table 2). The Actor group had a mean of 8.12 (SD = 3.64); *VitalSim*™ group had a mean of 10.45 (SD = 2.43); Traditional group had a mean of 8.66 (SD = 2.43). Since there were preexisting differences in knowledge, a one-way ANCOVA was performed using the pretest as a covariant in order to statistically equate the groups.

The mean post test 1 scores for the three groups were as follows: the Actor group had a mean of 11.68 (SD = 1.74); the *VitalSim*™ group had a mean of 13.15 (SD = 2.25); the Traditional group had a mean of 13.80 (SD = 1.89). The second post test was administered four weeks after the first post test and revealed the following: the Actor group had a mean of 12.18 SD = 1.75); the *VitalSim*™ group had a mean of 13.00 (SD = 3.82); and the Traditional group had a mean of 13.20 (SD = 2.30).

All three groups showed improvement in mean scores from the pretest to the post test, but these gains were not statistically significant as demonstrated in the ANCOVA results. The mean gain scores were as follows: the Actor group had mean gain scores of 3.56; the *VitalSim*™ group had gain scores of 2.70; and the Traditional learning group demonstrated the greatest mean gain score of 5.14.

Analyzing group mean scores between the first and second post test mean scores, there was a 0.5 gain in mean score in the Actor group, but the *VitalSim*™ and Traditional groups demonstrated a loss in mean scores from post test 1 to post test 2 (*VitalSim*™ group mean change was -0.15; Traditional group mean change was - 0.80). There were gain scores noted in the three groups from the pretest to the second post test as can be seen in Figure 6.

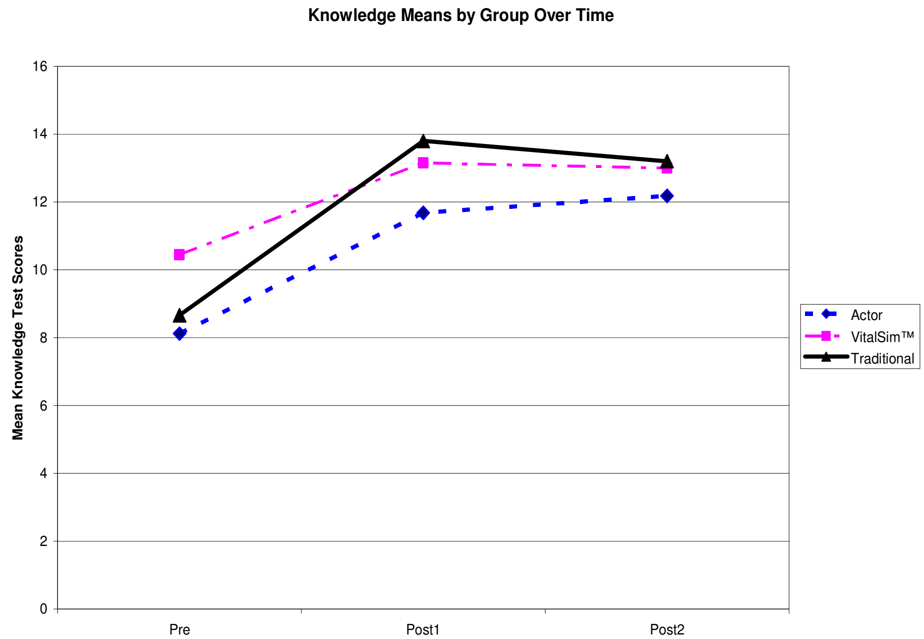


*Figure 6.* Line Graph- Mean Knowledge Scores by Group over time

*Confidence*

Ravert's (2002) self-efficacy survey was a tool which the students assess their confidence level based on twenty different questions. This tool is based on a scale from five (extremely confident) to one (not confident at all). Permission was granted from Ravert (2002) to use the instrument in this study. A Cronbach coefficient alpha of 0.76 was previously established which demonstrates acceptable internal reliability and validity.

In reviewing the confidence descriptive statistics, there are improvements from pre to post test 2 mean gain scores in all three groups as is shown in Table 3. Experimental groups Actor and *VitalSim*$^{TM}$ had mean gain scores of 1.11 and 1.49 respectively while the Traditional group had a mean gain score of 0.85 from the pretest to post test 2.

Table 3

*Confidence Descriptive Statistics*

| Dependent Variable | Pre Confidence Mean SD | | Post 1 Confidence Mean SD | | Post 2 Confidence Mean SD | | Total N |
|---|---|---|---|---|---|---|---|
| Actor | 2.62 | 0.66 | 3.43 | 0.52 | 3.73 | 0.63 | 16 |
| *VitalSim*[TM] | 2.55 | 0.56 | 3.39 | 0.49 | 4.04 | 0.51 | 20 |
| Traditional | 2.80 | 1.06 | 3.53 | 0.50 | 3.65 | 0.42 | 15 |
| Total | 2.64 | 0.76 | 3.44 | 0.50 | 3.83 | 0.55 | 51 |

The pre test confidence scores for the three groups were as follows: the Actor group had a mean of 2.62 (SD = 0.66); the *VitalSim*[TM] group had a mean of 2.55 (SD = 0.56); and the Traditional group had a mean of 2.8 (SD = 1.06). The first post confidence survey was administered three weeks after the pre confidence survey. The means at the first post test were: Actor group 3.43 (SD = 0.52); *VitalSim*[TM] group 3.39 (SD = 0.49); and Traditional group 3.53 (SD = 0.50). The mean scores at post test 2 were: Actor group 3.73 (SD = 0.63); *VitalSim*[TM] group 4.04 (SD = 051); and Traditional group 3.65 (SD = 0.42).

Both experimental groups showed improvements in pretest to post 1 test confidence mean gain scores. the Actor group (Experimental Group I) had a mean gain score of 0.81 and the *VitalSim*[TM] (Experimental Group II) had a mean gain score of 0.84 while the Traditional Group (Comparison Pedagogy) showed the smallest mean gain score of 0.73.

Between the first and second post the *VitalSim* $^{TM}$ group had the greatest mean gain score of 0.65, whereas the Actor group had a mean gain score of 0.3, and the Traditional group showed a mean gain score of 0.39 (see Figure 7).

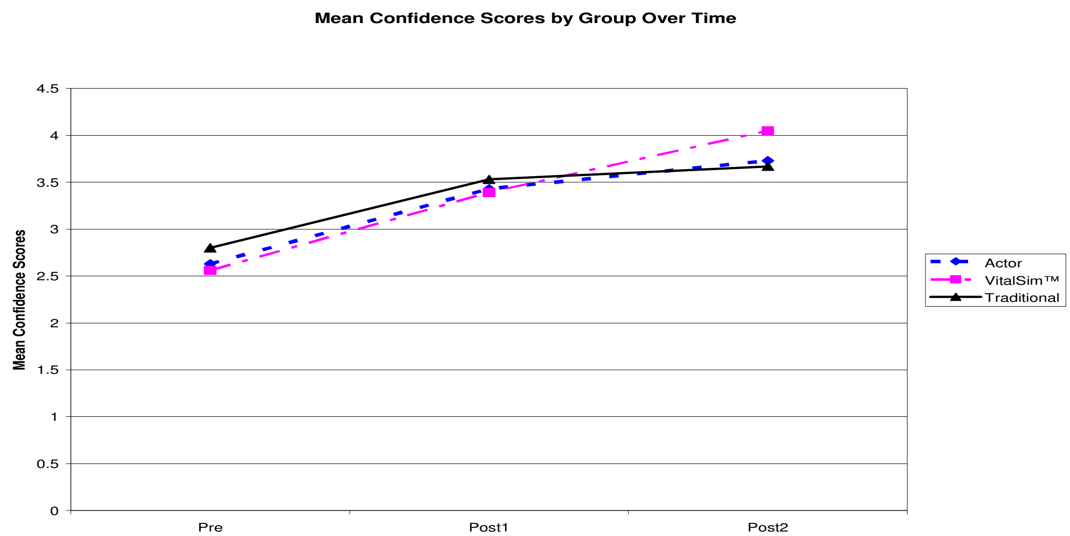


*Figure 7.* Line Graph – Mean Confidence Scores by Group over Time

Results

This study has focused on the use of different instructional pedagogies on knowledge and confidence levels. The following sections will discuss in more detail the results of the study based on each research hypotheses; Research Hypothesis 1, Research Hypothesis 2, and Research Hypothesis 3 in turn.

*Research Hypothesis 1*

This section reports results pertaining to the test of the following null hypothesis: There will be no significant difference in student knowledge based upon the instructional treatment – integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning. As seen in Table 4, the pre knowledge mean score showed F (2, 48) = 3.27, p = .047, and was significant. Follow-up testing showed that the Actor and

*VitalSim*™ difference would have been significant (8.13 versus 10.45); t (48) = 2.42; p = .059, but due to the Bonferroni adjustment for multiple comparisons was not significant. This difference likely explained the significant overall F. The evaluation of the pre knowledge scores was done to determine whether groups had similar levels of knowledge prior to the instructional treatment. Because of this difference in pre knowledge, an analysis of covariance (one-way ANCOVA) was used in order to statistically control for differences at the onset where the pre quiz was a covariant. Adjusted means are shown in Table 4.

Table 4

*Adjusted Knowledge Means (ANCOVA)*

| Dependent Variable | Pre Knowledge Mean | Post 1 Knowledge Adjusted Mean | Post 2 Knowledge Adjusted Mean |
|---|---|---|---|
| Actor | 8.12 | 12.08[a] [+] | 12.49[a] |
| VitalSim™ | 10.45 | 12.69[a] | 12.65[a] |
| Traditional | 8.66 | 13.99[a] [+] | 13.35[a] |

Note: Pre knowledge test showed F (2, 48) = 3.27, p = .047

Post 1 test F (2, 47) = 5.02; p= .011; $R^2$ = .40   Post 2 test F (2, 47) = .42, p= .66; $R^2$ = .10

[a] Mean adjusted for pretest using one-way ANCOVA

[+] Only Actor and Traditional groups were significantly different t (47) = 3.09, p = .01.

The first sub hypothesis is H01: There will be no significant difference in post-test scores of the simulation group with the Actor and the comparison group using traditional learning techniques. Only the Actor-Traditional group difference on post 1 knowledge test was statistically significant (t (47) = 3.09, p = .01). Post hoc comparisons for all three groups are shown in Table 5.

Table 5

*Post Hoc Mean Comparison for First Knowledge Post Test*

| Dependent Variable | Mean | SD | t | p | N |
|---|---|---|---|---|---|
| | | | 3.09 | -.010[*] | |
| Actor | 12.08[a] | 0.44 | | | 16 |
| Traditional | 13.99[a] | 0.45 | | | 15 |
| | | | 2.16 | 0.11 | |
| VitalSim™ | 12.69[a] | 0.40 | | | 20 |
| Traditional | 13.99[a] | 0.45 | | | 15 |
| | | | 0.99 | 0.98 | |
| Actor | 12.08[a] | 0.44 | | | 16 |
| VitalSim™ | 12.69[a] | 0.40 | | | 20 |

[a] Mean adjusted for pretest using one-way ANCOVA

[*] Statistical significance with a p value <0.05

Therefore the null hypothesis was rejected indicating there was a significant difference in post test scores between the Traditional group and the Actor group. This difference was unexpected since the Traditional instruction method appeared superior (see Figure 8).

The second sub hypothesis was H02: There will be no significant difference in post-test scores between the simulation group using the High Fidelity Simulator (*VitalSim™)* and the group using traditional learning techniques (Comparison Group). No significant difference between the *VitalSim™* group, and the Traditional group was found (see Table 5). Consequently the null hypothesis was accepted indicating that no significant difference in post test scores exists between the *VitalSim*™ and the Traditional groups.

The third sub hypothesis H03: There will be no significant difference in post-test scores in any of the groups. The overall F for one-way ANCOVA was calculated ($F$ (2, 47) = 5.02, p = .011). Consequently, the null hypothesis was rejected indicating that a significant difference was demonstrated in post test scores between the Actor and Traditional groups where the Traditional group showed the most improvement.

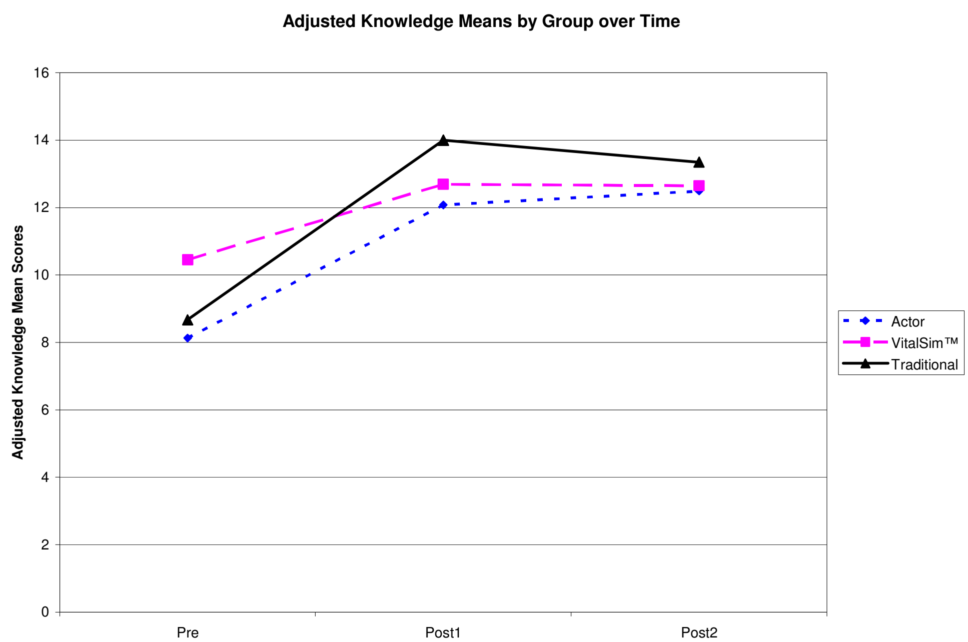


*Figure 8.* Line Graph – Adjusted Mean Knowledge Scores by Group over Time

*Research Hypothesis 2*

There will be no significant difference in student learning retention (one month) based upon the instructional treatment – integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning.

The first sub hypothesis of hypothesis 2 was H04: There will be no significant difference in post-test scores at one month of the simulation group with the actor and the group using traditional learning techniques. The results of the one-way ANCOVA showed that there was no significant difference in the Actor group and the Traditional group as is seen in Table 6. Consequently the null hypothesis was accepted indicating that no significant difference exists in post 2 knowledge scores between the Actor and the Traditional groups.

Table 6

*Post hoc Mean Comparisons for Second Knowledge Post Test*

| Dependent Variable | Mean | SD | t | P | N |
|---|---|---|---|---|---|
| | | | 0.85 | 1.00 | |
| Actor | 12.49[a] | 0.72 | | | 16 |
| Traditional | 13.35[a] | 0.73 | | | 15 |
| | | | 0.71 | .988 | |
| *VitalSim™* | 12.65[a] | 0.65 | | | 20 |
| Traditional | 13.35[a] | 0.73 | | | 15 |
| | | | 0.16 | .994 | |
| Actor | 12.49[a] | 0.72 | | | 16 |
| *VitalSim™* | 12.65[a] | 0.65 | | | 20 |

[a] Mean adjusted for pretest using one-way ANCOVA

The second sub hypothesis was H05: There will be no significant difference in post-test scores at one month between the simulation group using the High Fidelity Simulator (*VitalSim*™), and the group using traditional learning techniques (Comparison Group). The one-way ANCOVA was performed on post 2 knowledge test. The hypothesis was accepted as no significant differences were found between the two groups.

The third sub hypothesis was H06: There will be no significant difference in post-test scores at one month in any of the groups**.** The overall F for the one-way ANCOVA was determined ($F$ (2, 47) = .42, p= .66). In reviewing Table 6, it is noted that there was no significant differences between post 2 knowledge scores in any of the groups. Consequently the null hypothesis was accepted indicating that no significant difference in post test 2 scores exists between any of the groups.

*Research Hypothesis 3*

The third research hypothesis was: There will be no difference in students' confidence levels based upon the instruction treatment - integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning.

Table 7

*Adjusted Confidence Means (ANCOVA)*

| Dependent Variable | Pre Confidence Mean | Post 1 Confidence Adjusted Mean | Post 2 Confidence Adjusted Mean |
|---|---|---|---|
| Actor | 2.63 | 3.44[a] | 3.74[a] |
| *VitalSim*™ | 2.56 | 3.41[a] | 4.07[a] |
| Traditional | 2.8 | 3.51[a] | 3.63[a] |

*Note*. Pre confidence scores showed no statistical difference among groups

[a] Mean adjusted for pretest using ANCOVA

Pretest $F$ (2, 48) = .45, p=.01, $R^2$ = 02. Post test 1 $F$ (2, 47) = .18, p= .84, $R^2$ = .84.

Post test 2 $F$ (2, 47) = 3.36, p=.04, $R^2$ = .17.

Post 1 to Post 2 paired t-test mean gain scores: Actor group had no gain t (15) = 1.93; p>.05; *VitalSim*™ group had a significant gain t(19) = 4.94; p< .001; Traditional group had no gain t(14)=1.25; p >.05

The first sub hypothesis was H07: There will be no difference in confidence levels between the simulation group with the Actor (Experimental Group I) and the group using traditional learning techniques (Comparison Group). A one-way ANCOVA was performed using the results from the post 1 and post 2 confidence survey scores. The results are found in Tables 8 and 9. No statistically significant difference was found between the Actor group and the Traditional group. Consequently the null hypothesis was accepted indicating that no significant difference in confidence scores existed between the Actor and the Traditional groups.

The Bonferroni adjustment was used throughout the data analysis in this research in order to decrease potential Type I errors. Due to the Bonferroni adjustment, several p values were equal to 1.00. The unadjusted p-value for those comparisons would be p = .559, but the difference comes about through the Bonferroni correction as is noted on Tables 8 and 9.

Table 8

*Post Hoc Mean Comparison for First Confidence Post Test*

| Dependent Variable | Mean | SD | t | p | N |
|---|---|---|---|---|---|
| | | | 0.39 | 1.00[b] | |
| Actor | 3.44[a] | 0.13 | | | 16 |
| Traditional | 3.51[a] | 0.13 | | | 15 |
| | | | 0.59 | 1.00[b] | |
| *VitalSim*[TM] | 3.41[a] | 0.11 | | | 20 |
| Traditional | 3.51[a] | 0.13 | | | 15 |
| | | | 0.18 | 1.00[b] | |
| Actor | 3.44[a] | 0.17 | | | 16 |
| *VitalSim*[TM] | 3.41[a] | 0.11 | | | 20 |

[a] Mean adjusted for pretest using ANCOVA

[b] Unadjusted p-value for the comparison would be p = .559

The second sub hypothesis was H08: There will be no difference in confidence levels between the simulation group using the High Fidelity Simulator (*VitalSim*™) and the group using traditional learning techniques (Comparison Group). A one-way ANCOVA was performed to determine if any significance was found between *VitalSim*™ and the Traditional group. There was no significant difference found between *VitalSim*™ and the Traditional groups in both the post 1 and post 2 Confidence survey scores; however, it was noted that the significance level of .056 between these groups approached significance. Consequently the null hypothesis was accepted indicating that no significant difference in confidence scores exists between the *VitalSim*™ and the Traditional groups.

Table 9

*Post Hoc Mean Comparison for Second Post Confidence Test*

| Dependent Variable | Mean | SD | t | p | N |
|---|---|---|---|---|---|
| | | | 0.59 | 1.00[b] | |
| Actor | 3.73[a] | 0.13 | | | 16 |
| Traditional | 3.66[a] | 0.14 | | | 15 |
| | | | 2.43 | 0.056 | |
| *VitalSim*™ | 4.05[a] | 0.12 | | | 20 |
| Traditional | 3.66[a] | 0.14 | | | 15 |
| | | | 1.86 | 0.21 | |
| Actor | 3.73[a] | 0.13 | | | 16 |
| *VitalSim*™ | 4.05[a] | 0.12 | | | 20 |

[a] Mean adjusted for pretest using one-way ANCOVA

[b] Unadjusted p-value for the comparison would be p = .559

The third sub hypothesis was H09: There will be no difference in confidence levels in any of the groups. Tables 8 and 9 show the results of the one-way ANCOVA using the post 1 and post 2 confidence survey scores. No statistically significant differences were found in post hoc confidence testing between groups on mean confidence scores on post one test ($F$ (2,47) = .18; p= .84). Consequently the null hypothesis was accepted indicating that no significant difference in confidence scores between any groups.

Because the overall F for post 2 confidence scores for all three groups was significant ($F$ (2, 47) = 3.36, p= .043) even though pairwise analysis were not significant, and to avoid any potential type 2 errors, it was decided to conduct further analysis. Post 1 confidence and post 2 confidence mean scores pairwise t-tests were run on all groups. The results of the t-tests revealed that there was a statistically significant difference between post 1 and post 2 confidence scores with the *VitalSim*™ group only with a $p < .001$. This demonstrated that the *VitalSim*™ group showed an increase in confidence levels with that group of students. All students were concurrently going to clinical for four hours weekly and were in a variety of clinical groups so that students from the Actor and the Traditional groups were exposed to similar clinical experiences and were in the same groups as those from the *VitalSim*™ group. Therefore, students were exposed to a variety of clinical experiences, and those that participated in the *VitalSim*™ simulation might have had an advantage over those in the other two groups. In order to analyze closer based on the paired t-tests and the overall F values, it was decided to determine if any items within the confidence survey resulted in significant group differences.

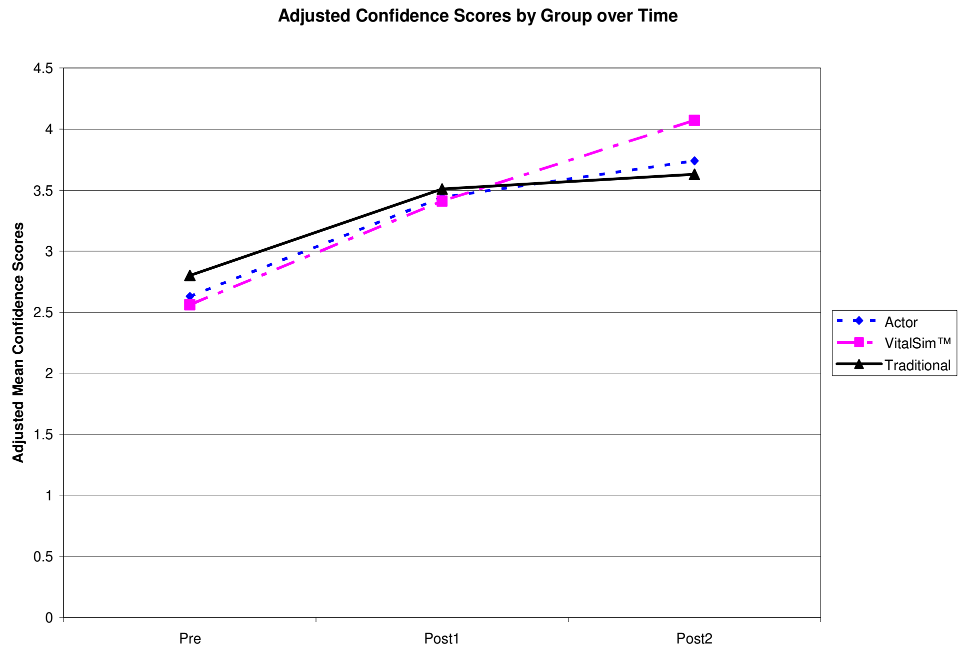


*Figure 9.* Line Graph – Adjusted Mean Confidence Scores by Group over Time

Patterns in the individual questions from the twenty question Confidence survey were analyzed. Pairwise t-tests were performed on the individual items on the confidence survey. Group differences and individual item responses were tested using pairwise t-tests. Upon analyzing individual items on the confidence survey over time in groups, there were significant differences found in four items of the confidence survey. The four items out of twenty that showed a consistent difference were appraisal, assessment auscultation (listening to sounds with a stethoscope) and history (see Appendix C for the confidence survey items). Table 10 contains results of these groups. The *VitalSim™* group demonstrated statistically significant higher confidence means for all four items compared to the Traditional group and three out of four items compared to the Actor group. Table 11 contains the means of the three groups based on the four items that were found to be statistically significant.

Table 10

*Pairwise Post 2 Confidence Appraisal, Assessment, History, and Auscultation*

| Dependent Variable | Post 2 Appraisal p | Post 2 Assessment p | Post 2 History P | Post 2 Auscultation p | n |
|---|---|---|---|---|---|
| | 0.28 | 1.00[b] | 1.00[b] | 1.00[b] | |
| Actor | | | | | 16 |
| Traditional | | | | | 15 |
| | .016* | .001* | .04* | .03* | |
| *VitalSim*$^{TM}$ | | | | | 20 |
| Traditional | | | | | 15 |
| | .03* | .016* | .01* | .23 | |
| *VitalSim*$^{TM}$ | | | | | 16 |
| Actor | | | | | 20 |

* Statistical significance with a p value < 0.05

[b] Unadjusted p-value for the comparison would be p = .559

The confidence survey contained a total of twenty items. The items that were found to be statistically significant were Appraisal, Assessment, History, and Auscultation. The following definitions were assigned to these terms: Appraisal is the ability to observe a patient; Assessment includes the ability to observe breathing rates and patterns; History refers here to the ability of the student to review the information provided by the patient; Auscultation refers to listening to the lungs for various sounds to determine if the patient needs assistance with breathing.

The *VitalSim*$^{TM}$ provided the opportunity for students to learn by taking their time observing, assessing, and deciding the intervention for the patient without the fear of something detrimental happening to the patient. The other sixteen items refer to areas that the *VitalSim*$^{TM}$ might not have an advantage over such as: taking vital signs and counting respirations (items 1, 2); applying and monitoring oxygen (items 5, 6, 7); talking, touching, initiating conversation, and questioning the patient, (items 10, 11, 12, 14); working in small groups (item 13); documenting, observing respirations, intervening (items 17 -20). It was expected that the *VitalSim™* would have had an advantage over determining abnormal lung sounds (item 16); however, the students might not have the ability to accomplish this at the first semester of the nursing program.

Table 11

*Post 2 Confidence Appraisal, Assessment, History, and Auscultation Means*

| Dependent Variable | Post 2 Appraisal Mean | Post 2 Assessment Mean | Post 2 History Mean | Post 2 Auscultation Mean | n |
|---|---|---|---|---|---|
| Actor | 3.88 | 3.37 | 3.31 | 3.31 | 16 |
| *VitalSim™* | 4.55 | 4.15 | 4.05 | 3.90 | 20 |
| Traditional | 3.80 | 3.13 | 3.40 | 3 | 15 |

## Summary

Descriptive statistics were calculated which revealed that all groups had improvements between the pre and post 1 knowledge test and confidence survey. A one-way ANOVA was computed to determine if there was a significant difference between the three groups after the pre knowledge quiz was administered. There was an overall significant difference found between the groups so Bonferroni adjustments were made in order to conduct post hoc comparisons. A one-way ANCOVA was performed to determine if there were any statistically significant differences between groups in knowledge and confidence scores. There was a statistical significant difference found between the Actor and Traditional group after the post 1 knowledge test favoring the traditional group. There was no significant difference found between the simulation groups, or between the *VitalSim*$^{TM}$ and the Traditional groups on post 1 knowledge test and confidence survey scores. Additionally, there were no significant differences found between the three groups after the post 2 knowledge tests or in the confidence survey.

There was a significant overall difference in confidence at post test 2. Post 1 to Post 2 confidence mean scores within groups and item differences within the confidence survey were explored. T-tests demonstrated that the *VitalSim*$^{TM}$ group improved significantly in confidence between post 1 and post 2 survey results. Post hoc comparisons were performed on the individual items on the confidence survey. The areas that students were more confident were appraisal, assessment, history, and auscultation. The *VitalSim*$^{TM}$ group had statistically significant higher mean confidence scores in the areas of appraisal, assessment history, and auscultation than the other two groups (see Table 10).

# CHAPTER V. SUMMARY, DISCUSSION AND RECOMMENDATIONS

The demand for flexibility in nursing education will increase over the next several years due to three main problems that exist in nursing today, and these were the three critical issues that were relevant to this study. First of all, the 118,000 nurse deficit is predicted to increase ten fold by 2020 (Bishop, 2007). Secondly, the nurse educator deficit is expected to grow as 46 percent of the current nurse educators are expected to retire by 2010 (Tanner, 2006). Third, it is logical to assume that the healthcare community (hospitals, clinics, extended care facilities, rehabilitation centers) will not be able to provide enough clinical placements to meet the demand of increasing nursing student enrollment. The healthcare community provides clinical settings so that nursing students can apply learned skills learned from the nursing school laboratory setting into the clinical setting with real patients. The challenge has been to find more clinical placements, amidst the nursing shortage. Assigning students on nursing units places an enormous toll on the nurses in the clinical setting by increasing the unit nurse's responsibility to assure that the students care for the patients correctly. Nursing students on the patient care units often places additional stress on the unit nurses. This study examined the feasibility of three instructional techniques that might be used to partially address these critical issues. One approach to the lack of sufficient clinical settings is to incorporate simulation within the classroom setting.

The integration of simulation as a teaching and learning pedagogy has been shown to be effective in teaching nursing students (Nehring, Ellis, & Lashley, 2001; Nehring & Lashley, 2004). The use of high fidelity simulation enhances clinical competence such that students are able to learn proper techniques in a safe and nonthreatening realistic environment that are used within the hospital setting (Murray, Grant, Howarth, & Leigh, 2008). One of the more recent types of simulation strategy is the incorporation of standardized patients, which is similar to an actor. Standardized patients are trained to perform in a certain way for specific training purposes (Becker et al, 2006; Bosek, Li, & Hicks, 2007). Simulation using standardized patients assists nursing students to learn new skills and perfect previously learned clinical skills in a safe environment. This study examined two variations of simulation (use of an actor to role play a patient and the use of a simulator) and traditional learning pedagogy as instructional techniques.

The intention of this chapter is to discuss the results and recommendations for future research associated with this study. The chapter opens with a summary of the study followed by a discussion of the results, future recommendations and a conclusion.

## Summary

This Quasi-experimental study examined simulation as a teaching pedagogy by placing nursing students in three different groups using three teaching modalities. The first teaching integration is the use of simulation with an actor. The second group integrated the *VitalSim*™ simulator as the teaching modality. The third group integrated traditional methods for their practice session within the health assessment course. This study focused on the impact of simulation on nursing student’s knowledge acquisition and confidence levels in order to address the three critical issues in the field of nursing education.

A total of 51 nursing students participated in the study during the fall of 2007 academic semester. Approximately 15-20 students were enrolled in each of the three

Health Assessment classes and each of the three classes were given one of the three instructional conditions.

Two instruments were used in the three classes to collect data. The data was collected from the three groups and were samples of convenience since existing class groups were used. Thus, the design in this research is a nonequivalent comparison group design. All 51 students who originally took the pre knowledge and pre confidence level survey took both tests at each of the three measurement intervals.

Participant demographic data was collected from the three Health Assessment courses. Participant age range was from 20 to 42. Approximately 94 percent of the students were females, leaving 6 percent (3 students) that were males. Approximately twenty percent (10) of the students had earned previous bachelor's degrees and one student had an associate arts degree. Ten percent of the students were not born in the United States and their first language was not English. Overall 75% of the participants in this study were single unmarried Caucasian females between the ages of 20 and 30 without children studying nursing full time at the university (see Table 1).

## Research Hypotheses and Discussion

In order to understand the effectiveness of simulation on knowledge acquisition and confidence levels, the following hypotheses were examined.

1. There will be no difference in student knowledge based upon the instructional treatment – integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning. $p < .05$

2. There will be no significant difference in student learning retention (one month) based upon the instructional treatment – integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning. $p < .05$

3. There will be no difference in students' confidence levels based upon the instruction treatment - integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning. $p < .05$

*Research Hypothesis 1: Knowledge Acquisition Post Test 1*

The first research question was divided into three sub hypotheses in order to analyze the hypothesis in more detailed. The sub hypotheses were analyzed individually.

Using the post 1 knowledge test results of Experimental Group I (Actor) and Comparison Group (Traditional), it was noted that there was a statistical significance between these two groups. It was interesting to note that the comparison group (Traditional) demonstrated a statistical difference with a p value of .01. In a similar study recently conducted by Scherer, Bruce, and Runkawatt (2007) suggest a reason that a traditional learning group might have performed better than the simulation group might be due to the fact that the traditional learning group had more time to work through the case scenario together as a group, whereas the simulation group were interacting together to solve the scenario in front of the patient. Working out the scenario placed the emphasis on the task, taking care of the patient, in the simulation group versus solving the case study in its entirety as a group. Thus students needed to be more than task-oriented in order to make meaning out of learning (Scherer, Bruce, & Runkawatt, 2007). Additionally, Bosek, Li, and Hicks (2007) discovered that actors need to be properly prepared for the role that they are portraying in the scenario; otherwise, learning might not occur. Therefore, another possible reason for the actor group not doing as well as the comparison group may be that the standardized patient did not appear realistic to the students as was discussed in Bosek, Li, and Hicks (2007) or possibly that the comparison group had more time to interact as a group and learn from each other. All three groups were able to discuss the scenario prior to and the actual day of class.

There was no statistically significant difference between pre and post 1 test scores between the simulation group using the high fidelity simulator (*VitalSim*™) and the comparison group (Traditional). These results agree with what Scherer, Bruce, and Runkawatt (2007) concluded among nurse practitioner students. Waldner and Olson (2007) echo similar knowledge results with simulation and traditional learning experiences among basic undergraduate nursing students.

There was no statistical significant difference in post 1 test scores between actor and *VitalSim*™. Knudson and Sisley (2000) discovered in a similar study utilizing simulation that there was no difference in knowledge scores between groups of medical students incorporating simulation versus real-life patients. The results of this study were consistent with Knudson and Sisley (2000) since there was no difference in knowledge scores between the three groups.

*Research Hypothesis 2: Knowledge Retention*

The second hypothesis looked for any difference in student learning retention (one month) based upon the instructional treatment – integration of HFS (*VitalSim*™), integration of actor (standardized patient), or traditional learning. In order to analyze this hypothesis, sub hypotheses were formed in which each group was compared to each other with regards to learning retention. A series of paired t tests were performed. The following paragraphs discuss the results of the paired t tests.

There was no statistical significant difference found in post two test scores at one month interval between the actor (standardized patient) and traditional groups. No research was located that utilized an actor to simulate a patient and its effects on learning. This demonstrates that simulation with the use of an actor was not found to be different from traditional learning methodologies. The case study was integrated with all three conditions since this is a traditional learning strategy that nurse educators have utilized for years.

This study found that there was no significant difference in post-test two scores at one month between the simulation group using the High Fidelity Simulator and the group using traditional learning techniques (Comparison Group). These results were consistent with Scherer, Bruce, and Runkawatt (2007) who found that no statistical significance existed between the high fidelity simulation and comparison groups with post two test scores.

There was no statistically significant difference in post two test scores in the actor and VitalSim™ groups. No current research was located analyzing two different simulation groups with regards to knowledge retention. However, results concurred with the findings of Scherer, Bruce, and Runkawatt (2007) where no statistical significance between the high fidelity simulation and comparison groups with post two test scores

*Research Hypothesis 3: Confidence*

The third hypothesis surrounded the idea of confidence levels between the three groups based upon the instruction treatment - integration of HFS (VitalSim™), integration of actor (standardized patient), or traditional learning. The hypothesis posits that there will be no statistical significance in confidence levels based upon the instruction treatment.

There was no difference in confidence levels between the simulation group with the actor (Experimental Group I) and the group using traditional learning techniques (Comparison Group). No studies were found in the literature utilizing an Actor as a type of simulation.

There was no significant difference found between Actor group and the Traditional Group in both the post one and post two Confidence survey scores; however, it should be noted that the significance level was .056 between the VitalSim™ group and the Traditional group. It is noted that these results approach statistical significance, but are not statistically significant.

Upon post one-way ANCOVA and pairwise post hoc tests, it was noted that there was no difference in confidence levels between the simulation groups: Experimental Group I using an actor and Experimental Group II using the *VitalSim*™. Pairwise post hoc testing was performed on the individual items on the confidence survey and found that there were significant differences in four of the twenty questions on the post two confidence survey. The four areas were appraisal, assessment, history, and auscultation. Post two appraisal confidence level between the Experimental Group II (*VitalSim*™*)* and the Comparison (Traditional) group was significant, indicating that the student felt confident in observing the patient for overall appearance. Post two respiratory assessment confidence between Experimental Group II (*VitalSim*™*)* and the Comparison group (Traditional) was significant suggesting that there was an advantage using the *VitalSim*™

since it appears to enhance student performance with assessment skills such as performing a respiratory assessment. Post 2 ausculatory (listening) confidence scores between the *VitalSim*™ and Traditional groups was significant indicating that the ability of the *VitalSim*™ group to be able to auscultate (listen to) lung sounds frequently demonstrates the ability to increase their assessment techniques, and therefore over time confidence levels as well.

The students who participated in this study concurrently were in the clinical setting on the patient care units where they utilize the skills learned in the Health Assessment class. The fact that the post 2 responses demonstrated a higher p value indicates that the students may have realized in the clinical setting to the extent to which they have improved their own assessment skills over time.

## Discussion

This study supports the relevance of technology integration, namely simulation, within a health assessment course for baccalaureate nursing students. Although there were not significant differences found in the various instructional treatments overall with regards to knowledge and confidence, differences were found upon analyzing individual questions on the confidence survey. The research does demonstrate that there is merit to integrating simulation within teaching health assessment modules with regards to confidence. Since it was found that there was no difference in knowledge within the three instructional pedagogies, this assists educators in selecting the appropriate teaching method for each specific class.

The improvement of post test scores shows that the three instructional treatments assisted students in learning content. All three groups improved in the post 1 test scores.

With regards to post 2 test scores, the traditional group demonstrated a loss of knowledge over time, whereas both simulation groups demonstrated an increase in knowledge over time. Similar studies did not find statistically significant differences in knowledge scores comparing high fidelity simulation and traditional learning groups with medical students (Scherer et al, 2007; Morgan et al., 2002). Although the results of this study indicate that the use of actor simulation and a simulator is comparable to traditional learning with regards to knowledge acquisition, it also showed that there may be certain areas that the integration of simulation enhances confidence levels. When confidence levels are increased, then students might be able to assess patients more effectively (Ravert, 2002). This study found that students rated confidence levels higher at the one month post simulation on the confidence level survey.

Post test confidence scores improved in the three groups. The Experimental group II using the *VitalSim*™ demonstrated the steadiest increase in confidence scores over time more than the Experimental group I (Actor) and the comparison (Traditional) group. Additionally further analysis revealed that there was a significant statistical difference in post 2 means as compared to post 1 means within the *VitalSim*™ group demonstrating the potential of *VitalSim*™ related to increasing confidence levels in baccalaureate nursing students.

*Limitations and Generalizability*

There are several limitations that affect the generalizability of this study. The study cannot be generalizable to all nursing student groups since this study used a small sample size of 51 first semester junior nursing students; however, the results can be generalizable to small size groups at similar nursing schools for first semester nursing students. Only one simulator was used in this result that possibly could limit the use of the results of the study to schools integrating that particular simulator. The focus of this study relied on students being truthful with relation to responding to how they placed their confidence levels so the responses might not in fact be an actual representation of confidence for students at this level.

*Clinical Exposure and Confidence*

Although it is potentially possible that clinical exposure did in fact affect student responses regarding confidence levels between the post one and post two confidence surveys, it would then affect all groups evenly since students were in different clinical groups in addition to different health assessment classes, and therefore, simulation versus non-simulation research groups. Students from the Actor group could have been in the same clinical group as some students from the Traditional group, so all students were exposed to similar clinical experiences.

*Instrumentation*

The instrumentation might have affected the results of the study. Scherer, Bruce, and Runkawatt (2007) and Morgan et. al. (2001) suggested that different instruments (knowledge test and confidence survey) might have produced different results. It is possible that the knowledge test could be improved with additional items that measured the following areas pertinent to the study: respiratory assessment skills, ausculatory sounds, abnormal versus normal sounds, nursing assessment, nursing intervention, and nursing diagnosis since these items might be more consistent with the patient assessment case scenario.

The confidence survey utilized in this study was developed by Ravert (2002) and used a Likert Scale of 1 through 5. Scherer, Bruce, and Runkawatt (2007) present a different confidence scale consisting of ten questions with a 0 through 4 Likert scale that might have been useful in this study. Additionally, it is possible that the confidence survey could have measured confidence in another format or with the addition of other questions. A more refined confidence instrument may have discovered differences not found with the current instrument.

*Simulation and the use of Actors*

In the 1980's, nurse educators incorporated the use of early simulation by using actors to play patients in simulated case scenarios (Radhakrshnan, Roche, & Cunningham, 2007). However, one study was located using standardized patients, or actors that demonstrated positive outcomes with teaching undergraduate nursing students skills (Bosek, Li, & Hicks, 2007). This research has contributed to the arena of simulation integrating an actor and has demonstrated statistical significance with confidence levels. Bosek, Li, and Hicks (2007) found that the use of standardized patients may be a promising adjunct to the clinical setting for skill attainment, but more research needs to be done with the use of standardized patients.

Radhakrshnan, Roche, & Cunningham (2007) found that the use of simulation assists with the ability of nursing students assessing patients. According to the literature reviewed, simulation demonstrates the ability of students learning in a self-paced risk-free realistic environment with immediate feedback and remediation available at any time (Nehring et al., 2001; Haskvitz & Koop, 2004; Rauen, 2004; Nehring et al., 2004; Ravert, 2002; Feingold et al., 2004; McCausland et al., 2004; Wilson et al., 2005). Simulation provides the opportunity to improve and /or learn skills within a safe environment, which is an important educational endeavor. The results of this study suggests that simulation is an important tool for nurse educators in order to provide active learning for their students based on Bandura's theory. Additionally, the type of simulator utilized is important for nurse educators to be able to operate. If the simulator is difficult to use, then nurse educators will not integrate the technology. The more sophisticated the simulator, the less apt the educator will integrate the technology (Radhakrshnan, Roche, & Cunningham, 2007). *MetiMan* is one example of a high fidelity simulator that is complicated and contains complex medical simulation programs. The programs may be too complex for nursing students to work with. For example, nurse educators find the *MetiMan* extremely difficult to work, even just to turn the simulator on and off. It takes several days of training to be able to learn how to turn the simulator (*MetiMan*) on and off, much less program the simulator with appropriate scenarios for nursing students. This study found that an important component to the successful integration of simulation was to align the student's level in the program with the simulation. Educators must remember to assure that the scenario is not too complicated for the student.

## Recommendations

The results of the study demonstrate that simulation can be an effective instructional pedagogy. Simulation incorporates both Bandura and adult learning theories which provides an interactive learning environment. The study needs to be replicated with a larger sample size using a detailed nursing skills and behavior checklist that could be incorporated within the clinical setting. The addition of the clinical instructor perception of critical thinking would add another dimension to the integration of simulation. In order to assess if simulation assists students to integrate theory into practice, clinical instructors could assess students in the clinical setting to determine if they are able to answer questions effectively in the practice setting.

An important consideration is the ease of use of the simulator since it could be easier to demonstrate to new faculty. In this study, the researcher demonstrated to the students and current new faculty how to use the *VitalSim*™ in less than twenty minutes while other simulators, such as the *Metiman*, may require multiple training sessions to learn the series of steps necessary to make the simulator operational. Students were able to continue using the simulator once the research data was collected in order to maintain their ausculatory assessment skills. Most nursing schools have "Open Skills Lab" where students can practice skills at their own pace which is a perfect opportunity for students to gain and improve basic ausculatory skills such as lung, heart, and bowel sounds. It is recommended that the integration of the *VitalSim*™ continues to be used within the nursing curriculum, and that more graduate nurse educator programs train future nurse educators both the benefit and ease of simulation within the classroom setting.

Kardong-Edgren, Lungstrom, and Bendel (2008) recently conducted a study integrating two different simulators (*VitalSim*™ *and SimMan*™) and found no differences with learning acquisition and satisfaction among baccalaureate nursing students. A suggestion would be to repeat the current study in terms of analyzing confidence levels and knowledge acquisition integrating two different simulators, similar to Kardong-Edgren, Lungstrom, and Bendel, with larger group size and the use of simulation throughout at least one semester or possibly the whole nursing program.

Replication of this study using the simulation continuously throughout the same semester could be conducted to determine the effectiveness of simulation. Future research could analyze larger groups with multiple simulation scenarios throughout a variety of nursing courses encompassing several levels of undergraduate nursing students, since the results of this study are only generalizable to this sample and course.

Additionally, students could be retested for knowledge retention longer than one month past the integration of the instructional pedagogy. Throughout the semester, the students who participated in this study were taught a variety of assessment skills, such as respiratory, cardiac, gastrointestinal (abdominal), blood pressures, and pulse. If students were exposed to the simulation weekly, then they might be able to refine their skills, in addition to increasing confidence levels so that they are more productive in the clinical setting. Students could be provided with multiple case scenarios that they continue to perform with the use of a simulator. Faculty could use the simulator to train students how to assess, not only lung sounds, but cardiac and abdominal sounds, in addition to blood pressures and pulse (heart) rates. At the end and beginning of the academic semester, students could be retested to see if knowledge remained the same, increased, or decreased.

Along the line of retesting nursing students past one month of the instructional treatment, it would be interesting to follow all students throughout the nursing program from the first to the last semester. A study could analyze those students who were exposed and not exposed to continual simulation throughout the nursing program to see how well they performed in higher level courses and on the NCLEX.

To further this line of research, more studies could be conducted incorporating a variation of instructional technologies with different participants. For example, graduate students bring a different knowledge and skill background and are able to integrate more critical thinking so results might be different. Future studies incorporating different instructional approaches such as a variation of the case study. Another strategy for future research is the integration of instructional pedagogy that would combine both simulation strategies and comparing both simulations with traditional learning strategies. Another question to ask is in what setting does each instructional treatment work best – online or face-to-face in the classroom? Additionally, more research should be conducted with the integration of simulation as an activity completed by one student via videotaping without an instructor present and the effects on student learning and confidence levels. There is still much more work that needs to be conducted in the area of simulation and simulation evaluation.

The future possibilities of simulation integration are endless. The value of simulation versus the clinical setting needs to be explored. Will students possibly gain more from the clinical setting if every student first completes several case study simulations prior to practicing on the clinical unit with real patients under the guidance and supervision of the nursing instructor? The drive for this recent comes from the fact that various hospitals have recently purchased simulators for training purposes of hospital personnel. Nurse educators and leaders have adapted new training strategies for new graduates and experienced nurses integrating simulation to demonstrate and test new skills and techniques with the nursing staff.

The development of simulation evaluation tools could also assist educators in demonstrating to students their increase in knowledge acquisition (Brett-Fleegler et al., 2008). It is believed that the future of simulation lies with competency testing and the ability of nurse educators to create simulation evaluation tools, in addition to students reviewing their own simulation experiences via videotaping to determine where they an improve.

## Conclusion

This study together with other research demonstrates that simulation does assist students with increasing their confidence levels and knowledge retention. Simulation is currently used in a variety of settings, including education, business, aviation, and healthcare. Instructional technology teachers need to be reminded of the benefits of simulation in education from preschool through doctoral education. There are many challenges that educators face when integrating simulation technology in the classroom. Simulation needs to be appropriately introduced to both faculty and students alike (Issenberg & Scalese, 2008). It is important to integrate simulation wisely such that it is realistic and aligns with the curriculum at the appropriate time for the student.

Further research needs to be conducted in order to ascertain best practices with simulation technology. There is limited empirical evidence to support the effect that simulation has on clinical practice (Murray et al., 2007). Studies have shown that students value the simulation experience within the safe, interactive learning environment, but there is no robust conclusive quantitative evidence indicating the transfer of knowledge and skills into the clinical practice (Murray et al., 2007). Simulation is seen as a potential learning pedagogy to promote safe practice in an ever increasing litigious healthcare environment. According to the National League for Nursing (2003), the challenge for nurse educators is to create learning environments that promote clinical competency, "critical thinking, self-reflection, and prepare nurse graduates for practice in a complex, dynamic healthcare environment" (p. 1-2).

Simulation can provide an opportunity for students to gain exposure to increased learning with the integration of debriefing, immediate feedback, and guided reflection. Additionally, these opportunities have enabled students to demonstrate the link between theory and practice, synthesize knowledge and gain clinical confidence (Decker et al., 2008). To be effective, simulation should be aligned with goals, skills and knowledge acquisition, competency testing, critical thinking, and best practices while integrating a variety of realistic case scenarios.

Simulation has been shown to be a positive adjunct to the clinical setting, but it has not been determined whether or not it could replace the need for clinical experiences altogether. Analyzing what is typically accomplished in the clinical setting and comparing those aspects to simulation is one method of comparing the two learning strategies. In the clinical setting, students work with real patients versus in the simulation lab, students are exposed to the case-based simulation approach conducted with the integration of the simulator and actor. Both provided close to real-world learning as possible with the kinesthetic learning. An interesting note in the literature that is a benefit of simulation, is that with simulation, an audience of several students is possible, while in the clinical setting, fewer students are allowed in patient rooms at the same time in order to maintain patient dignity and confidentiality. (Lasater, 2006).

Another aspect of learning in the clinical setting is the post conference. Debriefing is an important strategy that is used within simulation learning and is compared to post conference learning (Lasater, 2006). Both the post conference and the simulation debriefing are facilitated by nursing faculty. Lasater (2006) stated that students learn by sharing observations during and after the simulation experience. Even the students that are present within the lab can learn by observing others during the simulation and debriefing experience whether they are directly participating in the experience and discussion since this is facilitated by the nursing faculty and can be compared to their own simulation experience (Seropian et al., 2004).

The current research demonstrated the value of incorporating simulation for the benefit of increasing confidence. Additionally, there are possible benefits that have yet to be explored at this time with relation to the clinical setting. Simulation is now currently being integrated within hospital settings to train nurses and medical residents to learn new skills, techniques, and strategies as new medical equipment is purchased for the hospital setting. Simulation provides a kinesthetic (hand-on) learning strategy within a safe environment. There is a need for more studies to explore cost savings as well as issues of physical harm. The most expensive simulators might not be necessary in order to effectively train all personnel. Some lower cost simulators, such as the *VitalSim*$^{TM}$ could be purchased as additional simulators so that the medical facility has several simulators, rather than one expensive simulator. This would provide learning opportunities for more hospital personnel. The more training, the more lives that could be saved in the long run, especially since simulation has already proven to be an effective learning strategy for skill acquisition. This research demonstrated an increase in confidence levels so that nurses will ultimately be able to rely on themselves to make life or death decisions within the clinical setting.

Simulation was shown to be an effective learning strategy for baccalaureate nursing students, not only for skill acquisition, but for increasing confidence levels. Future research will be needed to connect the increase confidence levels with improvement in critical thinking which enables nurses to think and respond more quickly in the clinical setting, promoting more effective and efficient life or death decision making. This research supports an important aspect of that decision making algorithm, in addition to demonstrating that simulation would assist students with clinical acquisition since clinical sites are becoming less available. Students will still acquire knowledge, skills, confidence, and critical thinking without always being at the clinical site with the integration of simulation. Additionally, clinical experiences with real patients on clinical units might be more effective and beneficial with the addition of simulation integration in the campus laboratories on schools of nursing campuses.

The challenge facing nurse educators today is to implement teaching strategies that promote clinical and theoretical competency while at the same time assisting students in developing critical-thinking skills. There is the potential for simulation to assist with the clinical void in nursing education. With the increasing demand for more clinical sites, simulation may serve as a potential placement for clinical experiences (Nehring, 2008; Murray et al., 2008; Issenberg & Scalese, 2008; Decker et al., 2008). Simulation can mimic real life scenarios and assist students in acquiring knowledge and skills in a safe learning environment. Simulation does come in a variety of forms from online simulation, to simulators, to standardized patients. The challenge for the nurse educator is to develop realistic case-based scenarios, standardized simulation forms, and reliable testing checklists while making the simulation experience available to students (Decker et al., 2008). Instructional technologies, such as simulation, are available to educators. It is up to the educator to facilitate the integration of the simulation experience.

APPENDICES

# APPENDIX A

## Institutional Review Board

TOWSON UNIVERSITY

**APPROVAL NUMBER: 07-A044**

To: Beverly Davis Bye
From: Institutional Review Board for the Proctection of Human Subjects, Deborah Gartland, Member
Date: Tuesday, December 12, 2006
RE: Application for Approval of Research Involving the Use of Human Participants

APPROVED DEC 12 2006 TOWSON IRB

Office of University Research Services

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Thank you for submitting an Application for Approval of Research Involving the Use of Human Participants to the Institutional Review Board for the Protection of Human Participants (IRB) at Towson University. The IRB hereby approves your proposal titled:

*Integration of Simulated Problem-Based Scenarios in Baccalaureate Nursing Education: Evaluation of High-Fidelity Simulation in a Health Assessment Course*

If you should encounter any new risks, reactions, or injuries while conducting your research, please notify the IRB. Should your research extend beyond one year in duration, or should there be substantive changes in your research protocol, you will need to submit another application for approval at that time.

We wish you every success in your research project. If you have any questions, please call me at (410) 704-2236.

CC: Paul Jones
File

Invitation to Participate

November 2006

Dear Participants:

My name is Beverly Bye, and I am an Assistant Professor at Towson University currently working on a doctoral degree in Instructional Technology at Towson University. I would like to invite you to participate in a study for my dissertation research involving the use of simulation and case-based scenarios to support learning in the Health Assessment course. This study will involve your participation in a simulation which will allow you to collaborate with fellow participants in discussions about the simulation and case-based scenario while concurrently learning the material in the Health Assessment course. You will be asked to complete pre and post- tests, answering as many questions as you feel comfortable responding to. Additionally, a survey will be given to you to complete depicting your simulation experience. This survey should take approximately 15 minutes. Results from both the pre and post- tests and the survey will remain strictly confidential. Only group results will be reported.

Your participation in this study is completely voluntary and you may choose not to participate or to withdraw at any time. Should you choose to withdraw, this will have no impact on your continued participation or grade in the course. Your participation in this research will benefit future development of this course using technology support.

If you have concerns or problems about your participation in this study or your rights as a research subject, please contact the Chairperson of the Internal Review Board (IRB), Dr. Patricia Alt, at 410-704-2236. Should you have any questions regarding the study specifically, please feel free to contact either Beverly Bye at 410-704-5315 or Dr. Paul Jones at 410-704-2568.

Thank you in advance for your time. The results of this study will be available upon request.

Thank you,

Beverly Bye
Doctoral Student, Towson University
410-704-5315

Dr. Paul Jones
Towson University
410-704-2568

# APPENDIX B

## Pre Test-Post Test

| **Name:** | Assessment Day (circle one): Mon / Tues / Weds/ Thurs |
|---|---|

**Instructions:** Select the **BEST** answer.

1. The nurse notes which of the following as an abnormal finding on assessment of an adult client?
   a. Anterior costal angle of 85 degrees
   b. Exact symmetry of the thorax
   c. Ribs slope downward at a 45 degree angle
   d. 1:3 AP to transverse diameter ratio
   e. Don't know

2. When comparing pitch, intensity, and duration of the various types of breath sounds the nurse recalls that which of the following is an expected finding?
   a. Bronchial sounds are low pitched and have a 2:1 inspiratory-versus-expiratory ratio.
   b. Bronchovesicular sounds have a moderate pitch and a 1:1 expiratory-versus-inspiratory ratio.
   c. Vesicular breath sounds are very high pitched and have a 1:2 inspiratory-versus-expiratory ratio.
   d. Adventitious breath sounds are low-pitched and have a 2.5:1 inspiratory-versus-expiratory ratio.
   e. Don't know

3. The nurse suspects possible bacterial infection when the client describes his sputum as
   a. white.
   b. black.
   c. pinkish.
   d. yellow.
   e. Don't know

4. The parent of a 7-year-old boy tells the nurse that the child seems to have a thin and bony chest. The nurse's response is based on knowledge that:
   a. a child of this age should have a round chest padded with baby fat.
   b. as long as the child has a rigid chest wall, it doesn't matter how thin it is.
   c. thinness of the body is usually associated with congenital respiratory diseases.
   d. young children typically have thin chest walls making the bone structure more prominent.
   e. don't know

5. Percussion of the chest reveals which normal finding?
   a. Hyperresonance over the lungs of the child
   b. Dull sounds over the periphery of the adult's lung
   c. Very short duration of vibration over the child's lung
   d. Loud resonance over the central portion of the adult chest
   e. Don't know

6. Which statement best describes stridor?
   a. Dull sounds on percussion indicative of lung congestion with solid tumor
   b. Soft muffled adventitious breath sound heard in bases on exhalation
   c. Bubbling or rasping sounds heard over the lower lobes when the client coughs
   d. High pitched sound on inspiration and exhalation indicating laryngeal obstruction
   e. Don't know

7. The nurse uses vocal resonance testing and notes which finding as normal?
   a. Bronchophony reveals the client's spoken "99" as muffled.
   b. Vocal resonance reveals loudest spoken words at both peripheral lungs.
   c. Egophony reveals indistinguishable sounds when the client says "e-e-e."
   d. Whispered pectoriloquy reveals clearly distinguishable whispered "1-2-3."
   e. Don't know

8. A client has been treated in the past for pleural effusion and asks the nurse, "What is that, anyway? I know they took water out of my lungs, but I don't know how." The nurse responds
   a. "There wasn't really water inside your lung; it was actually in the main air tubes and had to be pumped out."
   b. "To do that, the doctor had to put a tube in your lung to drain the water out of the breathing space in your lung."
   c. "There are two thin membranes that cover the outside of your lungs, and sometimes fluid can build up between those layers."
   d. "Some people develop little pockets of fluid that build up on the outside of the lung, and these have to be drained periodically."
   e. Don't know

9. The nurse notes that thoracic expansion is greater on the left than the right and:
   a. documents this as a variation but within normal findings.
   b. refers the client to the physician for additional examination.
   c. instructs the client to rest briefly then repeats the examination again.
   d. asks the client to repeat the numbers "99" while observing chest movement.
   e. Don't know

10. When assessing an adult, which finding requires further investigation immediately?
   a. Persistent diaphragmatic breathing
   b. 1:1 AP-to-transverse-chest diameter
   c. Stridor and nasal flaring
   d. Bronchovesicular lung sounds in the periphery
   e. Don't know

11. In planning care for a client with asthma, the nurse includes which nursing diagnosis
   a. Ineffective airway clearance related to decreased cough
   b. Impaired gas exchange related to increased airway resistance
   c. Altered breathing pattern related to fluid in pleural space
   d. Pain related to abrupt leak into pleural space
   e. Don't know

12. When teaching a client with chronic bronchitis, the nurse would be correct stating:
   a. "Your cough will usually be dry and constant."
   b. "You may notice more sputum when you awaken in the morning."
   c. "Your breathing rate will increase when you are asleep."
   d. "You may notice pink frothy sputum."
   e. Don't know

13. A client has smoked two packs of cigarettes a day for 35 years. The nurse records this as how many pack years?
   a. 17
   b. 35
   c. 50
   d. 70
   e. Don't know

14. When assessing a client's cough, what would be indicative of bacterial pneumonia?
   a. Productive cough
   b. Dry cough
   c. Clear sputum
   d. Blood-tinged sputum
   e. Don't know

15. The nurse auscultates high-pitched squeaking sounds in the client's lungs during exhalation. The nurse should
   a. report that the client has decreased gas exchange.
   b. ask the client if he has asthma or bronchitis.
   c. check the chart to see if the client has pleurisy.
   d. correlate this to some type of alveolar obstruction.
   e. don't know

16. In completing a physical assessment, the nurse recognizes that respiratory function of older adult clients normally declines because of:
   a. increased elasticity of the alveoli.
   b. flaccidity of the chest wall.
   c. reduced inspiratory and expiratory effort.
   d. decreased anteroposterior diameter due to kyphoscoliosis.
   e. don't know

17. In assessing respiratory function, it is important that the nurse understand the physiology of ventilation, which is best described as:
   a. oxygen exchange in the alveoli.
   b. carbon dioxide transfer at the cellular level.
   c. gases moving in and out of the lung.
   d. gas exchange at the alveolar-capillary membrane.
   e. don't know

18. Which intervention should the nurse include in the plan of care for the client with orthopnea?

a. Avoid being around pets with dander
b. Raise the feet when sleeping or sitting.
c. Use pillows to prop the upper body when sleeping.
d. Rest at least 20 minutes of every hour.
e. Don't know

19. Which question will provide the nurse further information about the nature of a client's dyspnea?

a. "How often do you see the physician?"
b. "How has this condition affected your day-to-day activities?"
c. "Your medications do not work any more?"
d. "Isn't this the same problem you have had the past several visits?"
e. Don't know

20. On assessment, you note that the 45 year old male has a capillary refill time < 2 seconds with unlabored even respirations of 16, and non-tenting skin turgor. The nurse should

a. Document this as a normal finding
b. Contact the primary care provider immediately
c. Apply oxygen via nasal cannula at 2 litres per minute
d. Begin respiratory resuscitation (providing rescue breaths)
e. Don't know

**Demographical Information:**

TU ID # ____________________

Gender: M / F Race: ____________ Marital Status ________ Children Y/N

Age: ____20-30 ____ 30-40 _ > 40

First Bachelors degree? Y / N (If not, what was your first degree in and what year_____)

Is English your first language? Y / N (If not, what is your first language _____________)

Currently full time or part time student (circle one)

# APPENDIX C
## Self-efficacy for Respiratory Assessment Questionnaire

| 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. | 5 = Extremely Confident | 4 = Very Confident | 3 = Moderately Confident | 2 = Slightly Confident | 1 = Not At All Confident |
|---|---|---|---|---|---|
| 1. Assessing Vital Signs (T, P, R, BP) | | | | | |
| 2. Assessing respirations | | | | | |
| 3. Performing a general appraisal of a client * | | | | | |
| 4. Performing a respiratory assessment * | | | | | |
| 5. Monitoring O2 saturation | | | | | |
| 6. Applying O2 cannula | | | | | |
| 7. Applying O2 mask | | | | | |
| 8. Completing a client respiratory history * | | | | | |
| 9. Monitoring client's overall condition | | | | | |
| 10. Talking with clients | | | | | |
| 11. Touching clients in order to perform an assessment | | | | | |
| 12. Initiating conversation with clients to gain pertinent client medical information | | | | | |
| 13. Working in small groups with other nursing students | | | | | |
| 14. Knowing what questions to ask the client regarding respiratory history | | | | | |
| 15. Auscultating lung sounds. * | | | | | |
| 16. Determining normal versus abnormal lung sounds | | | | | |
| 17. Intervening and assisting a client with respiratory problems | | | | | |
| 18. Documenting a respiratory assessment | | | | | |
| 19. Knowing what to include in a respiratory assessment | | | | | |
| 20. Determining normal versus abnormal respirations. | | | | | |

Comments-Permission granted to use and modify Ravert's Self-efficacy for Nursing Skills Evaluation Questionnaire

* The four items that were shown to be statistically significant after post hoc testing on post 2 survey.

# APPENDIX D

## Respiratory Class Module and Content Outline Objectives

At the conclusion of the Respiratory Learning Module, participants will be able to:

1. Identify the anatomical structures within the respiratory system.
2. State the purpose of each structure within the respiratory system.
3. Interview a patient, and family if necessary, to gather information for the nursing history.
4. Perform a head-to-toe assessment on an individual patient, beginning with an adult patient, noting normal and abnormal conditions.
5. Identify true emergency respiratory conditions.
6. Manage a patient and family members during an acute respiratory condition by applying appropriate nursing interventions.
7. Effectively communicate with the patient and family before, during, and after an acute respiratory illness and the assessment process.

## Respiratory Assessment Content Outline

I. Nose, Throat, Mouth, Thorax & Lungs

A. Purpose

- ◆ Oxygenation assessment - focus on pulmonary and circulation
- ◆ Need Areas Affected are:
  - Oxygenation
  - Rest and Activity
  - Protection

B. General Appraisal: Upper Airway

1. Nose:

- ◆ Inspection / External
  - Symmetry
  - Skin color - lesions / Any Discharges
- ◆ Inspection / Internal (use penlight, may need nasal speculum)
  - Nasal Septum (look at turbinates - blue=allergies)
  - Mucosa -color, edema, exudates
  - Observe for nasal flaring
- ◆ Palpation: Tenderness / Mobility of Noses

2. Sinuses:
- ◆ Paranasal sinuses: Frontal and Maxillary
- ◆ Inspection with use of penlight for illumination
- ◆ Palpation for tenderness, apply gentle pressure to the areas.

3. Mouth and Throat:
- ◆ Check for gag reflex (Cranial Nerves????)
- ◆ Hypoglossal (XII) & Glossopharyngeal (IX)
- ◆ Inspection:
  - Lips: color, moisture, lesions
  - Teeth & Gums: loose or missing teeth, alignment, caries, inflammation, bleeding gums
  - Tongue: surface, color
- ◆ Buccal Mucosa:
  - Color, nodules, lesions, pigmentation, Stensen's duct (parotid gland duct located in buccal mucosa near 2nd molar)
  - Wharton's duct (located at base under surface of tongue, opens into submaxillary gland)
- ◆ Palate: color, nodules, uvula
- ◆ Throat: Color, swelling, exudate, tonsilar enlargement, breath odor
- ◆ Neck: previously discussed

C. Variations by Population

1. Infant Variations: Nose
- ◆ Obligatory Nose Breathers until 6-9 months of age
- ◆ Inspection and palpation - same as for adults, except less apt to palpate
- ◆ Assess for Silverman-Anderson index (system of assessing degree of respiratory distress) - check for nasal flaring then examine for retraction of xiphoid process and observe for grunting

2. Infant Variations: Mouth
- ◆ Edentulous - gums are smooth with raised 1 mm serrated tissue on buccal margins
- ◆ Occlusions - white pearl like retention cysts disappear within 1-2 months
- ◆ Epstein's pearls- increased at midline of hard palate secondary to retained secretions, gone within a few weeks
- ◆ Petechiae of soft palate - abnormal
- ◆ Cheesy material with erythematous base in mucous membrane called thrush- abnormal (Oral monoliasis)

3. Infant Variations: Tongue / Palate
- ◆ Tongue:
- ◆ Upper frenulum
- ◆ Lower frenulum if thick and short - may be tongue tied - some physicians can cut frenulum to help baby with feeding (sucking, especially breastfeeding)

- ◆ Palate:
- ◆ Hard palate - assess for cleft palate, gently palpate to be sure

4. Infant Variations: Saliva / Cry

- ◆ Saliva - little for 3 months - if large amounts may be indicative of fistula. Baby will drool after 3 months
- ◆ Cry:
  - Shrill or high-pitched -> increased intracranial pressure
  - Hoarse -> cretinism or hypocalcemia (tetany)
  - Absence -> severe illness or retardation
  - Stridor (high-pitched) -> small larynx or delay in the development of trachea

Geriatrics: Mouth

- ◆ Secretions may be decreased
- ◆ Mucosa: pale and dry
- ◆ Teeth: worn or absent (dentures)
- ◆ Periodontal disease: main reason of tooth loss in adults. Without teeth -> cheeks may appear sunken, lower face with increased wrinkles

D. Health History

1. Pertinent questions to ask: Obtain History

- ◆ Cough - productive or nonproductive, color of sputum if present
- ◆ Shortness of breath - where, timing (sitting, while walking) / Can you walk up 2 flights of stairs without being short of breath?
- ◆ Pain with breathing
- ◆ History of respiratory infection -bronchitis, pneumonia
- ◆ Smoking history
  - ppd (packs per day)/ number of years /even if hx/dc
- ◆ Exposures to allergens
- ◆ Flu vaccine / Last chest x-ray, PPD -abnormal?

E. Anatomy & Physiology: Localize Findings

- ◆ Sternum
  - Manubrium — Sub sternal notch
  - Body — Sternal angle
  - Xiphoid Process — Costal angles
  - Intercostal spaces: muscles in between rib, feel hard then mushy. 5th intercostal space under breast tissue.
    - ***Note: Costal cartilage of only 1st 7 ribs articulate with costal cartilage just above. Ribs 11 & 12 floating
- ◆ Lines of demarcation (imaginary) -:
  - <u>Anterior Chest</u>:
  - Midsternal -suprasternal notch down, Midclavicular from clavicle down, Anterior axillary down.
  - <u>Lateral Chest</u>:

- Anterior axillary, Midaxillary, Posterior axillary
  Start at axillary fold (arm resting against body)
- Posterior:
- Scapular line vertical from inferior angle of scapula / Vertebral line along spinous processes

◆ Lung borders:
◆ Superior borders: Anterior just above clavicle -apex of lungs rise 2-4cm
Above inner third of clavicle, lateral top of axilla
Posteriorly just above scapula
◆ Inferior borders: Anterior is at level of 6th rib (midclavicular line)
Lateral border at 8th rib is midaxillary line
Posterior border 10-12th rib (10th rib expiration, the 12th rib moves with inspiration)
◆ Thoracic Cavity: Leading into the lungs - trachea -> mainstem bronchus -> branches out to segmental bronchi and terminal bronchioles and alveoli
◆ Heart also in Thoracic Cavity
◆ Lobes of Lungs
  ◆ Right lung - ???? lobes
    ◆ 3 lobes (Is this important to know?)
◆ Fissures divide the lobes: Oblique Fissure (major fissure) - divides lungs in half
◆ Horizontal Minor Fissure (upper and middle lobes) - 4th rib. Also divides Right Lung
◆ Left Lung - ?????? Lobes
  ◆ 2 lobes. Oblique fissure divides the left lung lobes (Lobes project laterally & anteriorly)

F. Mechanics of Respiration

◆ Purpose: Supply oxygen to body cells and to rid the body of carbon dioxide.
◆ Function: Ventilation, Diffusion, and Perfusion, Blood flow, and Control of Breathing
◆ Phases of Respiration (2):
  - Inspiration
  - Expiration
  - Physical findings relate to upper, middle, and lower lung fields (or lobes)

G. Physical Exam: Guidelines: Physical Exam: Order of Exam

◆ Inspection
◆ Palpation
◆ Percussion
◆ Auscultation
◆ Patient is undressed from waist up
◆ Need adequate lighting
◆ Compare side to side
◆ Work from cephalocaudal approach (top to bottom)
◆ Visualize underlying structures

- ◆ Position patient – posterior chest with client sitting; anterior with client lying or sitting
- ◆ Assess anterior, posterior, and lateral thorax

H. PE: Inspection

- ◆ Shape and Configuration: Conical (normal) A-P to Lateral diameter is 1:2. Diameter from anterior to posterior is 1/2 diameter across chest
- ◆ Infant: diameter is 1:1
- ◆ Symmetry: Noted at rest and with movement (examples of abnormalities or deformities):
- ◆ Barrel chest, Pigeon chest (Pectus cavinatum) grooves on chest wall with displacement of sternum.
- ◆ Kyphosis - curvature of spine = hunch back, common in elderly
- ◆ One side of chest does not rise or fall with breath -----> pneumothorax or rib fracture
- ◆ Skin color
- ◆ Sputum
- ◆ Nails --> check for clubbing
- ◆ Respirations: Rate, Rhythm, Amplitude, Breathing Effort
- ◆ Use of Accessory Muscles
  - ◆ Sternocleidomastoid, trapezius, scaleness, diaphragm (normal in adults, not children)
  - ◆ Note: Position ---- if assume a tripod sitting position may indicate COPD, client trying to get expansion of air space

I. Physical Exam: Palpation

1. General Principles

- ◆ Tracheal alignment
- ◆ Skin for tenderness, masses, crepitation (subq air pockets resulting from pneumothorax, knick in pleural cavity, usually felt in upper chest and neck, a crackling sensation)
- ◆ Chest expansion or Excursion
- ◆ Place fingers at level of 10th rib posteriorly, thumbs in with the fingers extended outward, have client take a deep breath, observe for symmetry (both thumbs should move symmetrically) or lag, an unequal movement is abnormal
- ◆ http://64.78.42.182/sweethaven/MedTech/RespDisease/lessonMain.asp?mode=1&iNum=0202

  a.. Palpation: 4 Areas on the Chest

  - ◆ **Identify areas of tenderness**. Any area where the patient has reported pain or where there are lesions (a hurt, injury, wound) should be palpated.
  - ◆ **Assess observed abnormalities.** If you have seen masses or sinus tracts (blind, inflammatory, tube-like structures opening into the skin), palpate the area to evaluate the problem further.
  - ◆ **Further assess the respiratory excursion**. Determine the range of respiratory movement (how far the chest expands when he inhales and how far the chest contracts when he exhales). You can also feel symmetry of respiratory

movement (whether or not the body parts feel the same on both sides during a respiration).

- **Elicit tactile fremitus**. When a person speaks, vibrations that can be felt are transmitted through the bronchopulmonary system to the chest wall. These vibrations can best be felt when a person says the words "ninety-nine" or "one-one." Ask the person to speak louder or lower his head if you cannot feel the vibrations.

- **Finger Placement.**
- Place your finger pads on the skin surface over the area you are palpating.
- Do not move your fingers over the skin surface during palpation.
- Palpation should reveal a chest free from pain, tenderness, lesions, and masses.
- The wall should be firm with no indication of rib fractures or abscesses.
- The trachea will be midline; a deviated trachea is abnormal.
- Palpation of the respiratory excursion (respiration at rest position) should reveal an even, symmetrical movement of the chest.
- Tactile Fremitus:
- Palpable vibration transmitted through lungs when patient is speaking, felt in upper portion of chest posterior aspect
- Place hands on chest and have client say 99 or 1-2-3
- Anything that causes lungs to consolidate will cause increased fremitus -> Lobar Pneumonia
- Decreased air movement causes decreased fremitus -> emphysema

2. Palpation: Tactile Fremitus
   - Fremitus refers to the palpable vibrations transmitted through the lungs to the chest wall when the patient speaks.
   - Have the patient say "ninety-nine" or "one-one-one" and you will feel vibrations.
   - Vibrations are more difficult to feel over bone. **NOTE:** Patients with a heavy layer of fat may need to speak more loudly for you to feel the vibrations.
3. Percussion
   - Indirect: Over lung fields (posterior, then anterior) --- Do not percuss over bony areas
   - Percussing (Indirect): Use 3rd finger of non dominant hand on skin surface, strike with 2 (1) fingers of dominant hand
   - Percussion Notes:
     - Resonant - Clear hollow sound which is low in pitch, loud in intensity, moderate to long in duration
     - Hyper resonance - Emphysema (Child - normal)
     - Dull tones - Pneumothorax, Pleural Effusion
   - Diaphragmatic Excursion - done if client has shallow or painful respirations (p. 336 text)
4. Auscultation
   - Purpose: To assess airflow, obstruction, condition of lungs and pleural space.
   - How: Listen with diaphragm of stethoscope.
   - Why???????
   - Diaphragm used for High pitched sounds-- Lung sounds

- Technique: Using diaphragm, client breathes with mouth open more deeply than usual.
- Listen for full cycle of respiration (inspiration /expiration) in each location. Compare Symmetrically.
- Listen from top to bottom (exception - CHF- want to ascertain fluid level, chart crackling heard in RLL or LLL 1/3 way up lung field)
- Listen over apices, bases, between scapula, including lateral aspects
- Listen **anterior** above clavicle, down to 6th rib at MCI
- **Lateral** from top of axilla down to 8th rib, MAL
- **Posterior** from shoulders to 10th - 12th ribs
- *Why 10-12th ribs?????*
- Inspiration lungs move downward
- *What if you only listened posteriorly???????*
- You may miss RML
- Adults - 5-7 points on each side several inches apart to listen.

**1 RESPIRATION = 1 INHALATION + 1 EXHALATION**

- When listening to breath sounds always listen for ---- ____, ______,______, and _______
- Pitch, Intensity, Duration, and normal or abnormal location of sounds and absence of sounds

J. Breath Sounds

1. Normal Breath Sounds

- Tracheal (bronchial tubular), vesicular, bronchovesicular
- Start **posterior**, expect to hear bronchovesicular and vesicular
- Bronchovesicular - heard over upper center part of back near spine between scapulas
- Vesicular - heard through rest of field (below scapula and downward / heard over most of lung fields
- **Lateral** --hear vesicular
- **Anterior** --hear bronchotubular over trachea, bronchovesicular over main bronchus and below clavicles 2. Normal Breath Sounds: Bronchial Tubular
- Harsh, blowing sounds
- Similar to blowing through a tube
- Expiration > inspiration

a. Normal Breath Sounds: Bronchovesicular

- Moderate intensity
- Inspiration = Expiration in length of time each is heard

b. Normal Breath Sounds: Vesicular

- Soft, swishing sound
- Inspiration > Expiration
- Normal breath sounds

2. Adventitious or Abnormal Sounds

- ◆ Superimposed over normal sounds
- ◆ Describe what you hear and where you are hearing it

a. Adventitious or Abnormal Sounds: Rales (Crackles)

- ◆ Fine crackling sounds
- ◆ Usually occur with inspiration / in lower airway
- ◆ Due to air moving through fluid filled alveoli
- ◆ Increased with deep breathing and not cleared by a cough (fluid in alveoli not easily brought up)
- ◆ Sounds like strands of hair being rubbed together
- ◆ Fine, medium, or coarse
- ◆ Asthma, bronchitis, CHF
- ◆ Any disease that causes restriction or obstruction of air passages

b. Adventitious or Abnormal Sounds: Rhonchi

- ◆ Harsh, loud sounds
- ◆ Usually heard on expiration
- ◆ Due to partial bronchial obstruction form secretions
- ◆ Usually in upper airway and will sometimes decrease or clear with a cough

c. Adventitious or Abnormal Sounds: Wheezes

- ◆ Squeaky high pitched, musical sounding notes
- ◆ Usually heard with expiration due to partial obstruction from narrowed airway
- ◆ Heard in asthma or emphysema
- ◆ Sonorous wheezes: harsh snoring like quality (heard when there is obstruction of bronchus or trachea--- bronchitis)

d. Adventitious or Abnormal Sounds: Pleural Friction Rub

- ◆ Rough grating sound
- ◆ Heard during inspiration and expiration--- loudest at end of inspiration
- ◆ Not affected by a cough
- ◆ Heard over lower lateral and anterior chest wall, due to inflamed pleural surfaces rubbing together
- ◆ Potential pleural fluid dries up causing inflammation and surfaces rub together, client experiences severe pain upon inspiration

K. Vocal Sounds

- ◆ Auscultate and listen for changes in spoken sound
- ◆ Spoken sounds are usually soft muffled and indistinct
- ◆ Vocal sounds are used when you suspect some underlying pathology, not usually part of normal exam

1. Vocal Sounds: Bronchophony
   - ◆ Have person say 99 or 1-2-3
   - ◆ Should sound muffled and indistinct
   - ◆ If sounds clear may indicate pathology

2. Vocal Sounds: Egophony

- ◆ Ask person to say "eee" sound
- ◆ If change to "aahhh" sound, it is abnormal
- ◆ Record change in sound as E-A

3. Whispered pectoriloquy: have person whisper 1-2-3, usually sound is muffled
   - If it sounds as though person is whispering 1-2-3 directly into your stethoscope ---- ABNORMAL

4. Summary of Principles of Sound
   - ◆ Lung field consolidation enhances transmission of sounds
   - ◆ Change in voice sounds then will occur with diseases such as pneumonia
   - ◆ Pleural effusion --- lung is compressed due to accumulation of fluid in intra pleural space-- sounds become diminished or absent-- -- remainder of lung field near effusion may have bronchial breath sounds as well as bronchophony, egophony & pectoriloquy-- rest of lung field above effusion of compressed giving appearance of consolidation

M. Other Respiratory Abnormalities:
- ◆ Tachypnea: Rapid shallow breathing may be due to restrictive lung disease.
  - Pleuritic conditions with increased diaphragmatic breathing
- ◆ Hyperpnea: Rapid, deep breathing (hyperventilation)
  - Kussmaul respirations in diabetic ketoacidosis secondary to metabolic acidosis, patient is blowing off carbon dioxide
- ◆ Bradypnea: Slow breathing, decreased but regular rate, usually occurs in response to anything that will depress the respiratory center in medulla, such as drug overdose
- ◆ Cheyne-Stokes: Respirations wax and wane, increased respirations alternate with decreased and periods of absent respirations
- ◆ Biot's: similar to Cheyne-Stokes, irregular pattern --seen in head trauma, overdose, and meningitis

N. Summary – Respiratory System and Examples
- ◆ Remember……..
- ◆ Can hear bronchial breath sounds over areas of consolidation
- ◆ Adventitious sounds will be superimposed over normal sounds
- ◆ Transmission of sounds is better heard over areas of consolidation

1. Example 1: Pneumonia:
   What would you expect to find??
   - ◆ Inspection: Increased rate, guarding or lag on affected side during expiration (In children, sternal retractions and nasal flaring)
   - ◆ Palpation: Expansion decreased on affected side, tactile fremitus will be increased if bronchus is patent and decreased if bronchus is obstructed
   - ◆ Percussion: Dull over lobar pneumonia
   - ◆ Auscultation: Louder with a patent bronchus, vesicular change to bronchovesicular and bronchial
   - Expect bronchophony, egophony and pectoriloquy.

- May hear crackles-- fine to medium
- In children, breath sounds may be decreased early in the disease

2. Example 2: COPD (Emphysema)
   - Inspection: Increased anteroposterior diameter, such that A-P to lateral diameter appears equal (Barrel chest)
   - Use of accessory muscles, tripod positioning, shortness of breath, especially on exertion
   - Palpation: Decreased tactile fremitus, decreased chest expansion
   - Percussion: Hyper resonant, decreased diaphragmatic excursion
   - Auscultation: Decreased vesicular, may have prolonged expiration /Occasional wheeze

3. Example 3: Asthma

- Inspection: Increased use accessory muscles. Increased rate, shortness of breath with audible wheezes (if acute), apprehension, retraction of intercostal spaces, prolonged and labored expiration (if chronic, may have barrel chest)
- Palpation: Decreased tactile fremitus
- Percussion: Resonant, may be hyper if chronic
- Auscultation: Decreased breath sounds with prolonged expiration. Will hear wheeze on expiration

Developmental Variations: Infants

- Initial assessment occurs after birth
- Apgar--- HR, Respiratory Rate, Muscle Tone, Reflex irritability, and Color (0-2)
- A score of 7 - 10 indicates the baby is in good condition
- Inspection: Initially A-P to lateral diameter is equal / By age 6 reaches 2:1 proportion like adults/ Ribs and xiphoid process are prominent

# APPENDIX E

## Case Scenario

36 year old male with a history of asthma. Patient presents herself at the clinic today complaining of shortness of breath, chest tightness, and a productive cough for 1 week.

**Vital Signs as follows:**
BP – 120/78
R – 24
Pulse- 110
T – 99

**Meds:**
Singulair daily
Flonase 1 spray each nostril daily (for seasonal / environmental allergies)
Over-the-counter (OTC) creams and lotions (for intermittent rash on arms)

**PMH (Past Medical History):**
Seasonal allergy
Cigarette smoker – 1 ppd x 5 years
Recent URI (Upper Respiratory Infection - cold) – 2 months ago

Questions to guide your assessment of this patient (while working in groups of 3-4 students):

1. What other information would you like to ask or know regarding your patient based on chief complaint?

2. What type of assessment would you focus in on?

# APPENDIX F

## Outline of Teaching: Respiratory Modules

All Groups – take written pretest (Appendix B) and confidence level survey (Appendix C) prior to Respiratory Module Day 1.

All Groups - Respiratory Module Day 1:

1. Listen and actively participate in the lecture module – 2 ½ hours (see Appendix D)
2. Listen to lung sounds integrated throughout the lecture.
3. Watch a fifteen minute respiratory assessment video.
4. Students practice lung sounds on each other (30 minutes).
5. Selection of working groups consisting of 5-6 students by instructor randomly selecting students names by drawing names. Students will be given a time to report to class the following week – 10 minutes.
6. Provided the case study scenario and given instructions to read the scenario while making notes of any clarifications needed by the instructor on respiratory day two.
7. Each student is instructed to do the following prior to respiratory module day two:

   a. review the audio lung assessment CD included with their course textbook

   b. review the respiratory assessment DVD located on the Blackboard course site

   c. review the case study (see Appendix E).

Experimental I group (actor) or Group A plan - Respiratory Module Day 2:

1. Clarification of questions regarding the case scenario – 10 minutes.
2. Students work in their groups preparing for their roles during the simulation experience. Each student will select a number and given their role – 15 minutes
   a. recorder – records vital signs (blood pressure, pulse, respirations), any actions taken, questions asked and answers provided
   b. previous shift nurse – provides report to the oncoming nurse based on the information provided in the case study and any additional information received by the patient
   c. oncoming nurse – the nurse who is responsible for the patient
   d. nursing student – does the assessment and states the purpose of what is going on.
   e. nursing instructor – facilitating the scenario by asking questions and prompting as necessary
3. Simulation experience with the actor – 20 minutes

4. Debriefing - discussing what happened during the simulation, what could be improved, how they felt, and final results – 15 minutes. Students take an additional 5 minutes to discuss with the instructor their conclusions.

Experimental II group (*VitalSim*™) or Group B plan - Respiratory Module Day 2:

1. Clarification of questions regarding the case scenario – 10 minutes.
2. Students work in their groups preparing for their roles during the simulation experience. Each student will select a number and given their role – 15 minutes
    a. recorder – records vital signs (blood pressure, pulse, respirations), any actions taken, questions asked and answers provided
    b. previous shift nurse – provides report to the oncoming nurse based on the information provided in the case study and any additional information received by the patient
    c. oncoming nurse – the nurse who is responsible for the patient
    d. nursing student – does the assessment and states the purpose of what is going on.
    e. nursing instructor – facilitating the scenario by asking questions and prompting as necessary
3. Simulation experience with the *VitalSim*™ and educator – 20 minutes
4. Debriefing - discussing what happened during the simulation, what could be improved, how they felt, and final results – 15 minutes. Students take an additional 5 minutes to discuss with the instructor their conclusions

Comparison group or Group C plan - Respiratory Module Day 2:

1. Clarification of questions regarding the case scenario – 10 minutes.
2. Students work in their groups discussing what they should do to help the patient.- 20 minutes. Students will be assigned roles:
    a. Facilitator – leads the discussion and makes suggestions as to what they as the patient's nurse should be doing to assist the patient and asking pertinent questions in addition to assisting with the "what if" scenarios that could happen if something is missed
    b. Recorder – recording any suggestions and questions that should be clarified by the patient if he/she were present
    c. Summarizer – occasionally summarizing points that are made during the discussion
    d. Team leader – the person who takes charge of the situation
    e. Nurse – stating what assessment should be done when
3. Debriefing - discussing what happened during the simulation, what could be improved, how they felt, and final results – 15 minutes. Students take an additional 5 minutes to discuss with the instructor their conclusions.

All Groups – Respiratory Day 3:

1. Clarification time period for any questions that students may have regarding material presented the previous two weeks.
2. Written post test (see Appendix B)
3. Confidence Level Survey (see Appendix C)

# APPENDIX G
## Observer Simulation Checklist

| | Done/ Time | | Observer Comments |
|---|---|---|---|
| Ask appropriate history questions (**Most important)** | | | |
| • How long have you been having difficulty breathing? | | | |
| • Are you coughing? How long? | | | |
| • Are you coughing up anything? If so, what color? | | | |
| • Changes in breathing. | | | |
| • History of recent infections? Sinusitis, throat infections, cold? | | | |
| • Taking medications? (Antibiotics) | | | |
| • Frequency and site of exercise. | | | |
| • Do you smoke? How much and for how long? | | | |
| • Allergies? Usual symptoms associated with? | | | |
| • Doing anything unusual that may have caused breathing problem? | | | |
| • **May be related-** | | | |
| • Has this happened before? How often? | | | |
| • How have you helped your breathing in the past? | | | |
| • Exposure to pollution, smoke, or allergens? | | | |
| **Gather equipment:** | | | |
| • Stethoscope | | | |
| • Pulse oximeter | | | |
| • Blood pressure cuff | | | |
| **Assess:** | | | |
| 1. Wash hands, ensure patient privacy | | | |
| 2. Explain to patient procedure re. respiratory assessment (Take deep breaths in and out through your mouth every time I move the stethoscope) | | | |
| 3. Take vital signs – pulse, respiration, blood pressure, pulse oximetry | | | |
| 4. Have pt sit. Instruct patient to take deep breaths in and out of mouth while you are correctly assessing patient – anteriorly, posteriorly, laterally | | | |
| 5. Note changes in patient's respirations and /or behavior – reassess if needed | | | |
| 6. Identify breath sounds – normal versus abnormal and verbalize findings | | | |
| 7. Know when to reassess and Verbalize findings | | | |
| 8**. ID nursing Dx's-** | | | |
| • Ineffective airway clearance | | | |
| • Infection, risk for | | | |
| • Maybe- knowledge deficit r/t smoking and possible allergens | | | |
| 9. **Appropriate interventions**: | | | |
| • Note changes in patient's color and respiratory effort – use of accessory muscles and provide oxygen to patient while obtaining provider (MD/NP) | | | |
| • Instruct on use of inhaler | | | |
| • Review smoking cessation strategies | | | |
| • Review symptoms of potential asthma attacks | | | |
| • Follow up physician visits for asthma and smoking cessation | | | |

# APPENDIX H

## Respiration Simulation Template

**Discipline:** Nursing **Course:** Health Assessment
**Expected Simulation Run Time:** 20 minutes **Debrief /Guided Reflection Time:** 20 minutes
**Location:** Nursing Lab- Room 102 **Location:** Nursing Lab -Room 102

| | |
|---|---|
| **Admission Date: Today's Date:**<br>**Brief Description of Patient:**<br>**Name: P Gender: M Age: 33 Race: C**<br><br>**Allergies:** NKDA<br>**Immunizations:** Current<br>**Attending Physician/Team:** J1- Group A<br>**Medications:**<br>Singulair daily<br>Flonase 1 spray each nostril daily<br>Other- Over-the-counter (OTC) Lotions/creams for arms<br><br>**PMH:**<br>Seasonal Allergy<br>Cigarette smoker – 1ppd x 5 years<br>Recent Upper Respiratory Infection (URI) – 2 months ago<br><br>**History of Present illness:**<br>*33 year old male with no significant history. Patient presents himself at the clinic today complaining of shortness of breath, chest tightness ,and a cough for 1 week. The patient also states that he has eczema on both arms.*<br><br>**Social History:** Cigarette smoker – 1 ppd x 5 years<br><br>**Primary Diagnosis:**<br><br>**Surgeries/Procedures:** None | **Psychomotor Skills Required prior to simulation:**<br>Respiratory Assessment techniques including:<br>Observation / Inspection<br>Palpation<br>Auscultation<br>Identifying abnormal from normal breath sounds<br><br>**Cognitive Skills Required prior to Simulation:**<br>Lecture<br>Readings<br>Video review<br>Demonstration in class<br>Return demonstration in class |

## Simulation Learning Objectives:

**At the conclusion of the respiratory module, students will be able to:**

1. Understand the respiratory system

2. Demonstrate a respiratory assessment correctly by having the patient in the correct position while appropriately placing the stethoscope on the chest in an organized fashion.

3. Demonstrate the correct instructions to be given to the patient on breathing while assessing the lungs.

4. Identify normal and abnormal lung sounds.

5. Identify normal and abnormal respiratory signs and symptoms.

6. Correctly and efficiently document findings based on the respiratory assessment completed.

## Simulation Preparation:

| | |
|---|---|
| **Setting/Environment**<br>o ***ER***<br><br>**Simulator Manikin/s Needed:** VitalSim™<br><br>**Props:**<br>Equipment attached to manikin:<br>o **02 – near by within student's reach**<br>o **ID band _______**<br><br>Equipment available in room<br>o **Bedpan/Urinal**<br>o **Foley kit**<br>o **Incentive Spirometer**<br>o **Fluids**<br>o **IV / IVPB tubing**<br>o **IV Pump**<br>o **Feeding Pump**<br>o **02 delivery devices type**<br>o **Blood pressure cuff**<br>o **Pulse oximeter**<br>o **Penlight**<br>o **Stethoscope**<br>o **Crash cart with airway devices and emergency medications**<br>o **Defibrillator/Pacer**<br>**Suction** | **Medications and Fluids**<br>o **Metered-dose inhaler**<br><br>**Other Props**<br>Recommended Mode for simulation:<br>Preset with configured asthmatic<br>Have remote ready for adaptations (lung sound changes) during scenario when necessary |

**Roles / Guidelines for Roles**

- **Primary Nurse**
- **Previous shift Nurse**
- **Nursing Student**
- **Charge Nurse**
- **Family Member – wife played by Graduate Student**
- **Other: Recorder**

**Important information related to roles:**

1. Primary Care Nurse—
   a. Responsible to care for the patient/client
   b. Assures that the family is cared for as well

2. Nurse from previous shift – reporting off
   a. Assures that care is continuous
   b. Reiterates report as is seen on the case study
   c. States what was not asked and may question patient/client now or allow current shift

3. Nursing Student
   a. Asks pertinent questions to the Primary Care Nurse
   b. assess the patient/client per the Nurse

4. Recorder
   a. Takes notes of what is done and not done as perceived by the recorder

5. Charge Nurse
   a. Assists with questioning to provide the best care possible for the patient/client

## Physician Orders:

None initially, then Albuterol Inhaler prn

**Student Information Needed Prior to Scenario:**

- **Has been oriented to simulator**
- **Understands guidelines /expectations for scenario**
- **Has accomplished all pre-simulation requirements**
- **All participants understand their assigned roles**
- **Has been given time frame expectations**

**Report students will receive before simulation:**

33/W/M presented with shortness of breath and chest tightness. Denies cardiac symptoms.

**Vital Signs as follows:**

BP – 120/78
R – 24
Pulse- 110
T – 99

**Meds:**

Singulair daily
Flonase 1 spray each nostril daily (for seasonal / environmental allergies)
Over-the-counter (OTC) creams and lotions (for intermittent rash on arms)

**PMH (Past Medical History):**

Seasonal allergy
Cigarette smoker – 1 ppd x 5 years
Recent URI (Upper Respiratory Infection - cold) – 2 months ago

Scenario Progression Outline:

| **Timing** (approximate) | **Manikin / Actor Actions** | **Expected Interventions** | **May use the following Cues:** |
|---|---|---|---|
| 5 minutes | Normal breathing pattern | Students listen to previous shift report and ask pertinent questions to patient/client | **Role member providing cue:** Instructor<br><br>**Cue:** Any other questions? |
| 5 minutes | Patient/client becoming slightly worse with breathing. Breathing becoming louder and more difficult | Students asses patient/client using stethoscope – lung sounds<br>Pulse Oximeter<br>Vital signs – BP, respirations, pulse | **Role member providing cue:** Patient<br>**Cue:** Can you see I a having some difficulty here – do something |
| 5 minutes | Patient / client becoming slightly worse with breathing. Breathing becoming louder and more difficult.<br>Audible wheezing can now be heard | Students continue to assess and let patient / family member know what they are going to do.<br>Students should be requesting oxygen, nebulizer, and a healthcare provider for orders.<br><br>. | **Role member providing cue:** Family member (played by graduate student)<br><br>**Cue:**<br>Do something. He is having trouble breathing. Becoming more progressively upset. What would you want us to do for you if you were having this much trouble breathing? |
| 5 minutes | Patient/client becoming more comfortable provided that students assessed, treated, and continue to reassess. | Students should continue to assess patient/client. Students should educate patient/client and significant other regarding smoking cessation, signs and symptoms of asthma, avoidance of allergens / triggers. | **Role member providing cue:** Family member<br><br>**Cue:** What else would you want to do to assist your family member if they were in this situation? |

**Debriefing / Guided Reflection Questions for this Simulation** (20 minutes – discuss as group):

1. What were your primary concerns in this scenario?

2. Did you miss anything in getting report on this patient?

3. Did you have sufficient knowledge/skills to manage this situation?

4. What were your primary nursing diagnoses in this scenario? What nursing interventions did you use, what outcomes (NOC) did you measure? Where is your patient in terms of these outcomes now?

5. What did you do well in this scenario?

6. If you were able to do this again, what would you do differently?

# APPENDIX I

## Data Collection Analysis

| Research Hypotheses | Study Participants | Data Collection Method | Data Analysis Method |
|---|---|---|---|
| There is no difference in post-test scores between the simulation group with the actor (Experimental Group I) and the group using traditional learning techniques (Comparison Group). | Experimental Group I<br>Comparison Group | Post-test | *T* test, frequencies, descriptives (mean, SD),<br>ANOVA, ANCOVA |
| There is no difference in post-test scores between the simulation group using the High Fidelity Simulator (VitalSim - Experimental Group II) and the group using traditional learning techniques (Comparison Group). | Experimental Group II<br>Comparison Group | Post-test | *T* test, frequencies, descriptives (mean, SD)<br>ANOVA, ANCOVA |
| There is no difference in post-test scores in any of the groups. | Experimental Group I<br>Experimental Group II<br>Comparison Group | Post-test | *T* test, frequencies, descriptives (mean, SD)<br>ANOVA, ANCOVA |
| There is no difference in post-test scores at 1 month between the simulation group with the actor (Experimental Group I) and the group using traditional learning techniques (Comparison Group) | Experimental Group I<br>Comparison Group | Post-test | *T* test, frequencies, descriptives (mean, SD),<br>ANOVA, ANCOVA |
| There is no difference in post-test scores at 1 month between the simulation group using the High Fidelity Simulator (Vital Sim - Experimental Group II) and the group using traditional learning techniques (Comparison Group). | Experimental Group II<br>Comparison Group | Post-test | *T* test, frequencies, descriptives (mean, SD)<br>ANOVA, ANCOVA |
| There is no difference in post-test scores at 1 month in any of the groups. | Experimental Group I<br>Experimental Group II<br>Comparison Group | Post-test | *T* test, frequencies, descriptives (mean, SD)<br>ANOVA, ANCOVA |
| There is no difference in confidence levels between the simulation group with the actor (Experimental Group I) and the group using traditional learning techniques (Comparison Group). | Experimental Group I<br>Comparison Group | Confidence survey | ANOVA, ANCOVA<br>Descriptives, frequencies |
| There is no difference in confidence levels between the simulation group using the High Fidelity Simulator (Vital Sim - Experimental Group II) and the group using traditional learning techniques (Comparison Group). | Experimental Group II<br>Comparison Group | Confidence survey | ANOVA, ANCOVA<br>Descriptives, frequencies |
| There is no difference in confidence levels in any of the groups. | Experimental Group I<br>Experimental Group II<br>Comparison Group | Confidence survey | ANOVA, ANCOVA<br>Descriptives, frequencies |

# APPENDIX J

Knowledge Raw Data: Pre Quiz

| ID # | Experimental Group I A | Experimental Group II B | Comparison Group C |
|---|---|---|---|
| 01 | 13 | 6 | 10 |
| 02 | 11 | 11 | 9 |
| 03 | 6 | 10 | 12 |
| 04 | 11 | 15 | 6 |
| 05 | 9 | 12 | 12 |
| 06 | 11 | 10 | 12 |
| 07 | 6 | 8 | 8 |
| 08 | 2 | 14 | 7 |
| 09 | 7 | 9 | 8 |
| 10 | 6 | 10 | 7 |
| 11 | 4 | 11 | 12 |
| 12 | 7 | 9 | 7 |
| 13 | 13 | 12 | 9 |
| 14 | 10 | 10 | 6 |
| 15 | 12 | 6 | 5 |
| 16 | 2 | 8 | |
| 17 | | 12 | |
| 18 | | 10 | |
| 19 | | 14 | |
| 20 | | 12 | |

# APPENDIX J

Knowledge Raw Data: Pre, POST 1 and Post 2 QUIZ

| **ID #** | Experimental Group I A | | | Experimental Group II B | | | Comparison Group C | | |
|---|---|---|---|---|---|---|---|---|---|
| | Pre<br>2 | Post 1 | Post | Pre<br>2 | Post 1 | Post | Pre | Post 1 | Post 2 |
| 01 | 13 | 15 | 14 | 6 | 8 | 6 | 10 | 12 | 10 |
| 02 | 11 | 12 | 14 | 11 | 12 | 6 | 9 | 13 | 16 |
| 03 | 6 | 10 | 12 | 10 | 12 | 11 | 12 | 15 | 10 |
| 04 | 11 | 13 | 13 | 15 | 16 | 16 | 6 | 13 | 15 |
| 05 | 9 | 12 | 10 | 12 | 16 | 16 | 12 | 16 | 14 |
| 06 | 11 | 12 | 13 | 10 | 13 | 12 | 12 | 16 | 11 |
| 07 | 6 | 13 | 11 | 8 | 12 | 15 | 8 | 14 | 13 |
| 08 | 2 | 9 | 9 | 14 | 16 | 16 | 7 | 11 | 18 |
| 09 | 7 | 11 | 11 | 9 | 10 | 9 | 8 | 13 | 14 |
| 10 | 6 | 10 | 12 | 10 | 11 | 6 | 7 | 14 | 15 |
| 11 | 4 | 10 | 11 | 11 | 16 | 15 | 12 | 14 | 13 |
| 12 | 7 | 13 | 10 | 9 | 16 | 16 | 7 | 13 | 13 |
| 13 | 13 | 12 | 14 | 12 | 12 | 16 | 9 | 11 | 13 |
| 14 | 10 | 14 | 12 | 10 | 13 | 14 | 6 | 18 | 13 |
| 15 | 12 | 12 | 15 | 6 | 13 | 11 | 5 | 14 | 10 |
| 16 | 2 | 9 | 14 | 8 | 13 | 14 | | | |
| 17 | | | | 12 | 16 | 16 | | | |
| 18 | | | | 10 | 12 | 18 | | | |
| 19 | | | | 14 | 15 | 14 | | | |
| 20 | | | | 12 | 12 | 6 | | | |

# APPENDIX K

Confidence PRE QUIZ Raw Data

| ID # | Experimental Group I A | Experimental Group II B | Comparison Group C |
|---|---|---|---|
| 01 | 3.85 | 1.9 | 3.65 |
| 02 | 3.75 | 2.1 | 2.85 |
| 03 | 2.15 | 2.8 | 3.1 |
| 04 | 3.55 | 2.75 | 2.1 |
| 05 | 3.55 | 2.6 | 3.35 |
| 06 | 2.2 | 2.25 | 3.05 |
| 07 | 2.55 | 3.1 | 4.7 |
| 08 | 2.25 | 2.85 | 3.8 |
| 09 | 2.55 | 3.25 | 2.95 |
| 10 | 2.25 | 2.65 | 1.85 |
| 11 | 2.15 | 1.95 | 2.15 |
| 12 | 2.15 | 1 | 2.4 |
| 13 | 1.85 | 2.25 | 1 |
| 14 | 2.7 | 2.6 | 4.05 |
| 15 | 2.4 | 2.05 | 1 |
| 16 | 2.1 | 2.9 | |
| 17 | | 3.15 | |
| 18 | | 3.25 | |
| 19 | | 2.9 | |
| 20 | | 2.8 | |

# APPENDIX K

## Confidence Raw Data: Pre, Post 1, and Post 2 QUIZZES

| ID # | Experimental Group I A | | | Experimental Group II B | | | Comparison Group C | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Pre** | **Post 1** | **Post 2** | **Pre** | **Post 1** | **Post 2** | **Pre** | **Post 1** | **Post 2** |
| 01 | 3.85 | 3.85 | 4.75 | 1.9 | 2.9 | 4.4 | 3.65 | 4 | 4 |
| 02 | 3.75 | 3.25 | 3.1 | 2.1 | 3.2 | 3.55 | 2.85 | 2.95 | 3.55 |
| 03 | 2.15 | 3.3 | 3.75 | 2.8 | 2.25 | 3.45 | 3.1 | 3.15 | 3.45 |
| 04 | 3.55 | 3.65 | 4.1 | 2.75 | 3.7 | 4.55 | 2.1 | 3.35 | 4.05 |
| 05 | 3.55 | 4.1 | 4.4 | 2.6 | 3.1 | 5 | 3.35 | 3.25 | 3.5 |
| 06 | 2.2 | 3.2 | 3.25 | 2.25 | 2.55 | 4 | 3.05 | 3.85 | 4.1 |
| 07 | 2.55 | 3.6 | 4.2 | 3.1 | 3.5 | 4.1 | 4.7 | 3.8 | 4.35 |
| 08 | 2.25 | 2.95 | 2.55 | 2.85 | 3.7 | 4.45 | 3.8 | 4 | 3.85 |
| 09 | 2.55 | 2.15 | 3.75 | 3.25 | 3.7 | 3.7 | 2.95 | 3.25 | 3.4 |
| 10 | 2.25 | 2.75 | 3.3 | 2.65 | 3.25 | 3.25 | 1.85 | 2.75 | 2.95 |
| 11 | 2.15 | 3.25 | 3.05 | 1.95 | 4.35 | 4.1 | 2.15 | 3.3 | 2.8 |
| 12 | 2.15 | 4.05 | 2.95 | 1 | 3.7 | 3.9 | 2.4 | 3.4 | 3.55 |
| 13 | 1.85 | 3.3 | 3.9 | 2.25 | 3.05 | 3.45 | 1 | 4 | 4 |
| 14 | 2.7 | 4.1 | 4.05 | 2.6 | 3.8 | 4.4 | 4.05 | 4.65 | 3.85 |
| 15 | 2.4 | 3.6 | 4.6 | 2.05 | 3.8 | 4 | 1 | 3.25 | 3.45 |
| 16 | 2.1 | 3.8 | 4.05 | 2.9 | 3.35 | 3.5 | | | |
| 17 | | | | 3.15 | 4 | 4.45 | | | |
| 18 | | | | 2.95 | 3.25 | 3.3 | | | |
| 19 | | | | 2.9 | 3.45 | 4.3 | | | |
| 20 | | | | 2.8 | 3.5 | 4.95 | | | |

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# CURRICULUM VITA

NAME: Beverly June Davis Bye

PERMANENT ADDRESS: 16905 Flickerwood Road
Parkton, MD 21120

PROGRAM OF STUDY: Instructional Technology

DEGREE AND DATE TO BE CONFERRED: Doctor of Education, August 2008

Secondary education: Overlea Senior High School, Baltimore, MD, May 1976

| Collegiate institutions attended | Dates | Degree | Date of Degree |
|---|---|---|---|
| Loyola College (Baltimore, MD) | 6/1976- 5/1978 | Transferred | |
| Towson University (Towson, MD) | 2/1978-5/1980 | BS in Nursing | May 1980 |
| Loyola College (Baltimore, MD) | 2/1982 – 5/1983 | MEd | May 1983 |
| University of Maryland, Baltimore | 2/1996 – 8/1999 | MS in Nursing | August 1999 |
| Towson University (Towson, MD) | 9/2002 – 5/2008 | EdD | August 2008 |

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Major: Instructional Technology

Professional Publications:

Bye, B. (2007) Puzzling pelvic pain. *Nursing Made Incredibly Easy*, *5*(4), 64.

Bye, B. & Fisher, C. (2003) EMT-B Program Evaluation. Faculty Forum, Towson University. Towson, Maryland.

Bye, B (2001, Winter). Winter survival tips for the elderly. *GBMC Professional Nurse Connection 6*(1), 5-7.

**Professional positions held**:

## Nursing

**2004 – present** ***Minute Clinic*** *MD*

Performs episodic exams and prescribes medication pertinent to illness. Refer patients as necessary. Assists with orientation of new hires. Performs wellness exams, in addition to the episodic exams.

**2002- present** ***Mercy Medical Center*** *MD*

Performs rape exams, head-to-toe physicals while collecting evidence for prosecution. Instructs victims on follow-up care both physical and emotional, as well as education regarding STD's, pregnancy, etc.

Forensic Nurse Examiner (FNE-A) performing sexual assault forensic exams for both female and male victims of sexual assault. Additionally, providing testimony in court as an *Expert Witness* since 2003.

**2000 – Dec -2002 / June 2005- present- prn** GBMC Towson, MD

Perform preoperative History and Physicals, Pre-employment physicals

***1999-2000*** ***Planned Parenthood of Central Pennsylvania*** *PA*

Women's Health Nurse Practitioner- Performed OB / Gyn exams

STD counseling and exams on both men and women

***2001 – present*** ***Towson University*** *Towson, MD*

*Course Coordinator for Childbearing Families* – updating lecture and exam material, orienting new faculty, serving as a resource person to all maternal-child faculty.

***Summer, 2000*** ***University of Maryland, Baltimore*** *Baltimore, MD*

Instructed students in Medical-Surgical area at University Hospital in the Accelerated Nursing Program.

***1997 – present*** ***Towson University*** *Towson, MD*

Guest Lecturer in graduate nursing courses: The Adult Learner; Evaluation; and Learning and Teaching. Classroom and Clinical Instruction (Maternal Child, Health Assessment, Leadership, Health Promotion – Fundamentals Nursing course, Pharmacotherapeutics, Professional Issues: both J1 and S2 level writing courses). Childbearing Families Course Coordinator. Webmaster for Nursing website. Blackboard sites for all courses taught with an interactive discussion area for reviews and case studies. Senior Practicum Course Coordinator.

***1993 – 2000*** ***York College of Pennsylvania*** *York, PA*

Classroom and Clinical Instructor (Maternal Child Area)

***1982 - 1985*** ***Essex Community College*** *Baltimore, MD*

Classroom and Clinical Instruction (Introduction to Nursing, Medical Surgical Nursing 1, 2, 3)
Developed and Instructed in a Geriatric Aide course

## Staff Nurse / Clinical Coordinator

***1986 – 2003*** ***Greater Baltimore Medical Center*** *Towson, MD*

Employee Health Nurse Practitioner (November, 2001 – 2002) – Performs H&P's, vaccination updates, maintain PPD testing for employees, follow-up with needle sticks and Worker's Comp, and initiate Family Leave.

Clinical Coordinator (1989 – 1993) for weekend and off –shift coverage throughout the hospital. Helping troubleshoot clinical situations and staffing.
Various areas- Labor and Delivery, postpartum, urgent care, and nursery

## Charge / Staff Nurse

*1981 – 1988* *Franklin Square Hospital* *Baltimore, MD*

**Charge / Staff Nurse in ICU setting (1981-1985).** Worked ER / CCU/ ICU (1983 – 1988). Postpartum / Nursery (1985-1988).
*1980 – 1981* *St. Joseph's Hospital* *Towson, MD*

Worked Cardiac Step-down as a staff / charge nurse and new graduate.

## Biology Instructor

***1992 – 2000*** ***Villa Julie College*** *Stevenson, MD*
Taught Medical Terminology, Anatomy & Physiology, Chemistry for Nursing majors

## Childbirth Educator

***1986 – 2000, 2003-present Greater Baltimore Medical Center*** *Towson, MD*
***1985 – 1987*** ***Franklin Square Hospital*** *Baltimore, MD*
Instruct and develop curriculum for childbirth education at the hospital. Teach a variety of classes including preparation for childbirth, CPR, infant care, refresher, and breast feeding. (GBMC)

Developed and instructed in childbirth education for couples

## Licenses / Accreditations / Certifications

RN – Active License in both Maryland and Pennsylvania
CRNP (Family) – Active license in both Maryland and Pennsylvania
FNE – A (Forensic Nurse Examiner – Adult) – Certification in

Maryland current (since 2002)
ANCC – Family Nurse Practitioner (certified since October, 1999)
CES – Certified Childbirth Education Specialist (certified since 1987)
CPR Instructor (American Heart Association certified since 1980)

**Awards received**

Kappa Delta Pi (Inducted May 3, 2008)
Alumni Association Graduate Fellowship July 2006
Towson University Five year Service Anniversary – Spring 2007
Professional Nurse Trainee Scholarship –September 1997 to July 1999
Citizen's Certificate of Merit – Baltimore County – Awarded May 1997
Sigma Theta Tau International (National Nurse's Honor Society 1992)
Alpha Sigma Nu (College Honor Society,inducted 1983)
Graduated Magna Cum Laude from Towson University (1980)

**Professional Memberships**

Nurse Practitioner Association of Maryland (NPAM)
American Academy of Nurse Practitioners (AANP)
National Association of Women's and Reproductive Health (NAWRH)
Sigma Theta Tau International (National Nurse's Honor Society)- President of Iota Epsilon Chapter
Society) – President of Iota Epsilon Chapter
International Association of Forensic Nurses (IAFN)
Association for Educational Communications and Technology (AECT)
Chair and Webmaster of Nursing Alumni, Towson University
Webmaster of Nursing Department website (since 2001)

**Professional Honors**

Became a Forensic Expert Witness in Baltimore County – June 7, 2007
Invited and spoke at the Emergency Consortium Spring 2004, Summer 2004, Fall 2004, Spring 2005, Summer 2005, Fall 2005, Spring 2006, Summer 2006, Fall 2006, Spring 2007, Summer 2007, Fall 2007, Spring 2008
Invited and spoke at the Nurse Faculty Recruitment Fair – July, 2004, April 2005, and July 2005
Book Reviewer for LWW – Fundamentals text – March 2006
Served as Book Reviewer for F.A. Davis for several books, including Fundamentals of Nursing – January 2004 to present.
Served as Book Reviewer for Lippincott, Wilkens, and Williams for several books – including Maternal-Child and Dosage Calculation text books – January/ July 2004; March 2006
Served as a NCLEX test writer in May, 2003 in Chicago, Illinois
Assisted the Army with development of an Evaluation Tool – February through May, 2003 (currently serving as a consultant for evaluation of the assessment)
Served as a Book Reviewer for a new Medical-Surgical Book-October 2002.
Served as a NCLEX test writer alternate in September 2002.