

EFFECTIVENESS OF ONLINE SIMULATION TRAINING:  
MEASURING FACULTY KNOWLEDGE, PERCEPTIONS, AND INTENTION TO ADOPT

(4589 words)

Sujeong Kim, MSN, RN;<sup>a</sup>

Chang Park, PhD, Assistant Research Professor;<sup>a</sup>

Jennifer O'Rourke, PhD, APN, Associate Dean of the Graduate Nursing Program<sup>b</sup>

<sup>a</sup> University of Illinois at Chicago College of Nursing

<sup>b</sup> Loyola University Chicago, Marcella Niehoff School of Nursing

Corresponding Author (Present Address):

Sujeong Kim, MSN, RN

College of Nursing, University of Illinois at Chicago

845 S. Damen Ave.

Chicago, IL 60302, U.S.A.

e-mail: [skim467@uic.edu](mailto:skim467@uic.edu)

phone: +1-312-718-4087

Funding: This work was supported by Council for Excellence in Teaching and Learning,  
Curriculum and Instructional Grants, the University of Illinois at Chicago, Chicago, IL.

## Abstract

**Background:** Best practice standards of simulation recommend standardized simulation training for nursing faculty. Online training may offer an effective and more widely available alternative to in-person training.

**Objectives:** Using the Theory of Planned Behavior, this study evaluated the effectiveness of an online simulation training program, examining faculty's foundational knowledge of simulation as well as perceptions and intention to adopt.

**Design:** One-group pretest-posttest design.

**Setting:** A Large school of nursing with a main campus and five regional campuses in the Midwestern United States.

**Participants:** Convenience sample of 52 faculty participants.

**Methods:** Knowledge of foundational simulation principles was measured by pre/post training module quizzes. Perceptions and the intention to adopt simulation were measured using the Faculty Attitudes and Intent to Use Related to the Human Patient Simulator questionnaire.

**Results:** There was a significant improvement in faculty knowledge before and after training and observable improvements in attitudes. Attitudes significantly influenced the intention to adopt simulation ( $B = 2.54, p < .001$ ).

**Conclusions:** Online simulation training provides an effective alternative for training large numbers of nursing faculty who seek to implement best practice of standards within their institutions.

**Keywords:** simulation, faculty training, perception, adoption, knowledge, online

## **Effectiveness of Online Simulation Training: Measuring Faculty Knowledge, Perceptions, and Intention to Adopt**

Over the last 15-20 years there has been a significant increase (1000%) in the number of nursing programs in the United States (U.S.) who have incorporated simulation into the curriculum. From 2002 to 2010, the number of nursing programs using simulation grew from 66 programs to 917 programs and it is anticipated that this number will continue to grow across all levels of nursing education (Hayden et al., 2014). The benefits of simulation, including safe deliberate practice, enhanced clinical reasoning, communication skills, and transfer to practice, warrant comprehensive integration of simulation into nursing education (Goodstone et al., 2013; Ricketts, 2011; Sanford, 2010; Shin et al., 2015).

The National League for Nursing (NLN) recommends that simulation be facilitated by adequate numbers of faculty who have received training and developed expertise in the pedagogy of simulation, as data support the relationship between effective faculty simulation training and better learning outcomes for students (Jeffries, 2005; Nguyen et al., 2011; Rizzolo et al., 2015). However, nursing faculty have identified barriers to adopting this new technology, including a lack of training, lack of time, and limited resources (Akhtar-Danesh et al., 2009; Blazeck, 2011; Davis et al., 2014; Jansen et al., 2009; Nguyen et al., 2011). Online simulation training provides a mechanism to train large numbers of nursing faculty who potentially might not otherwise have access to training. However, limited information is available about the effectiveness of online simulation training for faculty.

We sought to evaluate the effectiveness of an online simulation training program for nursing faculty by measuring changes in knowledge, perceptions, and intention to adopt simulation before and after training. The Theory of Planned Behavior (TPB) was used as a

guiding framework for the study (Ajzen, 1991). In accordance with the TPB, faculty members' perceptions, including attitudes, subjective norms, and perceived behavioral control, were evaluated as factors potentially influencing the intention to adopt simulation. The specific aims of this study were to:

*Aim 1.* Examine the effectiveness of online simulation training on faculty's foundational knowledge of simulation

*Aim 2.* Examine the effectiveness of online simulation training on faculty's perceptions of simulation, including attitudes, subjective norms, perceived behavioral control, and intention to adopt

### **BACKGROUND**

Simulation facilitates learning based on principles of repetitive practice, feedback, standardization of experiences, and minimization of patient safety risks (Durham and Alden, 2008). The National Council of State Boards of Nursing (NCSBN) study found that up to a 50% substitution of traditional clinical time with high-fidelity simulation yielded no significant differences in outcomes (Hayden et al., 2014). Important outcomes, including licensure pass rates, nursing knowledge, and perceived readiness to practice were similar in nursing students who spent 50%, 25% or no hours in high-fidelity simulation, as replacement for traditional clinical. The NCSBN study and several systematic reviews of simulation recommend that simulation outcomes are dependent on using best practice guidelines, including faculty simulation training (Cant and Cooper, 2010; Doolen et al., 2016).

The literature supports a lack of adequate faculty training and competence with simulation. For example, in a systematic review of faculty development for the use of high-fidelity simulation, a lack of faculty training was identified as key barrier to using high-fidelity

simulation in nursing (Nehring et al., 2013). In one study with 193 nursing faculty from all levels of nursing education, 70% of faculty identified themselves as novices or advanced beginners in the use of simulation and 69% reported the need for more comprehensive education (Nguyen et al., 2011). Similarly, 90% of faculty members (n = 20) at a nursing program in the United Kingdom were using simulation yet only 40% felt confident using simulation. Other studies have found that as few as 25% of faculty feel prepared to use simulation (Dowie and Phillips, 2011). Faculty who are new to simulation report feeling less motivated, unqualified, uncertain, less innovative, and not ready to use it in practice as compared to faculty who have received training and consider themselves experts (Duvall, 2012; Harder et al., 2013).

A majority of faculty continue to learn about simulation through trial and error, training from mannequin suppliers, through reading the literature, and more positively, increasingly through formal workshops either in-person or online (Anderson et al., 2012). Several simulation programs in the U.S. provide simulation training for nursing faculty, but the high cost, access and time intensive nature for in-person training are barriers for schools of nursing who seek to train more than a few faculty. For example, the Center for Medical Simulation at Harvard offers a 5 day in-person comprehensive instructor workshop at a cost of over 5000 U.S. dollars per person. For faculty seeking in-person training without travel, the Center does offer host site training around the world but the cost is significant. As an alternative to in-person training, the NLN offers 17 e-learning courses that can be paid for by an individual or institution at a reasonable price but no evaluation data about program outcomes was found in the literature.

Despite an increasing number of simulation training options, little is known about the effectiveness of them. In one study, nursing faculty (n=11) who completed a simulation training program reported feeling more comfortable after simulation training but faculty attitudes were

not found to change after training nor was their intent to use simulation after training (Jones et al., 2013). In contrast, faculty attitudes (n = 15) towards the use and value of simulation were found to increase following an educational intervention and this was highly predictive of their reported intent to use simulation with future students (King et al., 2008). Understanding faculty perceptions of simulation and how this in turn influences their intention to use or not use simulation have importance in understanding how to engage, train and support faculty.

In summary, although there is consistency with the need for faculty simulation training, barriers such as the high cost and time intensive nature of the programs, limit the ability of many faculty and schools of nursing from participating (Nehring et al., 2013). Training faculty using online methods is convenient and time-flexible and may overcome the access issue, at a minimum (Cook and Steinert, 2013). A clear lack of simulation training program evaluation, beyond just examining faculty satisfaction further adds to the challenge (Berkowitz et al., 2011). The purpose of this study is to evaluate the effectiveness of an online simulation program, examining faculty's foundational knowledge of simulation as well as perceptions and intention to use, before and after training.

### **Theoretical framework**

Based on theories of learning outcomes (Kraiger et al., 1993), effective faculty training can be evaluated by measuring changes in cognitive, behavioral, and affective aspects. In particular, cognition can be assessed by measuring changes in knowledge and strategies, behavior can be assessed by examining if there is a gain in a new skill or improvement, and affective can be assessed by evaluating improved motivation and self-efficacy (Salas et al., 2012).

In this study, the TPB was used as a guiding framework to measure faculty outcomes related to an online simulation training program. The TPB hypothesizes that intention is influenced

by one's attitude, subjective norms, and perceived behavioral control (Ajzen, 1991). Using simulation as an example, the intention to adopt simulation into teaching can be influenced by attitudes, such as their comfort level with, competence with, and valuation of simulation. In addition, the framework suggests that faculty norms, such as the perception that simulation is supported by peers or administrators, can influence the intention to adopt simulation. A third concept of the TPB, perceived behavioral control, suggests that faculty perceptions of the ease of using simulation, training, and time associated with use may lead to the intention or lack of intention to adopt.

The Faculty Attitudes and Intent to Use Related to the Human Patient Simulator instrument was developed in 2008 using the TPB framework (King et al., 2008). The instrument evaluates faculty attitudes, subjective norms, perceived behavioral controls, and the influence on behavioral intention to use simulation. Although outcomes from two studies, where the tool was utilized, had mixed results, the authors recommended continuing to examine faculty perceptions and intention within the context of educational simulation preparation for faculty.

## **METHODS**

### **Design and sample**

A one-group pretest-posttest design was used to measure the effects of an online simulation training program on faculty's knowledge, perceptions, and intention to adopt simulation and differences in the influence of perceptions on faculty's intention to use simulation. All clinical faculty members of a Midwest college of nursing in the U.S. (which includes a main campus and five regional campuses) were invited to participate. The sample was a convenience sample of nursing faculty. The school of nursing was actively increasing the use of simulation across both the undergraduate and graduate program so any clinical faculty who

were actively teaching those students were invited to participate. Research active faculty were not asked to participate in this study although they were given access to the training if they choose to participate.

Of the 60 clinical faculty members invited to participate, 52 fully completed the pre-assessment survey measuring perceptions and intention however only 27 completed the post-assessment survey and are included in the final post-group analysis.

### **Instruments**

We used pre/post module quizzes and a 24-item survey to measure faculty's knowledge, perception, and intention to adopt simulation. Module quizzes (ranging from 4 to 8 items per module) were used to measure faculty members' foundational simulation knowledge before and after each of four online training modules. Quizzes were multiple choice items developed by the study investigator in collaboration with a simulation healthcare educator on faculty. Questions were developed directly from module pre-readings and the module presentations and items were designed to capture the most important components of each topic. In order to minimize a testing effect with pre/post-test quizzes, items were reverse modified (i.e., changed from "which of the following" at pre-test to "all of the following except" at post-test).

Perceptions and intention to adopt simulation were measured using the Faculty Attitudes and Intent to Use Related to the Human Patient Simulator (Jones et al., 2013; King et al., 2008). Permission to use the instrument was obtained through email communication (April 30, 2015 from Dr. Fahrenwald). The instrument is a 24-item questionnaire that includes 8 attitude items, 6 subjective norm items, 8 perceived behavioral control items, and 2 intention items (King et al., 2008). Each item is measured using a 5-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Higher scores indicate more positive perceptions and intention to adopt. In

prior studies, the internal consistency of the 24-item instrument, using Cronbach's alpha, in small samples of 11 and 15 faculty respectively, ranged from .56 to .82.

Based on applicability to the current study, the original instrument was modified to form a 21-item questionnaire. Two external faculty colleagues reviewed the instrument in collaboration with the principal investigator. With agreement across all three faculty, we removed one item from the Attitudes scale, "I feel comfortable using different instructional technologies, such as PowerPoint" as we felt this item was not necessary relevant to all nursing faculty and might bias the response. We removed one item from the Perceived Behavioral Control Measure, "It is important that the time it takes to become proficient using a particular teaching strategy does not exceed its educational effectiveness" because there was a similarly worded item in the instrument and on initial review faculty colleagues skipped this item as they felt it was a repeat. For this same reason, we removed one Behavioral Intention item because there was significant overlap between the two items on the original tool. Cronbach alpha testing of the revised tool as compared to the original tool is included in the results.

### **Intervention**

The online simulation training program is detailed in Table 1. Each module included a pre-test knowledge quiz, learning objectives, 3-5 readings, a 60-90 minute voice-over presentation with video snippets and images and a post-test knowledge quiz. The presentation was developed using multiple resources, including the INACLS standards, NLN guidelines, Society for Simulation in Healthcare, Laerdal Medical, and articles from an extensive literature review. Each of the modules was developed by the primary author and then was reviewed and critiqued by two simulation specialists who have certification training as simulation educators and had previously taken the NLN simulation courses.

## **Procedures**

Faculty participants were given access to the online modules during Fall 2015 and Spring 2016. All participants were consented and then directed to complete the Faculty Attitudes and Intent to Use Related to the Human Patient Simulator survey. Participants were given access to the four online modules which were housed on a web-based platform (BlackBoard).

Participants were able to complete the modules on their own time but in sequential order. After completing all four modules, participants were asked to complete the post-test Faculty Attitudes and Intent to Use Related to the Human Patient Simulator survey. Data were collected using the online quiz and survey functions of the Blackboard gradebook.

## **Ethical considerations**

Institutional Board Approval was obtained prior to data collection and the study was deemed exempt by the university board. Faculty names and pre/post-test scores were housed on a secure data system that only the primary author and secondary author had access to. Data was then downloaded into a statistical program without identifying information.

## **Data analysis**

The data collected were analyzed using the STATA 13.0 Windows program. To evaluate changes in participants' simulation knowledge, attitudes, subjective norms, perceived behavioral control, and intention of adoption, *t* tests were conducted between pre and post scores. To examine influence of attitudes, subjective norms, and perceived behavioral control on participants' intention to adopt simulation, multiple linear regressions were conducted.

Because the quizzes for the four program modules had different numbers of items, after the *t* tests, the participants' raw scores were converted to 100-unit scores to facilitate comparisons of all modules by dividing the number of correct answers by the total number of

quiz item in each module and multiplying the result by 100. In addition, participants' attitudes, subjective norms, and perceived behavioral control scores were converted into 100-unit scores by subtracting 1 from each original score and multiplying the result by 25. Correspondingly, the item scores for intention were converted by multiplying each original score by 10.

## **RESULTS**

Of the 52 participants who consented for the study, the mean number of teaching experience was 7.7 years. Fifty-eight percent reported having been exposed to some form of basic information on simulation through work and 48% had not previously used simulation in their teaching during the last year.

Cronbach alpha for the Faculty Attitudes and Intent to Use Related to the Human Patient Simulator was originally reported to be .76 for the Attitudes measure, .82 for the Subjective Norms measure, .49 for the Perceived Behavioral Control measure. Behavioral Intention was not determined due to low item count (Jones et al., 2013; King et al., 2008). In our study, Cronbach alpha for the modified instrument was .79 for the Attitudes measure, .81 for the Subjective Norms measure, and .28 for the Perceived Behavioral Control measure.

### **Changes in knowledge**

Changes in faculty knowledge were assessed using knowledge pre- and post-module quiz scores. Mean scores at pre-test across each of the modules ranged from 0-70 on a 100-unit range. Statistically significant differences between pre- and post-training knowledge were identified for all four modules as shown in Figure 1. Based on 100-unit scores, the most substantial knowledge improvement was found for the debriefing module (30.39,  $p < .001$ ), followed by the introduction (27.82,  $p < .001$ ), evaluation (25.00,  $p < .001$ ), and simulation principles module (21.20,  $p < .001$ ).

### **Changes in perceptions and intention**

Changes in faculty perceptions were assessed by comparing their attitudes, subjective norms, and perceived behavioral control before and after the online simulation training program. As shown in table 2, differences in faculty perceptions between pretest and posttest were not statistically significant. However, for one item, “*I feel comfortable using high-fidelity simulation as a teaching tool*”, a significant difference was found pre/post testing ( $t=3.43, p=.001$ ). Although not statistically significant, based on 100-unit scores, an observable improvement in mean attitudes was found (4.75), as shown in figure 2. Differences in intention of adoption between pretest and posttest was not significant, but an observable improvement in mean score was found (3.40) after the online training.

### **Changes in influence of perceptions on intention**

As shown in table 3, at pretest, the variance to adopt simulation (measured 32%) could be influenced by attitudes, subjective norms, and perceived behavioral controls and was significant. Attitudes were found to significantly influence the intention to adopt simulation in the next academic year ( $B = 2.37, p < .001$ ). At posttest, 25% of the variance of the model could be influenced by attitudes, subjective norms, and perceived behavioral controls but this was not significant. However, attitudes remained a significant factor influencing participants’ intentions to adopt ( $B = 2.62, p = .03$ ). Following training, the intention to adopt simulation showed greater sensitivity to attitudes.

## **DISCUSSION**

We evaluated the effectiveness of an online simulation training program for nursing faculty by measuring their knowledge, perceptions, and intention of adopting simulation. Our findings were mixed. Knowledge was significantly increased across all modules from pre to post

testing. While this is an important finding, scores at post-test were lower than expected with no individuals exceeding more than 70% which is concerning since more than half of the faculty reported participating in prior simulation education. Post-test knowledge scores represent short term knowledge gain and it would be interesting to measure retention in future faculty training as a key evaluation outcome.

Changes in perceptions and intention to adopt did not significantly change after simulation training. This is comparable to a previous study (Jones et al., 2013). Similar to the previous study, we measured faculty outcomes before and after simulation training and our results mirrored their non-significant findings pre/post for the measures of attitudes, subjective norms, perceived behavioral control and intention to adopt. Further supporting the similarities between our study and the previous study are the mean scores across each measure. At pre-test we found mean scores of 4.01, 4.14, and 3.67 for attitudes, subjective norms and perceived behavioral control as compared to the prior study findings of 4.17, 4.45, and 3.78 respectively (Jones et al., 2013). These were consistent at post-test as well. For one item for the attitude measure, *I feel comfortable using high-fidelity simulation as a teaching tool*”, we found a significant difference from pre/post testing ( $t=3.43, p=.001$ ). This was also found in the 2013 study who reported a significance of  $p=.007$  for that one item despite the overall measure not showing significance.

Most significant was the finding that attitudes remained a significant factor influencing participants’ intention to adopt simulation ( $B = 2.62, p = .03$ ) and that following training, the intention to adopt simulation showed greater sensitivity to attitudes. This is an important area that should be further examined. Although simulation training itself may not immediately or significantly change faculty perceptions regarding simulation, perceptions do significantly

influence intentions and therefore may be the area where training and simulation initiatives may should be geared, even if not all of the variables can be influenced or changed. For example, some factors that comprise subjective norms, including opinions of college administrators, peers, and students, cannot be changed through simulation training or over a short period.

To examine the effectiveness of the training, we only evaluated short-term cognitive and behavioral outcomes of faculty learning. In future research, other concepts should be considered for measuring faculty's individual status (such as faculty competency, comfort level, and simulation implementation) or long-term educational outcomes (such as the number of simulations implemented, satisfaction of students, and students' educational achievement) to evaluate the effectiveness of the online faculty training program.

Despite non-significant findings from pre to post scores, we did find improvements across each of the areas which is similar to prior studies and at least warrants further investigation with larger samples of faculty using a stronger study design. As well, the overall benefits of having an online training program for educating large numbers of nursing faculty provides positive impacts, in terms of convenience, accessibility and cost effectiveness.

### **Limitations**

The sampling method and sample size in this study were major limitations. Although our sample was more than double prior studies, using a self-selected convenience sample could bias our outcomes. It may be that the 52 faculty who choose to participate in the initial study survey, had more favorable attitudes towards simulation to begin with. In future studies, it will be essential to utilize a significantly larger faculty sample across multiple sites and to compare faculty outcomes from online training program as compared to other modalities of training.

A second limitation is the longitudinal nature of the study period. Faculty could complete the training over an academic year but because the sample was not randomized, extraneous variables, such as reading the literature, observed simulations, or conference attendance, were not explored or controlled, the outcomes must be viewed with this lens.

In prior studies, the instrument used in this study was validated, with Cronbach's alpha ranging from .56 to .82 (King et al., 2008) and from .67 to .81 (Jones et al., 2013). In this study, the internal consistency was low for subjective norms at posttest (.43) and perceived behavioral control at pretest (.28). This can be assumed as a result of skewed distribution of the data and thus the subjective norms and perceived behavioral control interpretation must be viewed with this limitation.

### **CONCLUSION**

As schools of nursing move to integrating more simulation into the curriculum, it is important to better understand faculty perceptions and adoption behaviors with respect to simulation. This study provided insight into the effectiveness of an online simulation training program for faculty's knowledge, perceptions, and intention of adopting simulation in their curricula. Follow-up evaluation of the training program across a larger more heterogeneous sample will be necessary to determine if the training does make a significant difference in faculty knowledge and perceptions of simulation. As well, it will be important to examine faculty's perceptions and intention to use simulation, regardless of training, in order to understand best practices moving forward.

### **References**

- Ajzen, I., 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50(2), 179-211. [http://dx.doi.org/10.1016/0749-5978\(91\)90020-T](http://dx.doi.org/10.1016/0749-5978(91)90020-T).

- Akhtar-Danesh, N., Baxter, P., Valaitis, R.K., Stanyon, W., Sproul, S., 2009. Nurse faculty perceptions of simulation use in nursing education. *Western Journal of Nursing Research* 31(3), 312-329. <http://dx.doi.org/10.1177/0193945908328264>.
- Anderson, M., Bond, M.L., Holmes, T.L., Cason, C.L., 2012. Acquisition of simulation skills: Survey of users. *Clinical Simulation in Nursing* 8(2), e59-e65. <http://dx.doi.org/10.1016/j.ecns.2010.07.002>.
- Berkowitz, L.R., Peyre, S.E., Johnson, N.R., 2011. Mobilizing faculty for simulation. *Obstetrics & Gynecology* 118(1), 161-163. <http://dx.doi.org/10.1097/AOG.0b013e31821fd34d>.
- Blazeck, A., 2011. Simulation anxiety syndrome: Presentation and treatment. *Clinical Simulation in Nursing* 7(2), e57-e60. <http://dx.doi.org/10.1016/j.ecns.2010.05.002>.
- Cant, R.P., Cooper, S.J., 2010. Simulation -based learning  
*Journal of Advanced Nursing* 66(1), 3-15. <http://dx.doi.org/10.1111/j.1365-2648.2009.05240.x>.
- Cook, D.A., Steinert, Y., 2013. Online learning for faculty development: A review of the literature. *Medical Teacher* 35(11), 930-937. <http://dx.doi.org/10.3109/0142159X.2013.827328>.
- Davis, A.H., Kimble, L.P., Gunby, S.S., 2014. Nursing faculty use of high-fidelity human patient simulation in undergraduate nursing education: A mixed-methods study. *Journal of Nursing Education* 53(3), 142-150. <http://dx.doi.org/10.3928/01484834-20140219-02>.
- Doolen, J., Mariani, B., Atz, T., Horsley, T.L., Rourke, J.O., McAfee, K., Cross, C.L., 2016. High-fidelity simulation in undergraduate nursing education: A review of simulation reviews. *Clinical Simulation in Nursing* 12(7), 290-302. <http://dx.doi.org/10.1016/j.ecns.2016.01.009>.
- Dowie, I., Phillips, C., 2011. Supporting the lecturer to deliver high-fidelity simulation. *Nursing Standard* 25(49), 35-40. <http://dx.doi.org/10.7748/ns.25.49.35.s52>.
- Durham, C.F., Alden, K.R., 2008. Advances in patient safety: Enhancing patient safety in nursing education through patient simulation, in: Hughes, R.G. (Ed.), *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Agency for Healthcare Research and Quality (US), Rockville, MD.
- Duvall, J.J., 2012. Motivation and technological readiness in the use of high-fidelity simulation: A descriptive comparative study of nurse educators. *The University of Alabama, Ann Arbor*, p. 114.
- Goodstone, L., Goodstone, M.S., Cino, K., Glaser, C.A., Kupferman, K., Dember-Neal, T., 2013. Effect of simulation on the development of critical thinking in associate degree nursing students. *Nursing Education Perspectives* 34(3), 159-162.
- Harder, B.N., Ross, C.J.M., Paul, P., 2013. Instructor comfort level in high-fidelity simulation. *Nurse Education Today* 33(10), 1242-1245. <http://dx.doi.org/10.1016/j.nedt.2012.09.003>.
- Hayden, J.K., Smiley, R.A., Alexander, M., Kardong-Edgren, S., Jeffries, P.R., 2014. The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Nursing Regulation* 5(2), S1-S64. [http://dx.doi.org/10.1016/S2155-8256\(15\)30062-4](http://dx.doi.org/10.1016/S2155-8256(15)30062-4).
- Jansen, D.A., Johnson, N., Larson, G., Berry, C., Brenner, G.H., 2009. Nursing faculty perceptions of obstacles to utilizing manikin-based simulations and proposed solutions. *Clinical Simulation in Nursing* 5(1), e9-e16. <http://dx.doi.org/10.1016/j.ecns.2008.09.004>.
- Jeffries, P.R., 2005. A framework for designing, implementing, and evaluating simulations used

- as teaching strategies in nursing. *Nursing Education Perspectives* 26(2), 96-103.
- Jones, A.L., Fahrenwald, N., Ficek, A., 2013. Testing Ajzen's theory of planned behavior for faculty simulation development. *Clinical Simulation in Nursing* 9(6), e213-e218. <http://dx.doi.org/10.1016/j.ecns.2012.01.005>.
- King, C.J., Moseley, S., Hindenlang, B., Kuritz, P., 2008. Limited use of the human patient simulator by nurse faculty: An intervention program designed to increase use. *International Journal of Nursing Education Scholarship* 5(1), 12-17. <http://dx.doi.org/10.2202/1548-923X.1546>.
- Kraiger, K., Ford, J.K., Salas, E., 1993. Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation. *Journal of Applied Psychology* 78(2), 311-328. <http://dx.doi.org/10.1037//0021-9010.78.2.311>.
- Nehring, W.M., Wexler, T., Hughes, F., Greenwell, A., 2013. Faculty development for the use of high-fidelity patient simulation: A systematic review. *International Journal of Health Sciences Education* 1(1). <http://dc.etsu.edu/ijhse/vol1/iss1/4>
- Nguyen, D.N., Zierler, B., Nguyen, H.Q., 2011. A survey of nursing faculty needs for training in use of new technologies for education and practice. *Journal of Nursing Education* 50(4), 181-189. <http://dx.doi.org/10.3928/01484834-20101130-06>.
- Ricketts, B., 2011. The role of simulation for learning within pre-registration nursing education — A literature review. *Nurse Education Today* 31(7), 650-654. <http://dx.doi.org/10.1016/j.nedt.2010.10.029>.
- Rizzolo, M.A., Kardong-Edgren, S., Oermann, M.H., Jeffries, P.R., 2015. The National League for Nursing project to explore the use of simulation for high-stakes assessment: Process, outcomes, and recommendations. *Nursing Education Perspectives* 36(5), 299-303. <http://dx.doi.org/10.5480/15-1639>.
- Salas, E., Tannenbaum, S.I., Kraiger, K., Smith-Jentsch, K.A., 2012. The science of training and development in organizations: What matters in practice. *Psychological Science in the Public Interest* 13(2), 74-101. <http://dx.doi.org/10.1177/1529100612436661>.
- Sanford, P.G., 2010. Simulation in nursing education: A review of the research. *The Qualitative Report* 15(4), 1006-1011. <http://nsuworks.nova.edu/tqr/vol15/iss4/1>
- Shin, S., Park, J.-H., Kim, J.-H., 2015. Effectiveness of patient simulation in nursing education: meta-analysis. *Nurse Education Today* 35(1), 176-182. <http://dx.doi.org/10.1016/j.nedt.2014.09.009>.

Table 1

*Online Simulation Training Program*

Module Contents	Objectives	No. of Pre/Post Quiz Items
Module 1 Introduction	<ul style="list-style-type: none"><li>• Define simulation</li><li>• Explain simulation fidelity</li><li>• Describe modalities of simulation</li><li>• State advantages of simulation</li><li>• Briefly review the nursing simulation literature</li></ul>	7
Module 2: Principles of Simulation	<ul style="list-style-type: none"><li>• Provide an overview of learning theories used in simulation</li><li>• Describe guidelines for operating a simulation from start to finish</li><li>• Discuss common challenges that can occur in simulation</li></ul>	8
Module 3: Debriefing	<ul style="list-style-type: none"><li>• Identify the goals of debriefing</li><li>• Describe various debriefing approaches</li><li>• Compare/contrast examples of judgment</li><li>• Identify various approaches to debriefing</li><li>• Discuss considerations for performing a debriefing</li></ul>	6
Module 4: Simulation Evaluation	<ul style="list-style-type: none"><li>• Discuss literature on simulation evaluation</li><li>• Identify examples of simulation evaluation methods in nursing</li><li>• Discuss future considerations for simulation evaluation</li></ul>	4

Table 2

*Differences in Faculty's Attitudes, Subjective Norms, Perceived Behavioral Control, and Intention for Adoption between Pretest and Posttest*

Questions	Mean $\pm$ SD		<i>T</i> ( <i>p</i> )
	Pre ( <i>n</i> = 52)	Post ( <i>n</i> = 27)	
Attitudes	4.01 $\pm$ .58	4.20 $\pm$ .37	1.74 (.86)
Subjective Norms	4.14 $\pm$ .52	4.15 $\pm$ .37	.08 (.94)
Perceived Behavioral Control	3.67 $\pm$ .33	3.66 $\pm$ .45	-.15 (.88)
Intention of Adoption	8.14 $\pm$ 2.44	8.48 $\pm$ 2.16	.60 (.55)

Table 3

*Influence of Perceptions on Intention*

Variable	Pre (n = 52)					Post (n = 27)				
	B	$\beta$	p	R <sup>2</sup>	F(p)	B	$\beta$	p	R <sup>2</sup>	F(p)
Constant	-4.26		.28	0.32	7.22	-8.20		.24	0.25	2.32
Attitudes	2.37	.55	<.01		(<.001)	2.62	.45	.03		(.105)
SN	-0.13	-.03	.86			0.94	.17	.44		
PBC	0.92	.12	.35			0.46	.09	.67		

Note. SN = subjective norms; PBC = perceived behavioral control.

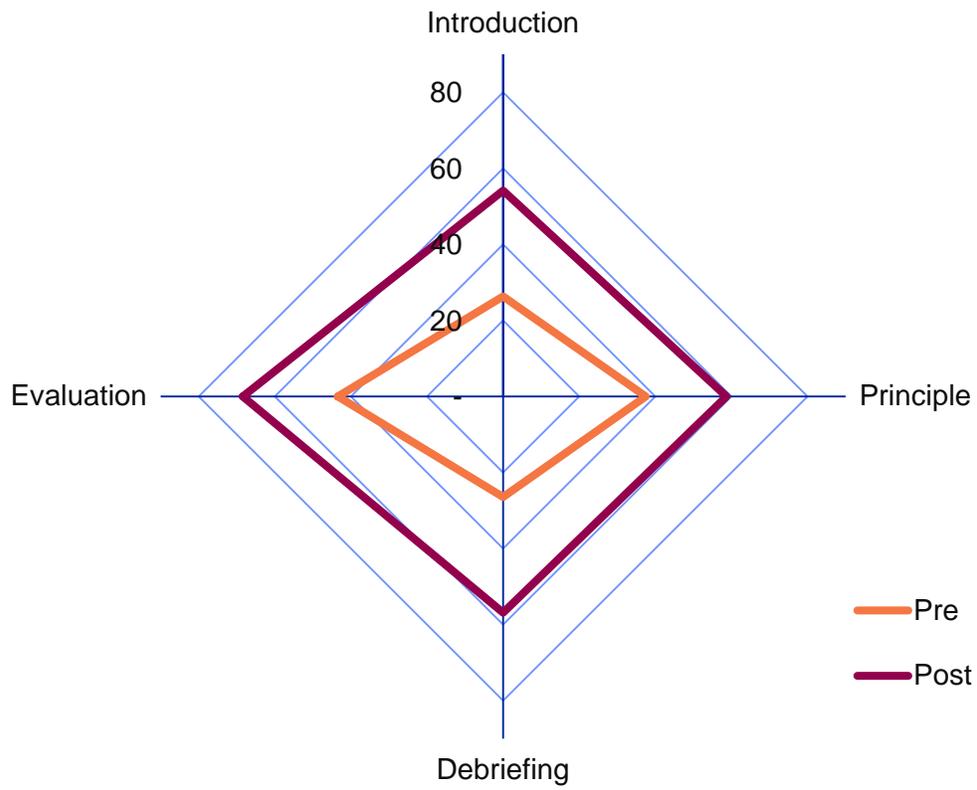


Figure 1. Changes in faculty knowledge on simulation.

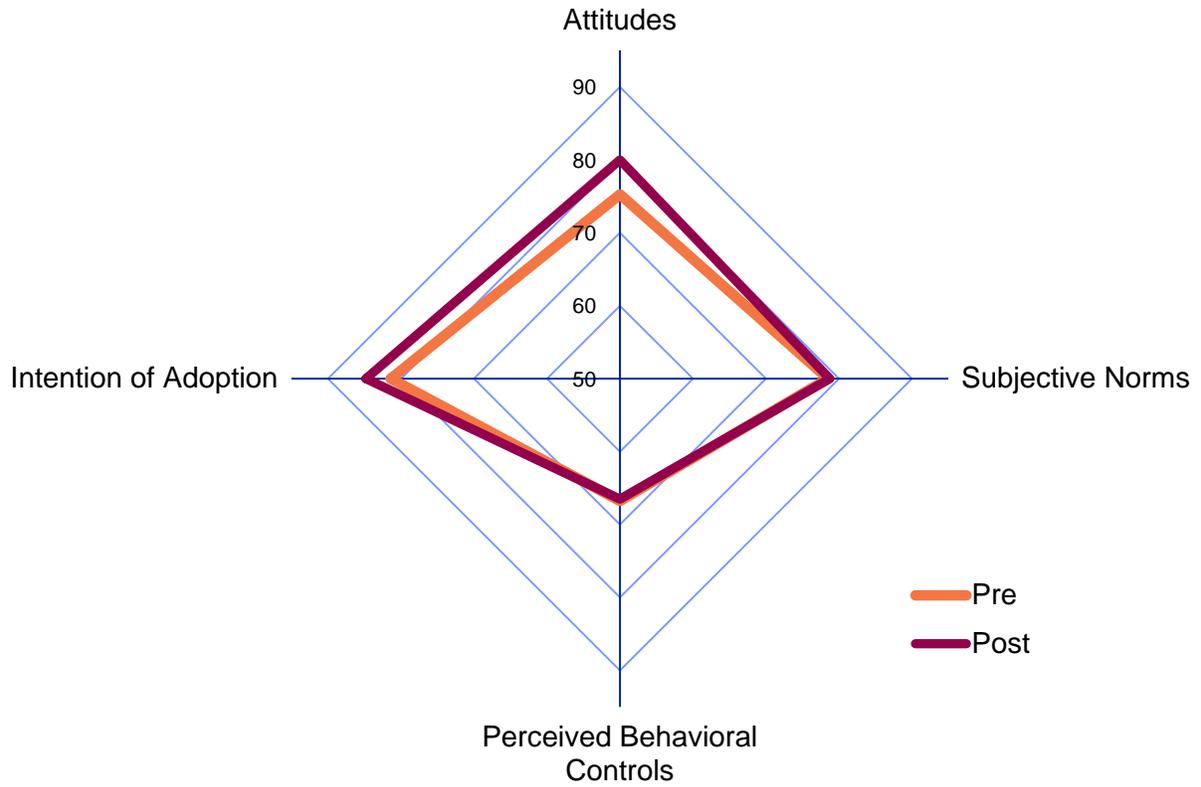


Figure 2. Changes in attitudes, subjective norms, perceived behavioral control, and intention to adopt simulation.