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Comparing Student Satisfaction in High- and Low-Fidelity Simulation Experiences

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COMPARING STUDENT SATISFACTION IN HIGH- AND LOW-FIDELITY SIMULATION EXPERIENCES

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COMPARING STUDENT SATISFACTION IN HIGH- AND LOW-FIDELITY SIMULATION EXPERIENCES

An Abstract of the Project by
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The purpose of this project was to compare student satisfaction in high- and low-fidelity simulation experiences. The project took place at the Pittsburg State University Irene Ransom Bradley School of Nursing. Participants included 79 pre-licensure Fundamentals of Nursing students in their first semester of nursing school. Implementation took place in the Fall of 2022. Students underwent either a high- or low-fidelity patient simulation experience related to pneumonia. Upon completion of the scenario students were asked to voluntarily participate in a satisfaction questionnaire. The questionnaire was composed of 27 closed-ended questions. There was a statistically significant difference with higher satisfaction scores with the low-fidelity simulation compared to the high-fidelity simulation.

Table of Contents

List of Tables

List of Figures

Chapter I

Introduction

Description of the Clinical Problem

The COVID-19 pandemic brought about many challenges in nursing education. One of the major challenges for students and educators was obtaining quality clinical hours. Spring 2020 found nursing students at Pittsburg State University, as well as around the globe, in lockdown mode. This meant no hospital clinical hours for nursing students, despite pending graduation of senior advanced medical-surgical students. Nursing students at Pittsburg State University were forced to do online clinical hours or work in small groups in the simulation lab. Simulation experiences often contribute to a portion of total clinical hours. The National League for Nursing (NLN) believes simulation in nursing school can boost critical thinking skills, and it is a successful evidence-based tool in nursing education (NLN, 2015). In circumstances such as a global pandemic, simulation hours are essential in preparing students to become competent nurses in the workforce. Educators have an important job in ensuring nursing students are receiving optimal experiences in the simulation lab.

Obtaining hospital clinical hours remains a challenge for students due to safety protocols brought about by the pandemic. Educators are continuing to rely on clinical simulation to fill that gap. Clinical instructors are feeling pressure to provide optimal

experiences for students to prepare to work as effective registered nurses. Fortunately, advanced technology offers high-fidelity simulators to be utilized in simulation experiences. With proper funding and training, clinical instructors can provide students with quality simulation experiences to better prepare them for the field. Clinical instructors have a duty and responsibility to provide students with the best clinical experiences, despite the challenge of decreased hospital hours. A transition of traditional low-fidelity simulation to high-fidelity simulation may be necessary to strengthen pre-licensure nursing educational experiences.

Problem Statement

Simulation experiences play a large role in overall clinical hours for pre-licensure nursing students. Simulation can provide effective learning opportunities if obtaining hospital clinical hours becomes difficult. High-fidelity simulation experiences may allow for increased student satisfaction compared to low-fidelity simulations.

Significance to Nursing Education

The COVID-19 pandemic has reinforced the importance of alternative methods in providing pre-licensure nursing students with adequate clinical experiences outside of hospitals and facilities. Nurse educators have a responsibility to maintain the safety of patients and students, yet continue to meet nursing education milestones in order to graduate proficient registered nurses. Clinical simulation experiences provide an effective alternative to hospital clinical experiences amongst pre-licensure nursing students.

The National Council of State Boards of Nursing (2021) recommends national simulation guidelines for prelicensure nursing programs. Their expert panel, consisting of representatives from International Nursing Association for Clinical Simulation and

Learning (INACSL), American Association for Colleges of Nursing (AACN), National League for Nursing (NLN), and Boards of Nursing agree it is not the number of clinical hours pre-licensure students obtain throughout school, but the quality of the experience. If there are inadequate hands-on opportunities in the hospital or clinical setting, simulation may offer a better alternative (NCSBN, 2021).

Reid et al. (2020) published a study that determined prelicensure nursing students' clinical judgment scores were "comparable when students participate in simulation clinical experiences as compared to hospital-based clinical practice" (p. 835). Indeed, nursing programs nationwide are having trouble with clinical placement sites due to the pandemic. It is encouraging to see studies proving there is no lack in clinical judgement gained when clinical experiences take place in a simulation setting, as compared to a hospital setting.

High-fidelity simulation involves the use of sophisticated life-like mannequins in realistic patient environments. They are also known as "human patient simulators" according to Healthcare Simulation (2019). The degree to which a particular simulator can reproduce or mimic human physiology is known as fidelity. Many nursing schools have the opportunity to utilize high-fidelity mannequins equipped with "expanding chests that breathe, variable heart rates and tones, measurable blood pressures, and palpable pulses" (Healthcare Simulation, 2019, p. 1.)

Nursing schools across the country should take advantage of increased access to high-fidelity simulators for clinical simulation experiences, especially when hospital clinical hours are limited. High-fidelity simulators are capable of preparing students for real-life patient scenarios that will be seen following graduation from nursing school.

These simulation experiences in nursing education are essential to developing competent registered nurses.

Theoretical Framework

Sister Callista Roy's adaptation model of nursing is useful in guiding topics of simulation in nursing education. Sister Roy's theory helps guide the nurse in making decisions for patients in response to changes. As the environment surrounding the patient is constantly changing, the nurse must possess qualities and critical thinking skills to adapt to those changes.

There are 10 explicit assumptions listed for Roy's adaptation model of nursing (Petiprin, 2020, p. 2.):

1) The person is a bio-social being.
2) The person is in constant interaction with a changing environment.
3) To cope with a changing world, a person uses coping mechanisms, both innate and acquired, which are biological, psychological, and social in origin.
4) Health and illness are inevitable dimensions of a person's life.
5) In order to respond positively to environmental changes, a person must adapt.
6) A person's adaptation is a function of the stimulus they are exposed to and their adaptation level.
7) The person's adaptation is a such that it comprises a zone indicating the range of stimulation that will lead to a positive response.
8) The person has four modes of adaptation: physiological, self-concept, role function, and interdependence.

9) Nursing accepts the humanistic approach of valuing others' opinions and perspectives.

10) There is a dynamic objective for existence with the ultimate goal of achieving dignity and integrity.

Roy's adaptation model of nursing is a good blueprint for this DNP scholarly project because the mode of simulation experiences needs to adapt to the environmental changes surrounding us. The COVID-19 pandemic has presented many challenges regarding clinical hours for pre-licensure nursing students. Quality clinical experiences are crucial for pre-licensure students. Nursing educators must adapt to these challenges and provide students with improved simulation experiences. One way to improve experiences in the simulation lab may be through the use of high-fidelity simulators.

Project Questions

The question to be identified throughout the project includes:

- Is there a difference in student satisfaction following usage of a high-fidelity human simulator versus usage of a low-fidelity simulator on a faculty-led simulation?

Definition of Key Terms

The key terms for the proposed project include the following: high-fidelity simulation, low-fidelity simulation, simulation, pandemic, and pre-licensure, clinical judgement, and student satisfaction.

High-fidelity simulation- "Healthcare education methodology that involves the use of sophisticated life-like mannequins in realistic patient environments." (Healthcare Simulation, 2019.)

Low-fidelity simulator- "Simulations that mirror the actual action or scenario closely but leave out factors that the user might experience in real-life." (Healthcare Simulation, 2019.)

Simulation- "A strategy to, not a technology, to mirror, anticipate, or amplify real situations with guided experiences in a fully interactive way." (National Council of State Boards of Nursing, 2021.)

Pandemic- "(of a disease) prevalent over a while country or the world." (Oxford Dictionaries, 2021.)

Pre-licensure- "Bachelor of Science in Nursing program involving a four-year program that is specifically designed for students who do not currently hold a state nursing license and have no prior nursing experience or education." (BSN Education, n.d.)

Clinical judgement- "the process by which the nurse decides on data to be collected about a client, makes an interpretation of the data, arrives at a nursing diagnosis, and identifies appropriate nursing actions." (Medical Dictionary, 2021.)

Student satisfaction- "the favorability of a student's subjective assessment of the numerous outcomes and experiences related with education and being shaped continually and repeated experiences." (Oliver & Desarbo, 1998.)

Logic Model

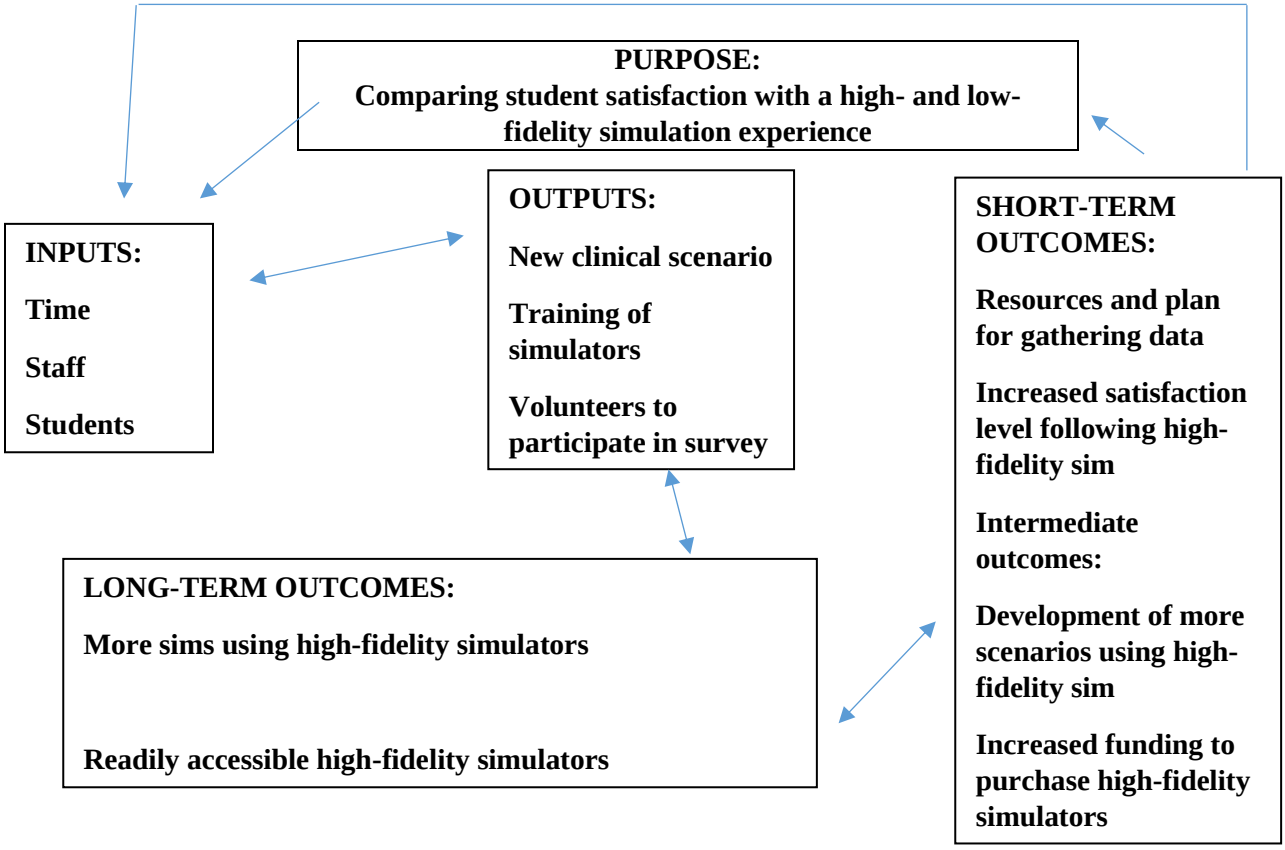
The components of the logic model for this project included inputs, activities, outputs, outcomes, and constraints listed in Figure 1 below.

The inputs were researcher, faculty, and student efforts for implementation of a new clinical simulation scenario using a high-functioning simulator and a low-functioning simulator. The biggest inputs in the project are faculty, researcher, and

student time. The other major inputs were technology including a high-fidelity simulator. Less major inputs include the PSU simulation lab. The output of the scholarly project was the development of a new clinical scenario that was applied using both a high-fidelity simulator and low-fidelity simulator. The intended short-term outcome is increased satisfaction level following a high-fidelity simulation experience. An expected intermediate outcome is the development of more clinical scenarios involving the use of high-fidelity simulators, increased funding for purchase of new simulators, and positive feedback from graduate nurse employers based on increased clinical preparedness. Long-term outcomes include more clinical simulations based on usage of high-fidelity simulators, readily accessible high-fidelity simulators in nursing education, and an increased number of hours allowed for clinical simulation experiences in nursing curriculums.

Figure 1

Comparing Student Satisfaction with a High- and Low-Fidelity Simulation Experience Logic Model



Summary

The COVID-19 pandemic has made obtaining clinical hours in nursing education more difficult compared to previous semesters. Nursing faculty have been challenged to provide an increased number of clinical hours through simulation experiences. Simulation is an effective tool in preparing students for real-life clinical scenarios. In order to optimize those experiences, nursing educators should focus more on developing high-fidelity simulation experiences instead of traditional low-fidelity simulation scenarios. High-fidelity simulation may result in an increased level of student satisfaction, and in return clinical preparedness upon graduation from nursing school.

Chapter II

Literature Review

The current literature was reviewed by searching applicable scholarly journals through the use of PubMed database. Pittsburg State University's Axe library search engine, Summon, was also utilized to assist with completing the goal of this scholarly project. The goal of this scholarly project was to determine whether: use of a high-fidelity simulation experience increased prelicensure baccalaureate student satisfaction and critical thinking as compared to traditional methods of low-fidelity simulation experiences. Search phrases included*: high-fidelity simulation, nursing simulation, low fidelity simulation, high-fidelity simulator, barriers to simulation effectiveness, increasing simulation satisfaction in nursing education, and effects of simulation on learning.* The search was limited to research articles published in peer reviewed scholarly journals within the last five years of the time of review. The literature search resulted in 20 usable articles. There were several themes included within the literature articles which serve as headings in the layout of Chapter 2. The themes are: *simulation in nursing education, effectiveness of high-fidelity simulation in nursing education, student satisfaction of high-fidelity simulation, barriers to high-fidelity simulation experiences.*

Simulation in Nursing Education

According to the National League for Nursing (NLN) (2015), simulation in nursing education has the ability to boost critical thinking skills, and is a successful evidence-based tool in students. (NLN, 2015). Clinical simulation experiences are a way to overcome the lack of hospital clinical experiences when it is impossible for nursing students to participate in clinical experiences, such as during the COVID-19 pandemic. If there are inadequate hands-on opportunities, simulation can offer a great alternative.

The National Council for State Boards of Nursing (2021) recommends national simulation guidelines for prelicensure nursing programs. The guidelines were developed as a follow-up to the National Simulation Study in 2014. This simulation study involved three study groups: clinical as usual (control), 25% simulation or 50% simulation. The results of the study concluded no statistically significant differences in clinical competency, comprehensive nursing knowledge assessments, or NCLEX pass rates among the study groups. Following this study, the NCSBN recommended up to 50% of clinical hours could be replaced with simulation experiences, while maintaining high outcomes for nursing students. (Hayden et al., 2014).

The participants of a recent study reported that the closer the scenarios were to reality, the easier it was for them to transfer their experiences from the simulation to their clinical placements. High-fidelity simulation is key to optimizing authenticity. For instance, one study discovered the "organization of simulation-based training and its implementation in the curriculum are crucial for the learning outcomes and for students' experiences of the transfer of knowledge to clinical practice." (Hustad et al., 2019, p. 54). This qualitative study discovered three themes through eight focus group interviews. The

themes included: “1) simulation-based training promotes self-confidence, 2) simulation-based training improved clinical skills and judgements in clinical practice, 3) simulation-based training emphasized the importance of communication and team collaboration.” (Hustad et al., 2019, p. 57). This study revealed simulation-based training allowed students to transfer positive learning outcomes to clinical practice skills. The authors believe simulation-based training integrated into bachelor programs in nursing is necessary and essential for preparing students for clinical practice. More importantly, their research showed “authenticity in simulation-based training is crucial.” (Hustad et al, 2019, p. 59).

Effectiveness of High-Fidelity Simulation in Nursing Education

The most up-to-date literature supports the use of high-fidelity simulation amongst nursing schools, in conjunction with hospital clinical hours. According to the NCSBN (2018), “the evolving educational landscape reveals to have acceptance of simulation, and there is an increased usage of high-fidelity simulation across all types of programs and courses.” (p. 4).

High-fidelity simulation experiences have proven to be helpful in preparing nursing students to provide safe and effective care for patients. A study by Dante et al. (2021) reported that multiple exposures to high-fidelity simulation enhanced the students’ ability to apply theory into practice. This phenomenological study was conducted at an Italian university. It concluded multiple exposures to high-fidelity simulation enhanced students’ ability to apply theory into practice.

Nursing knowledge and skills are shown to be improved through the use of high-fidelity simulation. Onturk et al. (2019) published an article reporting high-fidelity

simulation was more effective in teaching safe medication practices, as compared to a low fidelity teaching style. Medication practices are one of the main aspects of patient safety and have a particular importance among nursing interventions due to their legal and ethical responsibilities. This semi-experimental study included a student satisfaction and self-confidence learning scale, medication practice via oral route checklist, and pre and post-test for safe drug application knowledge assessment (Onturk et al., 2019). Of the 58 students there was a statistically significant difference between students' knowledge levels before and after the scenario, as well as increased satisfaction and self-confidence scores.

Another study by Cerra et al. (2019) demonstrates positive outcomes on nursing students' knowledge and performance as compared to other teaching methods. The purpose of a systematic review and meta-analysis completed in 2019, was to analyze the effectiveness of high-fidelity patient simulation based on life-threatening clinical condition scenarios on undergraduate and postgraduate nursing students' learning outcomes. Thirty-three studies were included in the study. High-fidelity patient simulation experiences showed an increase in student knowledge and performance when compared with any other teaching method. (Cerra et al, 2019).

The Indian Journal of Palliative Care (2020) published an article that determined high-fidelity simulation is beneficial for teaching how to provide end of life care. Following the high-fidelity simulation experience, students were better able to perform complex skills of clinical practice during end of life care. The students were also better able to deal with their own emotions following the experience. This study showed high-

fidelity simulation “enhanced students’ self-confidence and prepared them by providing a safe and supportive environment to learn.” (Rattani et al, 2020).

Student Satisfaction of High-Fidelity Simulation

Simulators used in nursing education are divided into three categories based on fidelity. Fidelity is the degree of realism the simulator is able to possess. The three categories include low, medium, and high. According to a study by Alconero-Camarero et al (2021), “high-fidelity simulators integrate multiple physiological variables for the creation of realistic clinical scenarios with life-size mannequins” (p. 806). In this study, 393 undergraduate nursing students participated in research to determine level of satisfaction for a clinical experience involving high fidelity simulation versus the experience using a medium-fidelity simulation experience. Nursing students involved in this research showed a significantly higher level of satisfaction participating in the medium-fidelity experience as compared to the group participating in the high-fidelity experience. (Alconero-Camarero et al, 2021). This was one of the only studies showing student preference of a lower-fidelity simulation. The authors concluded medium-fidelity simulation may be of benefit for “acquisition of basic skills, and at a lower cost.” (Alconero et al, 2021, p. 804).

A nursing school in Portugal participated in research to determine if high-fidelity simulation resulted in an increased level of satisfaction compared to medium-fidelity simulation (Baptista et al., 2016). Eighty-five undergraduate nursing students in their fourth year of a bachelor’s degree program were included in the study. The results included students being “very satisfied with the realism of high-fidelity simulated practice” and the researcher concluded that the high-fidelity simulation experience helped

the students more with recognition and decision compared with the medium-fidelity simulation (Baptista et al., 2016, p. 128). Their results were gathered through a satisfaction scale of perceived gains from simulated practice in a medium-fidelity environment (control group) and a high-fidelity environment (experimental group). (Baptista et al., 2016).

A further study from Basak et al. (2016) indicates nursing students' perceptions of simulation experiences using high-fidelity mannequins were found to be higher in contrast to their perceptions of experiences using low-fidelity mannequins. This was a quasi-experimental investigation where participants performed two simulations. One simulation used a low-fidelity mannequin and the other simulation used a high-fidelity mannequin. A Student's Satisfaction and Self-confidence Scale and Simulation Design Scale were used to obtain the data.

Barriers to Providing High-Fidelity Simulation Experiences

Many barriers to implementation of high-fidelity clinical experiences have been identified in the literature. One study published in *Nurse Education Today* (2016) identified main barriers through an integrative review of 21 articles. The three main barriers included: "lack of time, fear of technology, and workload issues." (Ghareeb & Cooper, 2016, p. 282). There were also three enablers identified in the review which involved: "faculty training, administrative support, and dedicated simulation coordinator."

Faculty Barriers

Traditional nursing education involves lectures in conjunction with hospital clinical experiences using live patients. Simulation experiences offer a safer, more

comfortable learning environment for nursing students. Our challenge with simulation in nursing education is that it requires training and skills in order to facilitate successful scenarios using simulators, particularly high-fidelity simulators.

According to the chief officer of nursing regulation at the NCSBN, one of the major barriers to usage of high-fidelity simulation experiences in nursing education is the facilitation of faculty training. (NCSBN, 2018). Alexander stated, "we know that faculty need to take specialized courses in order to be a facilitator of simulation and be able to run the simulation…and being able to actually have staff to facilitate and run the actual simulation experiences." (NCSBN, 2018, p. 4).

One article published in *Academic Medicine* mentions concerns of "prevention of the full value of health care simulation from a patient safety perspective." (Henriksen et al, 2018, p. 706). As faculty, there must be a formalized training session to properly run simulation experiences. With proper training, effective simulation for nursing students can result in increased patient outcomes and safety.

Research in China surveyed 108 nursing instructors to determine their usage of simulation in education. The study data suggested that faculty training programs for simulation should be based on the nurse educators' training needs. A training session will allow "hands-on learning simulation activities with expert feedback to help nurse educators achieve the competencies required for effective simulation-based education." (Luo, 2021, p.76).

Waxman et al. (2019) states, "not all simulation is consistently executed, and faculty development is essential to the success of any simulation program." (p. 67). They also report that despite simulation being ubiquitous in nursing education across the

United States, many educators lack the necessary skills or training to use simulation effectively.

The NCSBN Simulation Study (2014) recommends schools of nursing have an infrastructure to support the use of simulation along with providing education and training for their faculty. The International Nursing Association for Clinical Simulation in Nursing (INACSL) Standards of Practice first developed in 2011, (revised in 2013 and 2016), include eight standards and a glossary for healthcare simulation education, with faculty development and the use of the INACSL Standards of Best Practice. These standards should be utilized amongst all nursing schools when training faculty and developing new simulation scenarios.

The *Journal of Nursing Education* had a recent article about the development of a workgroup for simulation formation utilizing the INACSL's standards. This work group was formed in four stages and consisted of 14 faculty from five nursing campuses in California. Throughout the work study by Kilroy et al. (2021), challenges were identified and addressed to help provide a simulation program with new initiatives and a unified scheduling system, budget, standardized debriefing, and a student evaluation method. The faculty concluded with "greater dependence on simulation as an educational modality, implementation of a simulation work group may enable collaboration and growth across campuses while decreasing the disparity of simulation experiences." (Kilroy et al, 2021, p. 166).

Summary

The current literature supports the use of high-fidelity simulation experiences in prelicensure nursing education. The research shows it has the ability to produce more

confident, satisfied, knowledgeable, and better-performing student nurses. Improvement in clinical skills and an increased level of satisfaction following simulation experiences have been proven to translate into more prepared registered nurses following graduation from a prelicensure program. While a lack of appropriate faculty simulation training exists, the literature offers effective solutions to overcome this barrier. Despite minor faculty barriers, nursing programs across the world have proven high-fidelity simulation is essential to preparing students for graduation. As a result, students have a high-level of satisfaction following these experiences.

High-fidelity simulation experiences are proven to be beneficial to enhance nursing students' overall knowledge, critical thinking skills, performance, self-confidence, and satisfaction. There are also endless studies in the literature supporting the use of high-fidelity simulation experiences in prelicensure nursing education.

Chapter III

Methodology

Project Design

The purpose of this project was to determine the satisfaction level of students following use of a high-fidelity simulation experience compared to a low-fidelity experience. The patient scenario was the same. The high-fidelity experience involved the use of a high-fidelity patient simulator, while the low-fidelity experience involved the use of a mannequin with little to no technological function. All junior pre-licensure students enrolled in the Fundamentals for Nursing (N318) course in the Irene Ransom Bradley School of Nursing participated in the simulation experience following a simulation day already built into the curriculum. The satisfaction survey following the simulation was voluntary.

This was a comparative study involving data gathered from two types of simulation. The comparative data included satisfaction levels rated by students following the high- and low-fidelity simulation experiences. Students were approached to participate in the satisfaction survey following the experience and were also reassured that their participation had no effect on their grade in the course.

The simulation guidelines for prelicensure programs from The National Council for State Boards of Nursing's (NCSBN) (2021) were utilized in the formation and

development of the experience. The best practice guidelines from the International Association for Clinical Simulation and Learning's (INACSL) (2021) were also followed. Since originally announced in 2011, the INACSL Standards of Best Practice have "guided the integration, use, and advancement of simulation-based experiences with academia, clinical practice, and research." (INACSL Standards Committee, 2021, p. 2.)

Sample/Target Population

Undergraduate pre-licensure BSN students within the Pittsburg State University Irene Ransom Bradley School of Nursing were the target population for this scholarly project. More specifically, junior nursing students enrolled in Fundamentals for Nursing (N318) were asked to voluntarily participate in this study. Anticipated enrollment in the Pittsburg State University Fundamentals of Nursing class in the Fall of 2022 was 79 students. With a confidence level of 95%, a confidence interval at 4, and a population of 79, the calculated sample size is 70 (Creative Research Systems, 2021).

Inclusion & Exclusion Criteria

The determination of inclusion and exclusion criteria for the scholarly project was simple. All junior pre-licensure students enrolled in the Fundamentals for Nursing (N318) course for the Fall of 2022 met inclusion criteria to participate in the satisfaction survey following their simulation experience. Inclusion criteria included: pre-licensure baccalaureate nursing students enrolled in N318 and their presence on the simulation date. Exclusion criteria for the project included: anyone younger than 18 and non-English speaking students, nursing students not enrolled in N318, and any student not present on the scheduled simulation day.

Protection of Human Subjects

An approval was obtained from Pittsburg State University Institutional Review Board. All individuals participated in the survey on a voluntary basis. All participants were adults over the age of 18. The tools utilized were filled out voluntarily and were also anonymous. Participants were notified that participation in the study did not affect students' grades in the course.

The level of review the project qualifies for is exempt. The criteria making the project exempt included: a) Research is conducted in established or commonly accepted educational settings, involving normal educational practices, such as research on regular and special education instructional strategies; and b) Research involves the use of educational tests, survey procedures, interview procedures or observation of public behavior without information being obtained and recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects. The data was obtained from the CR-1 IRB form.

Letters from the director of IRBSON and the course instructor(s) were obtained, allowing project implementation in the Fundamentals of Nursing course in the Fall of 2022.

Instruments

Student satisfaction was measured using the "Satisfaction Scale Questionnaire with High-Fidelity Clinical Simulation- SSHF," developed by Alconero-Camarero et al. (2021), for use in a similar study. The questionnaire is composed of 27 closed questions valued by a five-degree Likert scale. The greater the score for each scale, the greater the level of agreement with it.

Content validity of Alconero et al.'s questionnaire was established by an expert panel. The questionnaire was validated by 150 nursing students in the second year of the Bachelor degree in Nursing at a Spanish university during the academic year 2013/2015. Lawshe formula was used to determine its validity, while for the construct validity a factor analysis was conducted using the principal component and Varimax rotation. Cronbach Alpha was used to determine internal consistency. The questionnaire developed presents satisfactory internal consistency (alpha 0.857). (Alconero et al., 2016). The author granted permission to use the questionnaire free of charge.

Procedure

Upon approval of the proposal by the DNP Scholarly Project committee, an IRB application was submitted to the Pittsburg State University IRB committee. When the project got approved, implementation of the simulation experiences took place. The goal for implementation was met and started in the Fall of 2022 with junior pre-licensure students enrolled in Fundamentals for Nursing. The formal implementation of the simulation was presented to the BSN program committee. Objectives and outcomes were presented to the course instructors.

Implementation of the patient scenario allowed for equal opportunities of junior nursing students enrolled in Fundamentals for Nursing. Each student was able to participate in a patient scenario involving pneumonia. Students were divided randomly to partake in either the high or low experience. The students spent approximately 15 minutes performing the scenario over a patient with acute pneumonia. All students participating in the simulation experience were asked to voluntarily fill out the satisfaction survey.

The simulation experiences took place over the regularly scheduled simulation days for Fundamentals of Nursing. Half of the clinical groups came on Tuesday, October 18th, 2022 to do a high-fidelity patient scenario over pneumonia. The remainder of the clinical groups came to the simulation lab on October 20, 2022, to complete a low-fidelity patient scenario over pneumonia. For the simulation experience, roughly half of the clinical groups were placed in a high-fidelity experience while the other half were placed in a low-fidelity experience. The groups were randomly assigned by course faculty. The simulation was run by the same course faculty for every experience. Each rotation included approximately eight total students. Both high- and low- fidelity experiences took an average of 15 minutes, not including debriefing time and time to fill out the satisfaction survey. Debriefing took another 10 minutes and the satisfaction survey took 5-10 minutes. There was a total of 30-35 minutes per group, with nine groups rotating through the simulation experience each day.

Resources needed for project completion included: all aspects of established simulation activities for the high- and low-fidelity experiences. These resources were included in faculty and staff cooperation, a high-fidelity patient simulator, a low-fidelity patient mannequin, and class time. The simulation experience took approximately 15 minutes, while the satisfaction survey took 5-10 minutes and debriefing was another 10 minutes.

Treatment of Data

The statistical analysis was performed using the Statistical Package of the Social Sciences (SPSS). Mean differences tests of the Satisfaction Scale Questionnaire items

were carried out to determine if the type of simulation affected student satisfaction. The significance level was set at $p < 0.05$.

Evaluation Tools Linked to Objectives

The INACSL's (2016) Standards of Best Practice: Outcomes and Objectives were used to develop the objectives. The INACSL (2016) states, "objectives may be broad or specific as a blueprint for simulation design." (p. 13). According to the committee "objectives are guiding tools to facilitate achievement of simulation-based outcomes and the hallmark of sound education design." (INACSL, 2016, p. 13).

Evaluation Plan

The project was evaluated by meeting objectives through planned outcomes. The learner objectives for the pneumonia simulation for high- and low-fidelity simulation were:

1. Instill infection control principles to reduce the risk of exposing self and others.
2. Identify patient risk for community acquired pneumonia through subjective assessment.
3. Perform a focused respiratory assessment.
4. Identify findings requiring immediate reporting to provider or other interprofessional team.
5. Accurately prioritize patient orders/interventions.
6. Effectively communicate patient status to interprofessional team
7. Effectively communicate and advocate for patient throughout the entirety of the simulation experience.

The learning outcomes for pneumonia simulation for both high- and low-fidelity simulation included the following:

1. Apply clinical decision-making skills following review of patient data.
2. Perform cardiovascular and respiratory assessment and prioritize interventions.
3. Maintain patient safety at all times.
4. Collaborate effectively with interprofessional personnel.

Plan for Sustainability

High-fidelity simulation experiences are the future of nursing education. Students may be able to display increased levels of confidence, enjoy simulation experiences more, be more proactive in the simulation learning environment, and be able to distinguish a relationship between theory and practice when using high-fidelity case scenarios. (Alconero et al, 2021, p. 808). The implementation of high-fidelity simulation experiences will be essential for nursing programs throughout the world, as they are proven to provide positive outcomes for student nurses.

Chapter IV

Evaluation Results

Purpose

The overall purpose of this project was to determine if there was a significant difference in student satisfaction while undergoing a high- or low-fidelity simulation experience. Pre-licensure nursing students at Pittsburg State University have the opportunity to participate in both high- and low-fidelity simulation experiences throughout the program. Most nursing schools throughout the world are also providing similar experiences for their pre-licensure students. With a rapid rise of high-fidelity simulator use in nursing schools, it is essential for programs to gather data about the students' perceptions of these experiences.

The project question that guided this scholarly project is the following one:

- Is there a difference in student satisfaction following usage of a high-fidelity human simulator versus usage of a low-fidelity simulator on a faculty-led simulation?

Sample Population

Participants in the satisfaction survey following a high- and low-fidelity simulation experience consisted of PSU IRBSON junior pre-licensure students in their first semester of nursing school. The students were all enrolled in Fundamentals for

Nursing, while also participating in hospital clinical hours. Many of the students had never participated in a simulation experience before. The sample population included traditional and non-traditional college students. All students were required to participate in the simulation scenario related to a patient with a pneumonia diagnosis; however, the satisfaction survey following the experience was voluntary.

The simulation experiences took place over one week on two different days. The first date included approximately half of the class performing a high-fidelity experience, while the second day the remainder of the class performed the same pneumonia scenario in a low-fidelity experience. The high-fidelity group included 45 students. This group participated in the simulation on Tuesday, October 18, 2022. The low-fidelity group included 34 students. This group participated in the simulation on Thursday, October 20, 2022.

Key Terms

High-fidelity simulation- "Healthcare education methodology that involves the use of sophisticated life-like mannequins in realistic patient environments." (Healthcare Simulation, 2019.)

Low-fidelity simulator- "Simulations that mirror the actual action or scenario closely but leave out factors that the user might experience in real-life." (Healthcare Simulation, 2019.)

Simulation- "A strategy to, not a technology, to mirror, anticipate, or amplify real situations with guided experiences in a fully interactive way." (National Council of State Boards of Nursing, 2021.)

Pandemic- "(of a disease) prevalent over a while country or the world." (Oxford Dictionaries, 2021.)

Pre-licensure- "Bachelor of Science in Nursing program involving a four-year program that is specifically designed for students who do not currently hold a state nursing license and have no prior nursing experience or education." (BSN Education, n.d.)

Clinical judgement- "the process by which the nurse decides on data to be collected about a client, makes an interpretation of the data, arrives at a nursing diagnosis, and identifies appropriate nursing actions." (Medical Dictionary, 2021.)

Student satisfaction- "the favorability of a student's subjective assessment of the numerous outcomes and experiences related with education and being shaped continually and repeated experiences." (Oliver & Desarbo, 1998.)

Data Analysis

In order to answer the survey questions, participants were asked to rate their response for each item on a scale of 1 to 5 as follows: 1=strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree. The survey included 27 close-ended questions related to the simulation experience. The tables below will break down all statistics.

Table I

Fidelity Group

	Frequency	Percent
Low-fidelity group	34	43.0
High-fidelity group	45	57.0
Total	79	100.0

There were more participants in the high-fidelity group (57%) than the low-fidelity (43%). The total number of students participating in simulation was 79.

Table II

Gender of Participants

		All		Low Fid		High Fid	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	Male	10	12.7	8	23.5	2	4.4
	Female	68	86.1	26	76.5	42	93.3
	Total	78	98.7	34	100	44	97.8
Missing		1	1.3	0	0	1	2.2
Total		79	100.0	34	100	45	100

Overall, 86.1% of the students participating in simulation were female, with 12.7% being male. There was one missing data entry for gender making up the remaining 1.3%. This data entry was part of the high-fidelity group. The low-fidelity group was made up of 76.5% female and 23.5% male, while the high-fidelity group included 93.3% female and 4.4% male.

Table III

Simulation Experience of Participants

		All		Low Fid		High Fid	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	Yes	9	11.4	6	17.6	3	7.9
	No	62	78.5	27	79.4	35	77.8
	Total	71	89.9	33	97.1	38	84.4
Missing	9	8	10.1	1	2.9	7	15.6
Total		79	100.0	34	100	45	100

Overall, only 11.4% (9) of the students had participated in a simulation experience before. Out of the low-fidelity group 17.6% of the students had participated in a simulation before, while only 7.9% of the high-fidelity group answered yes to this question. Overall, there were eight missing data entries on this question, with seven of those being in the high-fidelity group.

Table IV

Age of Participants in Years

		All		Low Fid		High Fid	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	18	1	1.3	1	2.9	0	0
	19	5	6.3	0	0	5	11.1
	20	44	55.7	17	50	27	60
	21	20	25.3	12	35.3	8	17.8
	22	5	6.3	2	5.9	3	6.7
	25	1	1.3	1	2.9	0	0
	28	1	1.3	0	0	1	2.2
	54	1	1.3	1	2.9	0	0
	Total	78	98.7	34	100	44	97.8
Missing	99	1	1.3	0	0	1	2.2
Total		79	100	34	100	45	100
Mean			20.9		21.6		20.4
Standard Deviation			4.0		5.8		1.4

The overall ages of students ranged from 18-54 years old. The mean age overall was 20.9 and a standard deviation of 4. The mean age of the low-fidelity group was 21.6 old, while the mean age of the high-fidelity group was 20.4 years old.

Table V

Group Statistics

Overall Average	High- or Low-Fidelity	N	Mean	Std. Deviation	Std. Error Mean
	Low-fidelity	34	4.44	.42	.07
	High-fidelity	45	4.18	.55	.08

The group statistics show an overall survey score for the low-fidelity group of 4.44, while the overall survey score for the high-fidelity group was 4.18. The standard deviation of the low-fidelity group was 0.42 and the standard error mean was 0.07. The standard deviation of the high-fidelity group was 0.55 and the standard error mean was 0.08.

Table VI

Independent Samples Test

Overall Average	t-test for Equality of Means			
	t	df	Sig. (2-tailed)	Mean Difference
	2.325	77	.023	.26295

There is a statistically significant difference in students preferring the low-fidelity simulation experience over the high-fidelity experience with p=0.023.

Table VII

Itemized Mean and Standard Deviations Overall

	All students		Low Fid		High Fid	
	Mean	SD	Mean	SD	Mean	SD
	3.89	.734	3.82	.758	3.93	.720
I feel that the equipment was real-life.	4.28	.678	4.15	.702	4.38	.650
I think the objective of the simulation was clear.	4.13	.966	4.38	.779	3.93	1.053
I believe the scenario recreated a real situation.	4.59	.567	4.62	.551	4.58	.583
I think the time allotted for the patient scenario was adequate.	4.09	1.102	4.41	.857	3.84	1.214
I feel the degree of difficulty of the scenario was adequate.	4.32	.712	4.36	.822	4.29	.626
I feel I was comfortable during the scenario.	3.62	1.084	3.97	.937	3.34	1.119
I believe the simulation experience allowed me to determine the patient's condition based off signs and symptoms.	4.23	.800	4.53	.563	4.00	.879
I believe my group made minimal mistakes during the simulation experience.	3.77	1.085	4.15	.821	3.49	1.180
The simulation helped me establish priority nursing interventions.	4.44	.675	4.65	.485	4.29	.757
I feel that the simulation improved my ability to provide care to my patients.	4.43	.728	4.56	.613	4.33	.798

I believe the simulation improved my nursing knowledge for my next patient encounter.	4.59	.543	4.79	.410	4.44	.586
I believe the simulation improved my ability to communicate with a healthcare team.	4.43	.728	4.59	.657	4.31	.763
I feel that the simulation made me less anxious about the skills a graduate nurse must possess.	3.99	1.031	4.32	.976	3.73	1.009
I believe the simulation was beneficial because it relates theory to practice.	4.37	.644	4.53	.563	4.24	.679
I think the simulation allowed me to plan patient care effectively.	4.06	.952	4.29	.760	3.89	1.049
I feel that I have improved my nursing skills following the simulation.	4.32	.751	4.42	.751	4.25	.751
I believe I have reinforced clinical decision making following the simulation.	4.33	.746	4.47	.563	4.22	.850
I believe the simulation helped me to assess clinical signs and symptoms of pneumonia.	4.33	.812	4.47	.748	4.22	.850
I think the simulation has decreased my probability of making a medical error in my next patient encounter.	4.25	.742	4.41	.657	4.13	.786
I feel that I have maintained my composure during the scenario.	4.35	.734	4.50	.788	4.24	.679
I believe the simulation improved my clinical competence.	4.44	.693	4.59	.701	4.33	.674
I feel the instructor gave constructive feedback following the scenario.	4.38	.910	4.53	.788	4.27	.986
I think debriefing allowed me to recognize errors.	4.66	.552	4.71	.524	4.62	.576
I believe I learned from the mistakes I made during the simulation.	4.54	.712	4.50	.862	4.58	.583
I feel that the simulation was practical.	4.49	.677	4.56	.613	4.44	.725

Overall, I was satisfied with the simulation experience.	4.48	.830	4.59	.892	4.40	.780
Overall	4.2901	.51165	4.4399	.41987	4.1769	.54902

Overall, the mean score for the low-fidelity experience was 4.44, which the overall mean for the high-fidelity experience was 4.18. The overall standard deviation for the low-fidelity group was 0.42, while the overall standard deviation for the high-fidelity group was 0.55.

Summary

The project's primary purpose included facilitating both a high- and low-fidelity simulation experience with junior BSN pre-licensure students at PSU. The purpose of this project was achieved by discovering these junior BSN students preferred a low-fidelity simulation experience over a high-fidelity simulation experience on a patient with a pneumonia diagnosis. Further discussion of these results will be provided in Chapter V.

Chapter V

Discussion

Relationship of Outcomes to Research

The overall purpose of this study was to determine if there is a significant difference in student satisfaction when undergoing a high-fidelity experience versus a low-fidelity experience. After the intervention, data analysis showed a statistically significant difference in preference of low-fidelity simulation compared to high-fidelity. The project participants included 79 junior BSN pre-licensure students enrolled in Fundamentals of Nursing at PSU's IRBSON. These students were in their first semester of nursing school. Students were required to participate in the simulation scenario over pneumonia, but the satisfaction survey following the experience was voluntary. The survey was reviewed and approved by the IRB within the IRBSON and the University IRB at PSU. This project determined low-fidelity simulation may have a place in the curriculum, particularly with new BSN students.

The project question was answered during this study. There is a statistically significant difference in student satisfaction following usage of a low-fidelity human simulator versus usage of a high-fidelity simulator. The majority of evidence-based research showed a higher satisfaction rating from students using high-fidelity simulation compared to low-fidelity simulation. It was anticipated the results of this study would

reflect that of evidence-based research, but data analysis of this project showed the opposite.

There are speculations as to why the outcome did not match the research. One reason may be a result of student experience with simulation. The research subjects were all first semester junior BSN students. Most studies referenced in the literature review either do not signify previous experience with simulation or the studies refer to students in their third of fourth semesters of nursing school. This implies the students have participated in a nursing simulation prior to the study. The majority of the students (90%) had never participated in any type of simulation prior to this study. Based off individual item analysis, it seems junior students are overwhelmed by the high-fidelity simulation experience compared to the low-fidelity experience.

Items with the greatest mean difference preferring low-fidelity simulation included: “I feel that simulation made me less anxious about the skills I must possess as a graduate nurse,” “I feel I was comfortable during the scenario,” “I think the time allotted for the patient scenario was adequate,” and “I believe my group made minimal mistakes during the simulation experience.” This data is shown in Table VII in the previous chapter. After analyzing these individual items, it is apparent students were more anxious, felt rushed, and did not feel comfortable or prepared to make the right decisions in the scenario.

The high-fidelity simulation experience used a high-functioning simulator that forced students to gather patient data through assessment. This included listening to heart and lung sounds, assessing palpable pulses for heart rate, and communicating with the patient through integrated speech of the simulation coordinator through the simulator.

This simulator also allowed the opportunity to perform nursing skills, such as putting in a Foley catheter and starting an IV. The low-fidelity experience used a static mannequin with no technological function. The students were given vital signs through a Zoom camera by the instructor, as well as the assessment data and communication. The low-fidelity experience did not require as much patient assessment and nursing intervention due to technological capabilities. For instance, when the students saw the doctor had ordered the nurse to put in a Foley catheter the student just had to "pretend" to put it in. The students in the high-fidelity simulation experience were expected to perform assessment and skills at a high level, because the technology allowed them to do so.

Based on group means, Table VII shows there were three items out of the 27 on the survey where students preferred high-fidelity simulation over low-fidelity. These included: "I feel the facility was real-life," "I feel the equipment was real-life," and "I believe I learned from the mistakes I made during simulation." This data does show the students seemed to think the simulation felt life-like. Ultimately, that is our goal with simulation education. Simulation faculty strive to create an environment as similar to a hospital setting as possible. In theory, this prepares nursing students for the field once they graduate. Students rated the "mistakes" statement higher in the high-fidelity experience as well. This is most likely due to the low-fidelity group not having much of an opportunity to fail.

Observations

The most interesting and noteworthy aspect of data analysis involved the low-fidelity group rating their overall survey score higher compared to the high-fidelity group. It is essential to take note of the student's experience with simulation. Nursing

faculty should consider incorporating at least one low-fidelity simulation experience towards the beginning of the program. There is a large push to replace all low-fidelity experiences to high-fidelity simulation, but the students may benefit from an introduction to simulation using a low-fidelity experience.

The instrument used in this study was the "Satisfaction Survey for Pneumonia Simulation." The tool was borrowed from by Alconero-Camarero et al. (2021), for use in a similar study. The questionnaire is composed of 27 closed questions valued by a 5-degree Likert scale. The greater the score for each scale, the greater the level of agreement with it. Dr. Alconero-Camerero gave permission through email to borrow, translate, and revise the survey to make it appropriate for this particular pneumonia scenario. The questionnaire was emailed in Spanish. An online translator tool was used to create an English version.

Alconero-Camerero et al.'s questionnaire was established by an expert panel. The questionnaire was validated by 150 nursing students in the second year of the Bachelor degree in Nursing at a Spanish university during the academic year 2013/2014. Lawshe formula was used to determine its validity, while for the construct validity a factor analysis was conducted using the principal component and Varimax rotation. Cronbach Alpha was used to determine internal consistency. The questionnaire developed presents satisfactory internal consistency (alpha 0.857). (Alconero-Camerero et al., 2016).

The outcome of the survey was not expected, but it was not worrisome. A follow-up study may be warranted to determine if there is a place for low-fidelity simulation in the nursing curriculum for pre-licensure BSN students.

Evaluation of Theoretical Framework

Sister Callista Roy's adaptation model of nursing proved to be useful in guiding the DNP Scholarly Project topic of simulation in nursing education. During the high-fidelity simulation experience, a high-tech environment was created in order to mimic the hospital setting. This is a major adaptation that nursing instructors at Pittsburg State have made during the transition from low-fidelity simulation to high-fidelity simulation. Instructors and clinical faculty have gone through extensive training and simulation development throughout the transition.

Roy's adaptation model of nursing was still a good reference for this scholarly project; however, this theory relates to adaptation. Originally, I expected the results to support adapting and progressing with technological advances in nursing education. There are so many new and amazing ways to support nursing students with high-tech simulators and other tools to better prepare them for real-life nursing. This research shows the students may not always prefer the progression to higher functioning simulators. An advanced technological simulation atmosphere may actually overwhelm and intimidate nursing students, particularly those undergoing their first ever simulation experience.

Roy's adaptation model of nursing was originally chosen for this DNP scholarly project because the literature review supports adapting the mode of simulation experiences to mimic real-life nursing care. A push from the NCSBN (2014) to incorporate more simulation hours into nursing curriculum has challenged nursing schools like Pittsburg State to optimize those experiences in the sim lab. One way to do that is utilize high-fidelity simulators. This DNP scholarly project helps identify a student

preference of low-fidelity simulation, despite the predicted preference of a high-tech sim experience.

Evaluation of Logic Model

The components of the logic model for this project included inputs, outputs, and short, intermediate, and long-term outcomes listed in Figure 1 below. The results from this project supported the logic model proposed in chapter 1 in some areas, but failed in others.

The inputs from chapter one were supported in the study. They included researcher, faculty, and student efforts for implementation of a new clinical simulation scenario using a high-functioning simulator and a low-functioning simulator. The biggest inputs in the project were faculty, researcher, and student time. These inputs were listed in chapter 1. The other major inputs were technology including a high-fidelity simulator. Less major inputs included the PSU simulation lab. The output of the scholarly project was the development of a new clinical scenario that was applied using both a high-fidelity simulator and low-fidelity simulator.

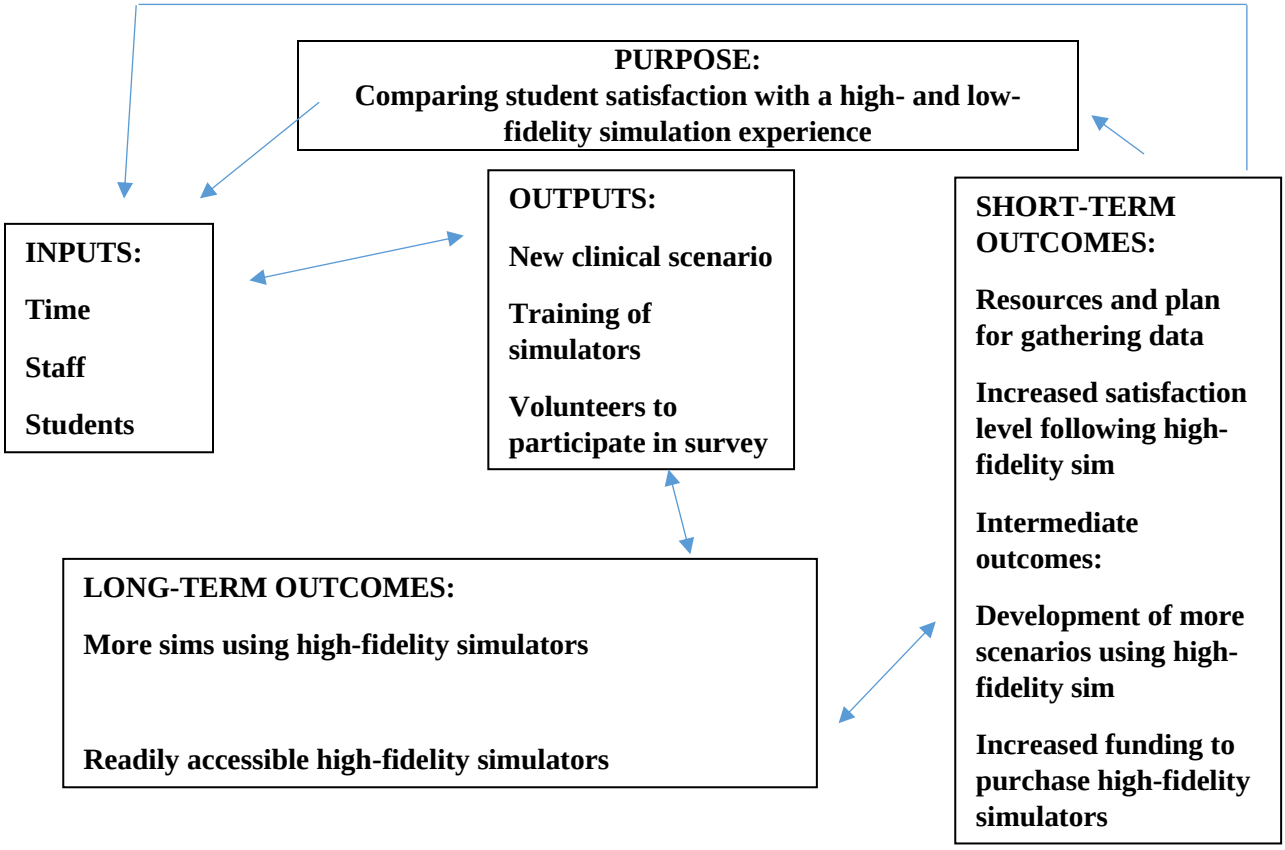
A few things that did not support the logic model proposed in chapter 1 included expected short, intermediate, and long-term outcomes. The short-term outcome of increased satisfaction following a high-fidelity experience did not align with the results. The expected intermediate outcomes of increased funding for purchase of a new high-fidelity simulator is not supported by the results of this study. If anything, the study shows an intermediate outcome of more incorporation of low-fidelity simulation.

Two of the long-term outcomes were not supported by the project. The outcomes included more clinical simulations based on usage of high-fidelity simulators and readily

accessible high-fidelity simulators in nursing education. The long-term outcome of an increased number of hours allowed for clinical simulation experiences in nursing curriculum is supported by the project. The results show there is a use for a low-fidelity introduction simulation experience in the pre-licensure curriculum.

Figure 1

Comparing Student Satisfaction with a High- and Low-Fidelity Simulation Experience Logic Model



Limitations

The method for sampling may have introduced bias or error into the results. About 10% of the group failed to answer the question at the top of the survey regarding previous experience with simulation. The question may have had a better opportunity being filled out if it were not on the same line as age and gender. It is helpful to know if this was a major contributor to why the students preferred low-fidelity simulation over high-fidelity.

The instrument may have been a factor in limiting the project. In order to utilize the borrowed survey, it had to be translated from Spanish to English. An online translator

tool, Google Translate, was utilized. Some of the items on the survey may not have not translated appropriately to make sense to the reader. However, after translating from Spanish to English and making edits to the 27 items, the survey was sent out to an expert panel in the PSU IRBSON. The members of the panel included Dr. Barbara McClaskey, Dr. Anna Beth Gilmore, Dr. Tracy Stahl, and Ms. Cortney Neblett. The four members of the panel were chosen by the researcher based off simulation experience. The team was made up of instructional faculty members as well as simulation faculty and committee members. All four members of the panel approved the survey prior to use.

Implications for Future Projects

The next step in practice improvement on this topic includes repeating this study in fourth semester nursing students. By the time students are in their last semester of nursing school they have been through the simulation lab many times for a variety of experiences. Students may not feel as overwhelmed or intimidated in a high-fidelity experience once they reach their senior semester.

This project can be replicated with a new group of students or repeated with the same group of students when they are seniors. The project can also be repeated at other nursing schools. This project could be utilized in hospital simulation centers as well. Any institution utilizing simulation can benefit from a study similar to this one. It is important to understand the preference of the user and the type of simulation preferred.

Implications for Education

The clinical significance of the project findings includes a student preference of low-fidelity simulation in the first semester of nursing school. Based off the satisfaction

survey students had the biggest concerns with time, anxiety, comfort level, and making mistakes while partaking in the high-fidelity simulation experience.

The suggested changes are aimed at pre-licensure BSN curriculum. Despite advances in technology within nursing simulation, there may be a place to for low-fidelity simulation in nursing education. Likely, low-fidelity simulation should take place in the first semester of nursing school and preferably in the first simulation experience. The low-fidelity simulation experience can serve as an introduction to simulation. Students will feel less anxious, less intimidated, and feel as if they are making fewer mistakes while using a low-fidelity simulator. An increased level of confidence going into the following simulation experiences throughout the program will benefit students greatly.

Conclusions

The overall purpose of the study was comparing student satisfaction level in high- and low-fidelity simulation using a student satisfaction survey. The project outcomes have contributed recommendations to nursing education curriculum. The recommendation is a need for a low-fidelity simulation experience in first semester nursing students. This DNP scholarly project showed a statistically significant difference in student satisfaction levels favoring low-fidelity simulation over high-fidelity simulation.

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