The Use of Simulation Strategies: An Experiential Approach toward Improving Academic Achievement

by

Melissa D. Duprey EdD., MSN, RN, CNE

Worcester State University
Phone 508-929-8419
Fax508-929-8168
486 Chandler St.
Worcester, MA 01602

1. **Background and Significance**

Nursing education, along with the practice of nursing, has undergone tremendous change in the past decade. Technological advancements are redefining traditional nursing pedagogy leading to changes in curriculum design, instructional delivery, and overall evaluation of teaching effectiveness (Jefferies, 2006). Many nursing programs continue to offer a curriculum that is inconsistent with the changing needs of today's healthcare environment. As technological advances continue to accelerate in the healthcare arena, nurse educators are faced with the challenge of competency, not only in the attainment of such, but also in the maintenance and advancement of professional competence (National Council of State Boards of Nursing, 2008).

A primary goal of nursing education is to prepare students to successfully pass a national standardized licensure exam and ultimately enter professional practice. As nursing students struggle to become competent health care providers, faculty seek to incorporate teaching strategies that emphasize a comprehensive approach toward patient care as a means of integrating skill sets, critical thinking, and academic achievement.

Research has established many benefits of simulation as related to clinical performance and skill acquisition, including the ability to isolate a specific skill, offer more complex scenarios, and further develop competency yet little is known regarding the impact upon academic achievement (Cannon-Diehl, 2009; Hodge, Martin, Tavernier, Perea-Ryan, & Alcala-Van Houten, 2009; Howard, Ross, Mitchell & Nelson, 2010; Kilgore, Goodwin, & Harding, 2013; Krautscheid, Kaakinen, & Warner (2008).

2. Research Design

This quasi-experimental study sought to quantify the impact, if any, of high-fidelity simulation on academic performance and perceived levels of clinical competence among students enrolled in a medical-surgical course during their fourth semester. Data consisting of four module exam scores were collected from two student groups. The control group received instruction via traditional teaching method of didactic lecture, and the experimental group received instruction via experiential-based teaching consisting of high-fidelity simulation scenarios, in addition to the traditional teaching method of didactic lecture. Each of the four modules presented included a prescribed high-fidelity simulation scenario developed by Laerdal Medical© and the National League for Nursing (2006). The only difference in teaching methods between the two groups was that the experimental group experienced simulated leaning activities in addition to didactic lecture, whereas the control group did not.

Participants in the experimental group also completed the Student Satisfaction and Self-Confidence in Learning survey (NLN, 2005) to determine the extent to whether high-fidelity patient simulators (HPS) were helpful in preparing for their clinical experience.

2.1 Selection of Participants

A nonrandomized, convenience sample of those enrolled in a medical-surgical course during the fourth semester, was used to establish participation in this study. The sample population was generated from course rosters. Participant selection was dependent upon the student's choice of registration. The sample population included a total of 50 enrolled students of which 29 full-time students were in the control group and 21 full-time students enrolled in the experimental group. Table 1 provides descriptive statistics of the sample population.

Table 1

Descriptive Statistics Summary of the Sample Populations

	Control Group *n* = 21		Experimental Group *n* = 29	
Variables	Frequency	Percent	Frequency	Percent
Gender				
Male	3	14.0	2	7.0
Female	18	86.0	27	93.0
Age				
18-24	3	14.0	8	28.0
25-39	12	57.0	18	62.0
40 and over	6	29.0	3	10.0
Marital Status				
Single	10	48.0	11	38.0
Married	8	38.0	15	52.0
Divorced	3	14.0	3	10.0
Employed				
No	5	24.0	8	28.0
Yes	16	76.0	21	72.0
Admission GPA				
3.0 or greater	6	29.0	21	72.0
2.9 or below	15	71.0	2	7.0

2.2 Ethical considerations

Informed consent was obtained from all participants. An introduction and explanation of the study was provided. Additionally, a research assistant not associated with the course, was responsible for collecting study consents and assigning alternative student numbers to allow for anonymity. Human subjects review approval was received from the university Institutional Review Board.

2.3 Data collection and Instruments

The instruments for the study included four module exams and the Student Satisfaction and Self-Confidence in Learning survey. The four module exams were used to determine whether a measureable difference in unit exam scores existed between students who participated in simulated learning using high-fidelity patient simulators (HPS) and those who were not exposed to that instructional strategy. Module exams consisted of 50 multiple-choice NCLEX-style questions. Questions were selected from established test banks developed by the publisher of the course text, and were the same for both the control group and the experimental group.

The Student Satisfaction and Self-Confidence in Learning survey was used to address student perception of high-fidelity patient simulators (HPS) as being helpful in preparing for the clinical experience. This five-point Likert scale survey was developed by the NLN in conjunction with Laerdal Medical and includes five items designed to measure student satisfaction with the simulation activity and eight items to measure self-confidence.

Four content modules included: immunological disorders, hematological disorders, cardiovascular disorders, and high-risk obstetric disorders. Following the completion of each module lecture, students participated in simulated events that coincided with the topic of study. Administration of the simulated scenarios and unit exams occurred over the course of a 16 week

semester. Content material was presented in the same order for both the control and experimental groups, each module receiving three hours of traditional lecture. Archival data from 21 nursing students in the control group was compared to data collected from 29 nursing students from the experimental group. The experimental group participated in four clinical scenarios using simulated learning activities that corresponded with their unit of study. Each simulation lasted approximately 30 minutes during which time students participated in predetermined simulated events based upon their unit of study. Participants attended a period of debriefing immediately following each simulation. During this time they were able to view the video of their performance, ask questions, and gain faculty and peer feedback. Two days following the simulated event, students completed a scheduled 50 question multiple choice unit exam. All exams were immediately graded and entered into a computer database by the research assistant using randomly assigned student identification numbers as a means of protecting anonymity.

2.4 Data analysis

Statistical analysis was carried out using the Statistical Program for Social Sciences (SPSS) for Microsoft Windows (17.0) to provide functionality for data management/preparation, data analysis, and reporting. Independent-measures t-test was used to compare the four unit exam scores of the control and experimental groups. The data was analyzed to determine if a difference exists between the control and experiemental groups following the implementation of experiential learning into a traditional lecture format. To determine if high-fidelity simulation had an effect on student achievement scores, data was collected from two separate samples. The control group consisted of retrospective archival data from the previous semester which was as compared to the experimental group. The Student-Satisfaction and Self-Confidence in Learning

survey was used to address student perception of high-fidelity patient simulators (HPS) as being helpful in preparing for the clinical experience. Respondents' answers were analyzed using descriptive statistics to identify mean differences between the variables and individual respondent scores.

3.0 **Results**

The results of this study were mixed as two of the four modules supported the hypothesis that the incorporation of experiential-based teaching strategies in the form of high-fidelity simulation was significant in affecting student achievement based on the measurement of module exam scores. Results are presented in Table 2 and Table 3.

Table 2

Group Statistics of Module Exam Scores

	Groups	N	Mean	SD
Immunological Disorders Module Exam	Control	21	82.67	7.857
	Experimental	29	82.21	7.098
Hematological Disorders Module Exam	Control	21	74.19	9.485
	Experimental	29	75.59	11.617
Cardiovascular Disorders Module Exam	Control	21	75.33	8.254
	Experimental	29	85.38	10.283
High-Risk Obstetrics Module Exam	Control	21	80.76	9.949
	Experimental	29	88.00	6.949

Table 3

Summary of Independent Sample t-Tests

Module Exam	t	df	p-value
Immunological Disorders Module Exam	.216	48	.830
Hematological Disorders Module Exam	-.452	48	.653
Cardiovascular Disorders Module Exam	-3.694	48	**.001***
High Risk Obstetrics Module Exam	-3.032	48	**.004***

Note. This table represents the statistical significance of the four module exams that were administered in chronological order during the semester and tested using the independent samples t-test.
*$p < 0.05$

The Student Satisfaction and Self-Confidence in Learning survey indicated participant satisfaction with the use of high-fidelity simulation. Based on participant responses, the data revealed that 93% of the sample agreed that the teaching methods used in the simulations were helpful and effective and 100% agreed that the simulation provided a variety of learning materials and activities which promoted learning of the curriculum.

Furthermore, these findings indicate that students in the experimental group perceived high-fidelity simulations as being helpful in the areas of content knowledge, skill acquisition, and ease of transition into actual clinical settings, thereby supporting current research (Ulrich, et al. 2010; Wagner, Bear, & Sander, 2009; Yuan, Williams,& Fang, 2012). Results are presented in Table 4.

Table 4

Student Satisfaction and Self-Confidence in Learning Survey results

Satisfaction with Current Learning	*M*
1. The teaching methods used in this simulation were helpful and effective.	4.3793
2. The simulation provided me with a variety of learning materials and activities to promote my learning the medical surgical curriculum.	4.4828
3. I enjoyed how my instructor taught the simulation.	4.2759
4. The teaching materials used in this simulation were motivating and helped me to learn.	4.4483
5. The way my instructor(s) taught the simulation was suitable to the way I learn.	4.2759
Self-Confidence in Learning	
6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	4.2414
7. I am confident that this simulation covered critical content necessary for the mastery of medical surgical curriculum.	4.4483
8. I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting.	4.2414
9. My instructors used helpful resources to teach the simulation.	4.3793
10. It is my responsibility as the student to learn what I need to know from the simulation activity.	4.5517
11. I know how to get help when I do not understand the concepts covered in the simulation.	4.5172
12. I know how to use simulation activities to learn critical aspects of these skills.	4.5172
13. It is the instructor's responsibility to tell me what I need to learn of	4.1379

the simulation activity content during class time.	
Mean of questions 1-5	*M* = 4.37
Mean of questions 6-13	*M* = 4.38
Overall mean	*M* = 4.38

[1]Likert scale: 1 = *strongly disagree*, 5 = *strongly agree*

4.0 **Discussion**

Research supports the premise that simulation enhances skill acquisition and student's level of self-confidence, yet there remains a gap in nursing education research addressing the impact of high-fidelity simulation on student achievement in terms of actual exam scores. Although only two of the four modules were proven to be statistically significant, it was interesting to see that there was a progressive increase in the mean average of the module exams throughout the duration of the study. This finding alone strongly indicates the need for early introduction and consistent use of simulated learning activities.

While the literature reveals a significant need for transformation and restructuring of nursing curricula, this process continues to be slow. Traditional teacher-centered methods of the past are no longer sufficient in preparing students to work in complex clinical settings, thus calling for reform in nursing education. Rather than embracing innovation within the classroom, many educators continue to be content driven, debating the need for updates and change rather than the actual implementation of such change. The demand for quality education directs academic endeavors towards ensuring safe, competent, and knowledgeable graduates. Nursing education continues to strive towards the development of best practice methods in attempts to bridge the gap between theoretical knowledge and clinical practice. While simulation has the ability to enrich the clinical experience by targeting a specific diagnosis or problem that may not

be available in the acute care setting, many nurse educators continue to examine the value of simulations and the impact upon achievement both clinically and academically (Scherer, Bruce, Graves, & Erdley, 2003).

5.0 **Conclusion**

The results of this study reveal a need for further investigation in the incorporation of high-fidelity simulation into traditional nursing pedagogy as a means of improving academic achievement. As educators continue to integrate simulated learning, there becomes a greater need to develop standardized methods of instruction using high-fidelity simulation in order to better determine the student's ability to correlate theoretical content with clinical practice. In doing so, graduates become better prepared to enter highly diverse and increasingly complex healthcare systems. Considering the rapid technological advances occurring in society and the global context in which students function, there has never been a more appropriate time for faculty to incorporate experiential-based teaching pedagogy.

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