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# HIGH FIDELITY SIMULATION: EXPERIENTIAL VERSUS OBSERVATIONAL LEARNING

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## ABSTRACT

Simulation is an ideal method for engaging kinesthetic learners because of its ability to increase nursing knowledge, provide opportunity to practice nursing skills and develop critical thinking. Simulation is thought to provide a smooth transition to "real-life" nursing. The use of simulation allows a safe and virtually risk free atmosphere for students to learn, practice, and perform competencies. This quantitative study differentiates types of high-fidelity simulation through use of a Likert-style survey. The High Fidelity Simulation Comparison tool, an instrument to measure differences in observational and experiential high-fidelity simulation experiences was developed, validated, and found to be reliable. The review of literature and results of the survey support the use of simulation in Millennial generation learners with kinesthetic learning preferences. This sample is representative of current and upcoming traditional undergraduate students. Findings from this study show that experiential high fidelity simulation is ranked higher by students when compared to observational in helping them to grasp skills, increase critical thinking, learn from their mistakes and increase clinical performance. This paper provides support for the use of moderate and high fidelity simulation as an effective best practice method for the kinesthetic learner. Findings from the study could impact future educational learning activities and budgetary requests for additional equipment and space.

**Keywords:** Simulation, kinesthetic learner, research, experiential, observational.

## INTRODUCTION

The use of simulation has been shown to provide a smoother transition to "real-life" nursing. Simulation is an ideal method for engaging kinesthetic learners because of its ability to increase nursing knowledge and provide opportunity to practice nursing skills and develop critical thinking that is essential for nursing practice (Vivien, Tham, Lau, Mei & Kiat, 2010). Initially, nursing schools utilized low-fidelity simulation for students to practice crucial nursing skills. Over time nursing schools have moved into the realm of moderate and high fidelity simulation. This type of simulation better meets the primary goal of simulation which is to engage the learner into a situation that seems real to life (Gates, Parr & Hughen, 2012; Schlairet, 2011; Vivien et al., 2010). Simulation is a natural fit to nursing education because it provides a safe and risk free environment in which competencies can be achieved and assessed (Decker, Sportsman, Puetz & Billings, 2008).

Within the last 15 years, nursing education has been involved in a movement encouraging increased use of simulation as a means to meet nursing student learning outcomes (Gates et

al., 2012; Schlairet, 2011). Various levels of fidelity (low, moderate, high) can be used in simulation experiences. Simulation is demonstrated through computer-based simulation, skill trainers, and full scale simulation that may involve the use of high fidelity manikins or real life role playing also known as standardized patients (Gates et al., 2012; Vivien et al., 2010).

## LITERATURE REVIEW

Simulation is appropriate across multiple generations in the current workforce as simulation engages many learning styles. While simulation may come easier to the Millennial or Net generation (those born between 1982 and 2002) experiences can be modified to engage Baby Boomers (born between 1943 to 1960) and Generation Xers (born between 1961-1981) by focusing or tailoring the experience to the needs of those specific learners (Notarianni, Curry-Lourenco, Barham, & Palmer, 2009). Both independent and social learners have shown satisfaction with high-fidelity simulation learning experiences (Vivien et al., 2010; Fountain & Alfred, 2009).

Learners in today's educational institutions are categorized as multimodal, with a high percentage considered kinesthetic learners preferring to be actively involved in the learning process (Autry & Berge, 2011; Meehan-Andrews, 2009; Alkhasawneh, Mrayyan, Docherty, Alashram & Yousef, 2008). There is an increased need for kinesthetic or hands on learning experiences in order to better prepare nursing students for their role as registered nurses in clinical settings. Of interest, identified literature fails to recognize the difference between varying types of high fidelity simulation. While "hands on" learning opportunities are well-received by nursing students, not all high-fidelity simulation experiences are the same. This research seeks to differentiate observational (OHFS) and experiential high fidelity simulation (EHFS) experiences.

### Framework

Howard Gardner (1993, 1999) proposed the theory of multiple intelligences (MI). The theory of MI proposes people learn through various means. This theory consists of seven methods: (a) linguistic, (b) logical/mathematical, (c) spatial, (d) bodily/kinesthetic, (e) musical, (f) interpersonal, and (g) intrapersonal and naturalist (Gardner, 1999). The bodily/kinesthetic learner prefers to be actively or directly involved in the learning process. Research has demonstrated kinesthetic learners perform better in clinical and lab experiences in comparison to the didactic (classroom) environment (Noble, Miller & Heckman, 2008). Bodily/kinesthetic intelligence learners are able to engage in the learning of new content through the use of the senses such as touching, moving, dramatization, and role play. Movement and active engagement has produced positive academic outcomes as evidenced by improvement of examination scores and increased critical thinking abilities (Schlairet, 2011). Medical and health science students prefer kinesthetic learning activities like simulation over classroom lectures (Meehan-Andrews, 2009; Carnegie, 2008). This study will use the theory of MI (Gardner, 1999) as a framework for the use of such modalities in nursing students. Literature reveals that students are seeking kinesthetic learning activities that increase hands on experiences and increase the ability to retain and fully comprehend content that may not always be so easily mastered by the kinesthetic learner (Pilcher, 2011; Schlairet, 2011; O'Bryne, Patry & Carnegie, 2008). The theory of MI (Gardner, 1999) was chosen because of its varying components. While literature has shown that many nursing students are kinesthetic learners, MI offers that there are other learning modalities to consider, such as

observational experiences. While this study seeks to differentiate the two types of high fidelity experiences, one might consider the learning style that each represents.

## METHODOLOGY

### Human Subject Review

This study received approval from the Institutional Review Board (IRB) of the university for which the research is being conducted. Information regarding the study was given to the subjects prior to the survey. Return of a completed survey denoted informed consent as the IRB did not allow for signatures to be collected on the informed consent form. Since one of the primary investigators was lead faculty in one of the two courses surveyed, other members of the research team surveyed subjects in that course to eliminate any possible coercion.

### Research Question

The following research question was posed: Is there a difference in OHFS and EHFS to undergraduate nursing students? This question was significant to the researchers because many academic institutions are logistically and/or financially limited by experiences that can be presented to students. Since both experiences were being offered, the researchers wanted to explore any differences in the learning activities. The findings could impact future experiences as well as budgetary requests for additional equipment.

### Methods

For purposes of this research study, OHFS experiences were those in which the students were not able to actively engage in providing direct care to the simulated patients. For example, students may have been asked what medication they felt needed to be administered and then the facilitator administered the medication to the simulator through computer software. This experience was held in a large simulation laboratory in a health care facility with nursing faculty observing the students and the simulation laboratory staff engaging in the scenario. At least one clinical group (n=8+) at a time was engaged in the experience.

Conversely, EHFS simulation experiences involved direct “hands on” care delivered by a group of students. The group sizes were smaller and ranged from 3-5 students at a time. These experiences were conducted in a smaller simulation laboratory with nursing faculty serving as a participant in the simulation experience in the role of the primary health care provider (PHCP). Students were required to serve as the nursing team for this scenario. They initiated intravenous therapy, provided medications, assisted with elimination by providing bed pans and catheter insertion, and communicated with the PHCP and simulated family members.

Prior to this study, no instrument was identified that specifically acknowledged differences between OHFS and EHFS. A survey instrument was developed with formal measurements for measuring differences in these types of simulation experiences. Items for the survey were developed based on these two types of experiences; thus, there were two different parts to the survey.

The items found in the survey were subjected to expert reviews to ensure the subject matter was comprehensively covered and the content was clear to the reader. Expert reviewers (N=5) were nursing faculty members who were familiar with both observational and

experiential high fidelity simulation. The first part of the survey dealt with the observational experience while the second part concerned with the experiential experience. The questions incorporated into the survey reflected the simulation experiences.

**Description of the Sample**

There were 121 students enrolled in second and third semester courses during data collection. Ninety-eight students participated in data collection. Of those, 69 (70.4%) were enrolled in second semester, while 29 (29.5%) were enrolled in third semester. Demographic data were unable to be collected due to IRB restrictions. However, both groups of students were predominately Caucasian and female, with ages ranging from 20-34 among second semester students and 21-39 for third semester students. The demographics of this sample reflect that the majority of these students were from the Net or Millenial generation (Notarianni et al., 2009). The sample was aggregated based on semester in the BSN program (second semester student occurrences [n = 138] and third semester student occurrences [n = 58]).

**Data Collection**

It is important to note that both students in the second semester course and third semester course experienced both types of simulation experiences. The OHFS experience occurred during the first semester (fundamentals) course with the EHFS occurring during the second semester (Adult Health I) course. Third semester students were chosen to participate in the survey because they had no other simulation experience since second semester at the time of data collection. These students had not experienced simulation since successful completion of the previous course. All second semester students were surveyed at the end of the semester after completion of both experiences.

After the purpose of the study was explained to all students and an informed consent form was presented to all students present in class, the students had the opportunity to participate in the survey. Definitions of the type of experiences were given to the students prior to the administration of the surveys. First, the observational portion of the survey was administered. The students were instructed to “bubble-in” the corresponding circle on the Scantron that represented their response to each item. Once all of the surveys had been returned, the same procedure was conducted for the experiential portion. Both surveys asked students the same questions.

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**RESULTS**

Data were analyzed using IBM SPSS version 21.0.

**Descriptive Statistics**

The survey questions that were found to be significantly different by second and third semester students are shown in Table 1. These questions included (a) Allowed ability to grasp skills not learned in clinical, (b) Grading criteria was specific of what was expected,

(c) Facilitators allowed me to ask questions & increase critical thinking and (d) Simulation will increase my performance in reality clinical.

**Table 1.** *Frequencies of differences by question and semester (N = 138)*

| | 2nd Semester (*n* = 138) | | 3rd Semester (*n* = 58) | |
|---|---|---|---|---|
| Variables | *n* | % | *n* | % |
| Allowed ability to grasp skills not learned in clinical. | | | | |
| Strongly Agree-Agree | 82 | 59.4 | 44 | 75.9 |
| Neutral | 29 | 21.0 | 14 | 24.1 |
| Disagree-Strongly Disagree | 27 | 19.5 | 0 | 0 |
| Grading criteria was specific of what was expected. | | | | |
| Strongly Agree-Agree | 76 | 55.1 | 40 | 69.0 |
| Neutral | 42 | 30.4 | 18 | 31.0 |
| Disagree-Strongly Disagree | 20 | 14.5 | 0 | 0 |
| Facilitators allowed me to ask questions & increase critical thinking. | | | | |
| Strongly Agree-Agree | 69 | 50.0 | 37 | 63.8 |
| Neutral | 34 | 24.6 | 14 | 24.1 |
| Disagree-Strongly Disagree | 35 | 25.4 | 7 | 12.1 |
| Simulation will increase my performance in reality clinical. | | | | |
| Strongly Agree-Agree | 89 | 66.4 | 46 | 79.3 |
| Neutral | 32 | 23.9 | 10 | 17.2 |
| Disagree-Strongly Disagree | 13 | 9.7 | 2 | 3.4 |

The survey questions that were found to be significantly different by observational and experiential treatments are shown in Table 2. These questions included (a) Allowed ability to grasp skills not learned in clinical, (b) Simulation allowed me to learn from my mistakes, (c) Grading criteria was specific of what was expected, and (d) Simulation will increase my performance in reality clinical.

**Table 2.** *Frequencies of differences by questions and treatment (N=196)*

| | Observational (*n* = 97) | | Experiential (*n* = 99) | |
|---|---|---|---|---|
| Variables | *n* | % | *n* | % |
| Allowed ability to grasp skills not learned in clinical. | | | | |
| Strongly Agree-Agree | 55 | 56.7 | 71 | 71.7 |
| Neutral | 24 | 24.7 | 19 | 19.2 |
| Disagree-Strongly Disagree | 18 | 18.6 | 9 | 9.1 |
| Simulation allowed me to learn from my mistakes. | | | | |
| Strongly Agree-Agree | 71 | 73.2 | 85 | 85.9 |
| Neutral | 15 | 15.5 | 9 | 9.1 |

| | | | | |
|---|---|---|---|---|
| Disagree-Strongly Disagree | 11 | 11.3 | 5 | 5.0 |
| Grading criteria was specific of what was expected. | | | | |
| Strongly Agree-Agree | 51 | 52.6 | 65 | 65.7 |
| Neutral | 35 | 36.1 | 25 | 25.3 |
| Disagree-Strongly Disagree | 11 | 11.3 | 9 | 9.1 |
| Simulation will increase my performance in reality clinical. | | | | |
| Strongly Agree-Agree | 56 | 62.9 | 73 | 77.7 |
| Neutral | 26 | 29.2 | 14 | 14.9 |
| Disagree-Strongly Disagree | 7 | 7.8 | 7 | 7.5 |

**Bivariate Statistics**

Mann-Whitney U tests were performed to analyze differences among groups using ordinal level Likert data. Significant differences by survey question and semester enrolled in the BSN program are shown in Table 3. Significant differences by survey question and treatment are shown in Table 4.

**Table 3.** *Significant differences by semester enrolled in BSN program* (*N* = 196)

| | | | Mann-Whitney *U* | |
|---|---|---|---|---|
| Variables | *n* | Mean Rank | *z* | *U* |
| Allowed ability to grasp skills not learned in clinical. | | | | |
| Second semester | 138 | 105.96 | -2.974 | 2973.00* |
| Third semester | 58 | 80.76 | | |
| Grading criteria was specific of what was expected. | | | | |
| Second semester | 138 | 104.59 | -2.425 | 3711.50** |
| Third semester | 58 | 84.02 | | |
| Facilitators allowed me to ask questions & increase critical thinking. | | | | |
| Second semester | 138 | 106.35 | -3.099 | 2918.50* |
| Third semester | 58 | 79.82 | | |
| Will increase my performance in reality clinical. | | | | |
| Second semester | 138 | 96.49 | -2.001 | 81.00** |
| Third semester | 58 | 79.71 | | |

* $p < .001$
** $p < .05$

**Table 4.** *Significant differences by treatment* (*N* = 196)

| | | | Mann-Whitney *U* | |
|---|---|---|---|---|
| Variables | *n* | Mean Rank | *z* | *U* |

| | | | | |
|---|---|---|---|---|
| Allowed ability to grasp skills not learned in clinical. | | | | |
| Observation | 97 | 106.93 | -2.517 | 3984.00* |
| Experiential | 99 | 90.24 | | |
| Simulation allowed me to learn from mistakes. | | | | |
| Observation | 97 | 106.94 | -2.208 | 3983.00* |
| Experiential | 99 | 90.23 | | |
| Grading criteria was specific of what was expected. | | | | |
| Observation | 97 | 106.39 | -2.016 | 4036.50* |
| Experiential | 99 | 90.77 | | |
| Will increase my performance in reality clinical. | | | | |
| Observation | 97 | 100.03 | -2.105 | 3468.00* |
| Experiential | 99 | 84.39 | | |

* $p < .05$

All students ranked that EHFS allowed them the ability to grasp skills that were not learned in clinical compared to OHFS. They also felt that EHFS allowed them to learn from their mistakes greater than OHFS. Facilitators allowing student questions leading to increased critical thinking was ranked higher in EHFS. Grading criteria that was provided prior to the experience in EHFS was specific to what was expected of the student. It was also noted that the students ranked EHFS as increasing reality clinical performance greater than OHFS. These four findings were significant at $p < .05$.

While the findings were significant among all students, the third semester students ranked EHFS greater than those in second semester. Third semester students ranked the ability to grasp skills not learned in clinical and facilitators allowing questions to be asked and increasing critical thinking were significant at $p < .001$. This finding may be attributed to the students having completed more reality experiences that those in the second semester cohorts. Grading criteria specific of expectation and increasing reality clinical performance were significant at $p < .05$.

The High Fidelity Simulation Comparison tool was found to be reliable (10 items; Cronbach's $\alpha$=.812) (Portney & Watkins, 2009).

## DISCUSSION

This review of literature and results of the survey support the use of simulation in learners who are or have some level of kinesthetic learning preference. This is due to the congruency between the kinesthetic learner needs and attributes. The findings may be attributed to the kinesthetic preferences of the Net or Millennial generation represented by the sample (Boateng, 2011). However, this sample is representative of the current and upcoming traditional undergraduate population. The use of simulation in nursing education is increasing due to a need (a) to address the push to increase enrollment in nursing schools, (b) to maintain student retention through engagement, (c) to offer supplemental methods to limited

clinical opportunities and (d) to produce increased competencies of new graduate nurses entering into practice for a smoother transition and increased patient safety (Schlairet, 2011; Decker et al, 2008). Moderate and high fidelity simulation are supported by nursing and education research as an effective best practice method for the kinesthetic learner.

## LIMITATIONS

The inability to collect demographic data, other than the reported aggregate data, limited comparison of groups and the ability to make other linkages to the data. Therefore, the observational and experiential surveys were not able to be linked by person. The research was conducted at a single university with traditional college-aged students. The results may have been different if the generational make-up of the cohorts studied had been different. Also, the sample was predominantly Caucasian and female. Both of these variables could have an effect on the findings. Another confounding variable could be the addition of another facilitator in the EHFS experience for the second semester cohorts as changes in faculty occur. The facilitator in the EFHS experiences could not be controlled as there were no links to the individual students with the data. A variation in clinical experiences between the second and third semester students was present. Thus, timing may have influenced the survey results. In addition, there was a difference in the experiences in terms of faculty participation and group sizes. These factors could not be controlled by the researchers due to space limitations in the facilities. Standardizing the process for both groups would have allowed for greater control over the variables.

## CONCLUSIONS

Specifically, findings from this study show that EHFS is ranked higher by students when compared to OHFS in helping them to grasp skills, increase critical thinking, learn from their mistakes and increase clinical performance. Nurse educators need to be aware that there is a difference in the type of experiences in high-fidelity simulation. It is important to include "hands on" opportunities for students engaging in high-fidelity experiences. Literature supports the use of varying teaching methods for different generations. This study validates those findings among students in the Millenial or Net generation.

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