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SIMULATION DESIGN CHARACTERISTICS: PERSPECTIVES HELD BY NURSE EDUCATORS AND NURSING STUDENTS

by

Jane B. Paige

A Dissertation Submitted in

Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

in Nursing

at

The University of Wisconsin-Milwaukee

December 2013

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ABSTRACT
SIMULATION DESIGN CHARACTERISTICS: PERSPECTIVES HELD BY NURSE EDUCATORS AND NURSING STUDENTS

by

Jane B. Paige

The University of Wisconsin-Milwaukee, 2013
Under the Supervision of Professor Karen Morin

Simulation based learning (SBL) is pedagogical method poised to innovate nursing educational approaches. Yet, despite a growing body of research into SBL, limited investigation exists regarding assumptions and beliefs that underpin SBL pedagogy. Even though key simulation design characteristics exist, the particular methods nurse educators use to operationalize simulation design characteristics and how these choices are viewed from the perspective of nursing students is unknown. Without understanding what motivates educators to design simulations as they do, it is difficult to interpret the evidence that exists to support chosen methods. Through the exploration of perspectives (points-of-view), underlying beliefs can be uncovered. Educators readily share their points-of-view on simulation design both formally (in literature) and informally (ordinary conversations). These conversations portray the subjectivity surrounding simulation design and become a vehicle for exploration. The purpose of this study was to describe and compare nurse educators' and nursing students' perspectives about operationalizing design characteristics within educational simulations. The National League for Nursing-Jeffries Simulation Framework guided this study by identifying the interaction of teacher, student, and educational practices on the five design characteristics (objectives, student support, problem solving, fidelity, and debriefing). It was from this interaction that



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perspectives were investigated. A Q-methodological approach was employed to investigate the subjectivity inherent in perspectives. Derived from 392 opinions on simulation design, a 60-statement Q-sample was rank-ordered into a quasi-normal distribution grid by 44 nurse educators and 45 nursing students recruited from two national organizations. Factor analysis and participants' explanations for statement placement contributed to factor interpretation. Factor analysis revealed nurse educators share a common, overriding *Facilitate the Discovery* perspective about operationalizing simulation design. Two secondary bipolar factors revealed that even though educators share a common perspective, there exist aspects of simulation design held in opposition regarding student role assignment and how far to let students struggle including when and if to stop a simulation. Factor analysis revealed nursing students hold five distinct and uniquely personal perspectives labeled *Let Me Show You, Stand By Me, The Agony of Defeat, Let Me Think it Through,* and *I'm Engaging and So Should You*. Second-order factor analysis revealed nurse educators share similar aspects of thinking with four of the five nursing students' perspectives. Results suggest ongoing and sustained educational development along with time for nurse educators to reflect on and clarify their perspective about simulation design is essential. Educators need to emotionally prepare and support nursing students prior to and during simulation activities. Further educational research is needed on how operationalizing simulation design characteristics differ based on a SBL activity with either a formative or a summative purpose.



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**ACKNOWLEDGEMENTS**

This study was supported, in part, from a Sigma Theta Tau International - Eta Nu Chapter grant and a Harriet H. Werley Doctoral Student Research Award from the University of Wisconsin-Milwaukee College of Nursing. The National League of Nursing – Jeffries Simulation Framework (NLN-JSF) was the theoretical framework that guided this study and permission for its use was granted from the National League for Nursing New York, NY (Appendix A).

On a personal note, completing this journey across this tempestuous scholarship trail could not be possible without the support and encouragement of some very special individuals. I would like to express my gratitude to those who guided my on this passage. From the beginning, Dr. Karen Morin, as my committee chair, helped me develop my scholarship bringing what was contained in my mind to the written page. This perpetual writing process evolved and developed along the journey. Dr. Rachel Shiffman, Dr. Barbara Daley, Dr. Julia Snethen, and Dr. Suzie Kardong-Edgren, as committee members, offered me additional insight into the existing possibilities beyond this journey. With thanks, I recognize Dr. Steven Brown for his expert instruction and consult regarding Q-methodology. His constructive feedback on methodological techniques and insight into understanding the philosophical orientation of this unique research approach was greatly appreciated. I acknowledge Dr. Kardong-Edgren and Dr. Jeffrey Groom who served as domain experts. I also want to thank my colleagues who listened as I worked though ideas in my head and provided consistent encouragement.

Finally, was the understanding my family provided. They realized the time and focus I needed to make this journey and supported me along the way. I appreciated my



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children as they provided “we are so proud of you Mom” encouragements and my husband who understood the time commitment to complete this journey.



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# CHAPTER 1.0

## INTRODUCTION

Findings reported in the study spearheaded by the Carnegie Foundation for the Advancement of Teaching (Benner, Sutphen, Leonard, & Day, 2010) indicate nursing education programs are currently deficient in their preparation of nurses for the healthcare environment. This is not a new finding. In 2005, del Bueno concluded a crisis in critical thinking existed when 65 percent of nurse graduates did not meet entry work expectations for clinical judgment. Similar results were noted when the Joint Commission on Accreditation of Healthcare Organization (JCAHO) surveyed hospitals and noted low ratings in graduate nurses' ability to respond to emergency situations, supervise the care provided by others, and perform psychomotor skills (JCAHO, 2005). Despite these reports, educational processes to prepare nurses (theory plus supervised and apprenticeship clinical experiences) have essentially remained unchanged over the last 30 years, even as the healthcare environments new graduate nurses enter have significantly changed (Broome, 2009; Niederhauser, Macintyre, Garner, Teel, & Murray, 2010).

In order to address concerns identified in these reports, nursing education is called upon to transform its educational system in order to better prepare nurses for today's practice. This uniform message is heard from nursing scholars and educators (Benner et al., 2010; Cronenwett et al., 2007; NCSBN, 2010a; Stanley & Doughety, 2010; Tanner, 2010) and reiterated in the Institute of Medicine (IOM) report, *The Future of Nursing: Leading Change, Advancing Health* (Shalaha et al., 2010). In response to this challenge, efforts to develop and investigate new pedagogies in nursing education are occurring. Simulation based learning (SBL) is one of these pedagogical methods poised to innovate

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nursing educational approaches (Ironside & Jeffries, 2010; Jeffries, 2006; Kardong-Edgren, 2010a; McCallum, 2006; Nehring, 2008; Parker & Myrick, 2012). Simulation, borrowed from Gaba's (2004) frequently used definition is, "…a technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion" (p. i2). However, as with any new innovation, associated problems, issues, and concerns emerge. This chapter delineates issues left unattended or unresolved as SBL has emerged as an innovative pedagogy in nursing education. As a result, a study investigating simulation design as one of these unresolved issues was proposed along with its anticipated significance to the science of nursing education. The National League for Nursing-Jeffries Simulation Framework (NLN-JSF) (Jeffries, 2005) along with an expansion by this investigator served as the guiding framework for this study.

## Problem Statement

Historically, the idea of simulation as part of educational practices goes back decades, although only in the last ten years has educational research on this pedagogy seen increased attention (Gaba, 2011). In fact, research on SBL has struggled to keep up with the technological advances engineered by manikin and other educational products marketed by manufacturing companies (Dieckmann, Manser, Wehner, & Rall, 2007; Schiavenato, 2009). Furthermore, use of SBL in nursing education (as well as other healthcare disciplines) has escalated faster than the development and testing of the theoretical frameworks that provide conceptual clarity and pedagogical understanding for educators (Dieckmann et al., 2011; Harris, Eccles, Ward, & Whyte IV, 2013; Parker & Myrick, 2009; Parker & Myrick, 2012; Schiavenato, 2009; Walton, Chute, & Ball, 2011).

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This recent proliferation of SBL with "seemingly universal adoption" (Schiavenato, 2009, p. 388) in nursing education has occurred even as questions remain about educators' understanding of this teaching/learning strategy. Despite a growing body of research into SBL, there is limited investigation into the language, assumptions, principles, and underlying beliefs of SBL as a pedagogical method (Schiavenato, 2009; Walton et al., 2011). The problems this study investigated revolved around two major areas. First, lack of conceptual clarity in language used with SBL design and second, limited pedagogical[1] understanding regarding underlying beliefs and assumptions that influence educators' intentions and actions about design of SBL activities. Each of these problem areas is further delineated.

First, lack of conceptual clarity exists surrounding language explicating simulation design such as fidelity, realism, cueing, and student support (Dieckmann et al., 2011; Gosen & Washbush, 2004; Groom, Henderson, & Sittner, 2013; Jeffries, 2005; Rudolph, Simon, & Raemer, 2007; Schiavenato, 2009). As a result, conversations between educators, administrators, learners, and researchers occur without common understanding (Alinier, 2007; Beaubien & Baker, 2004). This leads to confusing, misleading, and even problematic design of SBL activities. For example, educators classify realism in SBL using a range in fidelity levels. However, questions remain about what are the dimensions of fidelity, what comprises the levels of fidelity, how much fidelity is necessary, as well as the cost efficacy in creating realism (Adams et al., 2008a; Adobor & Daneshfar, 2006; Beaubien & Baker, 2004; Dieckmann, Gaba, & Rall, 2007; Grant, McNeil, & Luo, 2008; Neill & Wotton, 2011; Salas, Wilson, Burke, & Priest,

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[1] For purposes of this study, pedagogy (study of teaching children) and andragogy (study of teaching adults) are considered together.

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2005; Waxman, 2010). Dieckmann and colleagues (2007) state, “right now, this [simulation design] is only by trial and error” (p. 191). Adding to this, conceptual clarity surrounding student support is lacking. Uncertainty exists regarding the type, degree, and format for offering student support during a SBL activity (Adams et al., 2008a; Adams et al., 2008b; Alessi, 2000a; Groom et al., 2013; Jeffries, 2005; Jeffries & Rodgers, 2007b). For example, cueing (type of student support) is minimally defined and described in the literature, although the terms ‘cueing or cue’ are heard in ordinary conversations and appear in written instructional directions and instruments evaluating SBL activities. Lack of clarity on how to design and deliver a cue can contribute to improper or misunderstood information received by the student and potentially result in false learning (Adams et al., 2008b; Clapper, 2011). In part, these issues arise due to definitional ambiguity in simulation design language. Without clarity in language, an idea that is represented when a given term is used can be misunderstood (Waltz, Strickland, & Lenz, 2010).

Second, pedagogical understanding of SBL as a new and evolving teaching/learning method has yet to be established. Pedagogical understanding is guided by the use of theoretical frameworks (Harris et al., 2013; Merriam, Caffarella, & Baumgartner, 2007), incorporation of educational and learning theories (Arwood & Kaakinen, 2009; Clapper, 2010; Kaakinen & Arwood, 2009; Parker & Myrick, 2009), and educators’ personal reflection on the actions, intentions, and epistemological beliefs that underlie teaching practices (Pratt, 1998; Reilly & Spratt, 2007; Walton et al., 2011). The following explicates where gaps remain.

Currently, a mixture of theoretical considerations (or what can be considered the beginnings of frameworks) regarding various aspects of SBL are emerging. However, it

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is during this period of theoretical development that educators proceed without the benefit of having clarity about the assumptions and principles that underpin SBL. This makes it difficult for educators to have a common frame of reference from which to design, conduct, and evaluate SBL activities (Dieckmann et al., 2011; Gobbi et al., 2012; Schiavenato, 2009). Theoretical guidance for SBL is scattered and obscured within the literature base. At this time, no systematic review of emerging theoretical frameworks or considerations for SBL has been undertaken.

Moreover, incorporation of educational and learning theories into SBL is an absent or unseen activity. This was evident when Kaakinen and Arwood (2009) evaluated 120 nursing simulation publications and found only 13% referenced a learning theory, concluding educators view simulation from a teaching perspective rather than a learning perspective. Likewise, Rourke and colleagues (2010) analyzed 47 nursing research SBL studies (including dissertations) and found only ten percent had adequate use of learning theory. Similar findings were reported in multidisciplinary consensus reports on simulation use in healthcare education (Nestel, Groom, Eikeland-Husebo, & O'Donnell, 2011). In an international survey of simulation use in nursing programs, less than half of nursing schools reported using a conceptual framework or theory for simulation practices (Gore, Van Gele, Ravert, & Mabire, 2012). Since the majority of nurse educators enter academia with a practice-driven education, they often lack a strong grounding in the field of education (Caputi, 2010; Stanley & Doughety, 2010). Therefore, providing educators an opportunity to gain knowledge in educational principles and theory plus time to reflect on these education practices and learning theories is crucial. Ferguson and Day (2005) express concern whether the science of nursing education is based on “reality or myth”

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(p. 107). In other words, are teaching practices based on what those before us have done or are they derived from evidence? Pratt (1998), a notable educational researcher, iterates it is false to assume only sufficient content knowledge and a predetermined set of instructional practices are all that are needed to be an effective teacher. Establishing an educational knowledge base that reflects the contemporary challenges of nursing education as well as providing efforts to assist nurse educators to develop and apply educational and learning theory to SBL has been less than ideal (Emerson & Records, 2008; Ironside, 2001; Taibi & Kardong-Edgren, 2013).

Thirdly, nurse educators need the opportunity to critically examine and reflect on their teaching/learning practices. A component of this critical examination, and a frequently overlooked activity, is the exploration of epistemological beliefs that underpin teaching/learning practices (Keskitalo, 2011; Paige & Smith, 2013; Pratt, Boll, & Collins, 2007; Rowbotham, 2010). Without understanding, what beliefs and attitudes motivate us (educators) to teach as we do, it is difficult to interpret the evidence that exists to support our chosen methods (Emerson & Records, 2008). Locating the time and energy to explore beliefs behind teaching and learning practices has not been a major focus in educational research (Emerson & Records, 2008; Pratt, Arseneau, & Collins, 2001; Pratt et al., 2007; Reilly & Spratt, 2007). This is a key factor driving the need for this study. In order to explore underlying beliefs, educators need time for reflection and collegial discussion of teaching and learning practices. Yet, as nurse educators (this researcher included), when we do reflect on our teaching practices, this investigator contends this level of reflection is directed more at our action and intent associated with teaching verses our underlying beliefs. Pratt (1998) calls the set of beliefs and intentions that direct

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our actions teaching perspectives. According to Pratt, gaining awareness of perspectives (individual and shared) held towards teaching and learning enhances pedagogical understanding. This collective understanding subsequently enhances collaborative efforts between educators. If this is not accomplished a potential misunderstanding or rejection of alternative perspectives of teaching may occur (Jarvis-Selinger, Collins, & Pratt, 2007) and any improvement in teaching will be difficult (Pratt, 1998).

As educators acquire knowledge about new technologies (such as SBL), time is needed to reflect on how these new teaching/learning strategies fit into current teaching perspective(s). In the case of SBL, without adequate time and reflection on why or how what we do works or does not work, nurse educators can potentially design and conduct simulations that are not ideal (Akhtar-Danesh, Baxter, Valaitis, Stanyon, & Sproul, 2009; Clapper, 2010; Clapper, 2011; Howard, Englert, Kameg, & Perozzi, 2009; Jones & Hegge, 2008; King, Moseley, Hindenlang, & Kuritz, 2008; Miller & Bull, 2013). For example, educators may focus energies on increasing the realism of a SBL activity (Beaubien & Baker, 2004) instead of applying sound pedagogical principles. If poorly designed SBL activities take place, the learner can leave with a false sense of learning or what Clapper (2010) calls a "confident incompetent" (p. e8). Laschinger and colleagues (2008) concur and caution educators that negative learning may occur if a SBL is less than ideally designed.

Equally important, pedagogical understanding of educational practices requires examination of student perspectives (Pratt, 1998). Little is known about the conceptual differences about teaching/learning strategies as held by the teacher and by the student (Lecouteur & Helfabbro, 2001). In a study exploring differences between college

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educators and students, Lecouteur and Helfabbro (2001) found very different views towards teaching and learning. They recommended exploring and scrutinizing attitudes towards teaching methods as a means to reduce frustration levels experienced by teachers and students if teaching methods do not go as intended.

It is important to recognize that when educators evaluate the learning experience, it is common practice to use student responses to evaluate and revise educational interventions. In a 2010 nationwide simulation survey conducted by the National Council of State Boards of Nursing (NCSBN), 72 percent of respondents reported use of students to evaluate the quality of simulation scenarios (Kardong-Edgren, Willhaus, Bennett, & Hayden, 2012). While students evaluate simulation activities, they are not qualified to determine whether a scenario is valid or based on existing evidence. In order to collect feedback, instruments are available for use by students to evaluate SBL activities (Jeffries & Rodgers, 2007a). In these instruments, students rate items that evaluate cueing, fidelity, and the support offered in SBL. However, it is unknown what conceptual understanding or perspective students use when making these evaluations. The utility of student evaluations becomes compromised if students are evaluating something different from what educators think they are evaluating.

In addition, educators should not assume that the student experienced the SBL activity in the manner intended (Dieckmann et al., 2007). Dieckmann (2009) provided the following example. He observed student behavior during a SBL activity and noted students had learnt to interact with the simulator with the intent they thought would satisfy the instructor verses the intent to treat the patient situation. This type of student action could result in missed learning opportunities or more concerning, false learning.

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Since students are the recipients of simulated learning and are asked in some component to evaluate the learning activity, it would be beneficial for educators to understand from what perspective students are basing their evaluations. Currently, it is unknown how student perspectives towards simulation design characteristics compare to nurse educators' perspectives.

The majority of researchers who have investigated SBL have focused on investigating learning outcomes following SBL activities (Flanagan, Clavisi, & Nestel, 2007; Laschinger et al., 2008). This has preceded determining the particular means (unique design choices) about what comprises a well-designed SBL educational intervention (activity). Salas and colleagues (2005) claim, "there is more [to simulation design and delivery] than meets the eye" (p. 366). Upon review of studies that investigated learning outcomes, it was unclear what measures were undertaken to monitor/control whether the SBL intervention itself was well designed. Descriptions of scenarios and events were outlined in studies, however the particular means by which student support, fidelity, problem solving were designed in SBL activities and conducted were rarely reported. Not all SBL educational interventions are equally effective (Kneebone, 2005; Waxman, 2010) nor are their simulation design characteristics of equal importance. In order to have confidence that the SBL activity had an effect on learning outcomes, confidence in the design of the SBL educational intervention is critical. Efforts to expand understanding of the particular means to design a SBL activity have not seen the level of investigation needed (Alinier, 2011). In part, confidence in the SBL design depends on pedagogical understanding and conceptual clarity in SBL language. Without clear and common language as well as theoretical frameworks to guide SBL practice and

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research it is difficult to go beyond describing phenomena occurring in SBL let alone reach relevant explanation of underlying processes (Dieckmann et al., 2011).

Whereas a number of investigators have reported key simulation design categories, a few being repetitive practice, debriefing, range of difficulty level, defined learning outcomes, realism, and student support (Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005; Jeffries, 2005; McGaghie, Issenberg, Petrusa, & Scalese, 2006), it is apparent they are broad, conceptually based categories. What remains unknown is how these design characteristics are made operational within a SBL activity. This uncertainty becomes apparent when nurse educators are presented with a variety of design options and subsequently have to make design decisions. Currently, socially constructed and anecdotal data exist about preferred design choices; however, there are minimal empirical data on what works best as well as how to prioritize options (Alinier, 2011; Cook, 2010; Groom et al., 2013; Rudolph et al., 2007).

Simulation design is of keen interest to educators. This becomes apparent during conference proceedings and list-serve postings as educators query each other about what they are doing with simulation design while offering their own commentaries. Educators are asking and seeking answers to simulation design questions, a sampling exemplified in Table 1.1. The extent of this discourse becomes evident in a collection of opinion statements. To date, gathering such a collection of current opinions on how to put design characteristics into operation has not been undertaken.

Additionally, it is not always possible to put into operation all design features. Their usage depends on available resources in supplies and equipment, educator knowledge and experience, as well as logistical management of the number of students as

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they engage in SBL. Thus, educators are forced to make choices. Consequently, educators are trying to figure out what more there is beyond the broad characteristic categories for simulation design. Groom (2009) uses the analogy of a three-dimensional "Rubik cube" (p. 132) to represent all the "twist and turn" decision making options involved in simulation design. He contends these twists and turns are not to be randomly made, but rather should be based on evidence of what works best for different SBL purposes. Yet, until best evidence for design of simulation is established, current practice is largely subjectively based. Educators readily share their opinions and points-of-view about what they did or what they think should be done in designing and conducting SBL activities, both formally (in literature) and informally (in ordinary conversations). These conversations, commentary, and discussions represent the discourse educators offer in designing and conducting SBL educational interventions.

Table 1.1

*Sample of Questions on How, When, What for SBL Design*

- What is the level of student preparation needed prior to entering a simulation?
- What type of orientation and preparation should a student have prior to participating a simulation?
- What type of education and preparation should a nurse educator have prior to conducting a simulation?
- How many students are too many for a SBL activity?
- When should student roles be randomly assigned or predetermined?
- When should students play other characters in the simulation and if so what level of role?
- Should simulations be graded or not? If so, how does this affect the design of the simulation? Should grade be a team score or individual?
- What level of fidelity or realism is needed for different types of simulations? Is it necessary to have real healthcare equipment or can the environment be simulated in other means?
- How much support should students receive during a simulation in the form of cues, help from faculty, and help from other role characters?
- How should educators respond to student errors or omissions? For example, continue with the simulation, give cues to get back on track, or adjust the simulation based on student decision making?

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When considering the conceptual ambiguity with SBL language, the limited pedagogical understanding of SBL design, while acknowledging that educators hold varying beliefs towards teaching and learning practices, it is not difficult to imagine the number of different opinions that have formed about simulation design. These opinions matter. Opinions become the vehicle for exploring teaching and learning practices. The particular means on how to operationalize simulation design characteristics are based on subjectivity as there is yet no firm evidence beyond the broad categories for simulation design (objectives, problem solving, student support, fidelity, debriefing). This subjectivity manifests itself as a complex, multidimensional phenomenon that reflects a particular perspective. As one understands the perspectives of others, the likelihood of being effective in one's professional role is increased (Brookfield, 2006). Likewise, seeking first to understand before being understood enhances one's effectiveness (Covey, 1989). Considering these statements, it becomes clear investigating perspectives is a valuable undertaking. Efforts to gain a better understanding of perspective(s) held by nurse educators as they make simulation design choices along with how perspectives compare to student perspectives has been a neglected activity in SBL research.

## Purpose of Study

The purpose of this study was to describe and compare nurse educators' and nursing students' perspectives about operationalizing design characteristics within simulation based learning educational interventions in nursing education. The National League for Nursing-Jeffries Simulation Framework (Jeffries, 2005; Jeffries, 2012), along with this investigator's adaption by expansion, provided the theoretical framework in

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which the simulation design characteristics objectives, student support, problem solving, fidelity, and debriefing were identified.

**Theoretical Framework**

The National League for Nursing-Jeffries Simulation Framework (NLN-JSF) (Jeffries, 2005) is a comprehensive framework developed to provide theoretical direction as educators plan, conduct, and evaluate simulation activities. A description of this framework is presented followed by a discussion of its expansion by this investigator. Further history and detail of this framework will continue in Chapter 2.0. Visually (Figure 1.1), the NLN-JSF consists of five conceptual components across three spheres. These conceptual components include (1) teacher (renamed facilitator) factors, (2) student (renamed participant) factors and (3) educational practices in the first sphere, (4) simulation design characteristics in the second sphere, and (5) outcomes in the third sphere. Two conceptual components (outcomes and simulation design characteristics) are further divided. Outcomes are comprised of: (a) learning (knowledge), (b) skill performance, (c) learner satisfaction, (d) critical thinking, and (e) self-confidence. Simulation design characteristics are comprised of: (a) objectives, (b) student support, (c) problem solving, (d) fidelity, and (e) debriefing.

Development of the NLN-JSF theoretical framework was drawn from insights gained in empirical and theoretical literature from nursing, medicine, and other non-healthcare related disciplines (Jeffries & Rodgers, 2007b) and recently underwent review resulting in minor revisions (Jeffries & Rogers, 2012). As can be seen in the visual diagram (Figure 1.1) of the NLN-JSF, sphere one (interaction of teacher, student, and educational practices) has an effect on sphere two (design characteristics) and sphere

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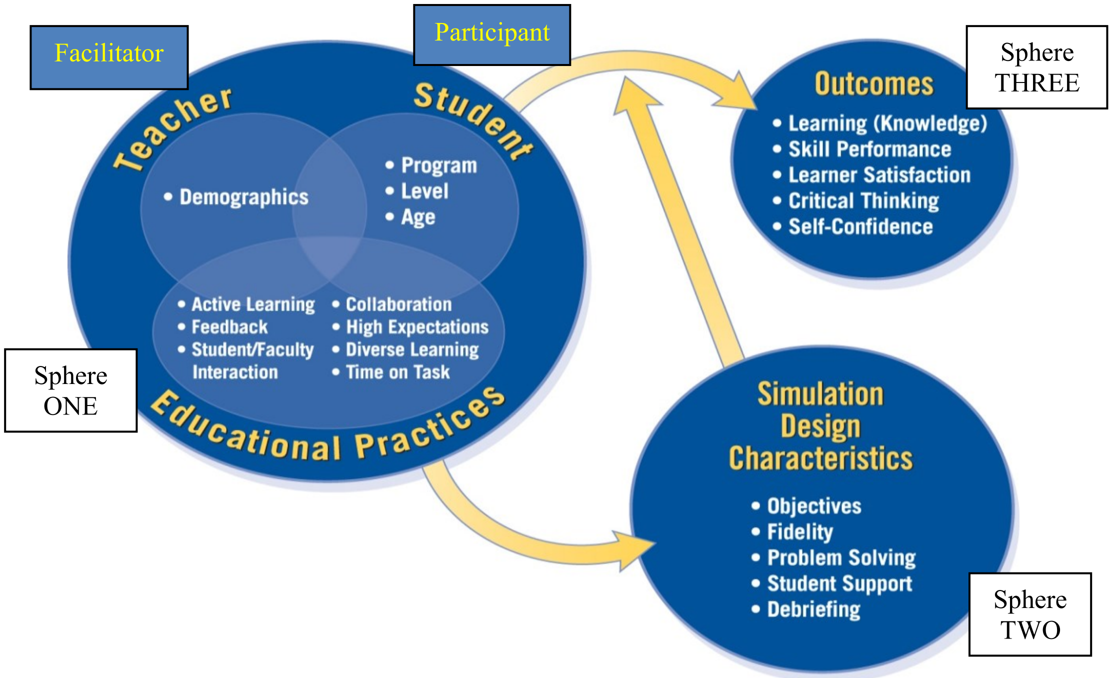
three (outcomes). The effect between sphere one and sphere three is mediated by sphere two (simulation design characteristics) as the educational intervention.

Figure 1.1

*National League for Nursing – Jeffries Simulation Framework*




Permission for use granted from the National League for Nursing New York, NY
Jeffries, P. & Rodgers K. (2007). Theoretical framework for simulation design. In P. Jeffries (Ed.) Simulation in nursing education: From conceptualization to evaluation (pp. 21-33). New York: National League for Nursing (Appendix A)

Educational researchers readily describe what happens before (pre-brief), during (simulation activity) and after (debriefing) a SBL activity. However, locating information about these happenings (before, during, after) are scattered throughout SBL literature. Consequently, finding this information can be problematic. In order to address this problem and add clarity to the design process, this investigator adapted and expanded the NLN-JSF sphere two (simulation design characteristics) from its original design to visually include a pre-brief, simulation activity itself, and a debriefing (Figure 1.2).

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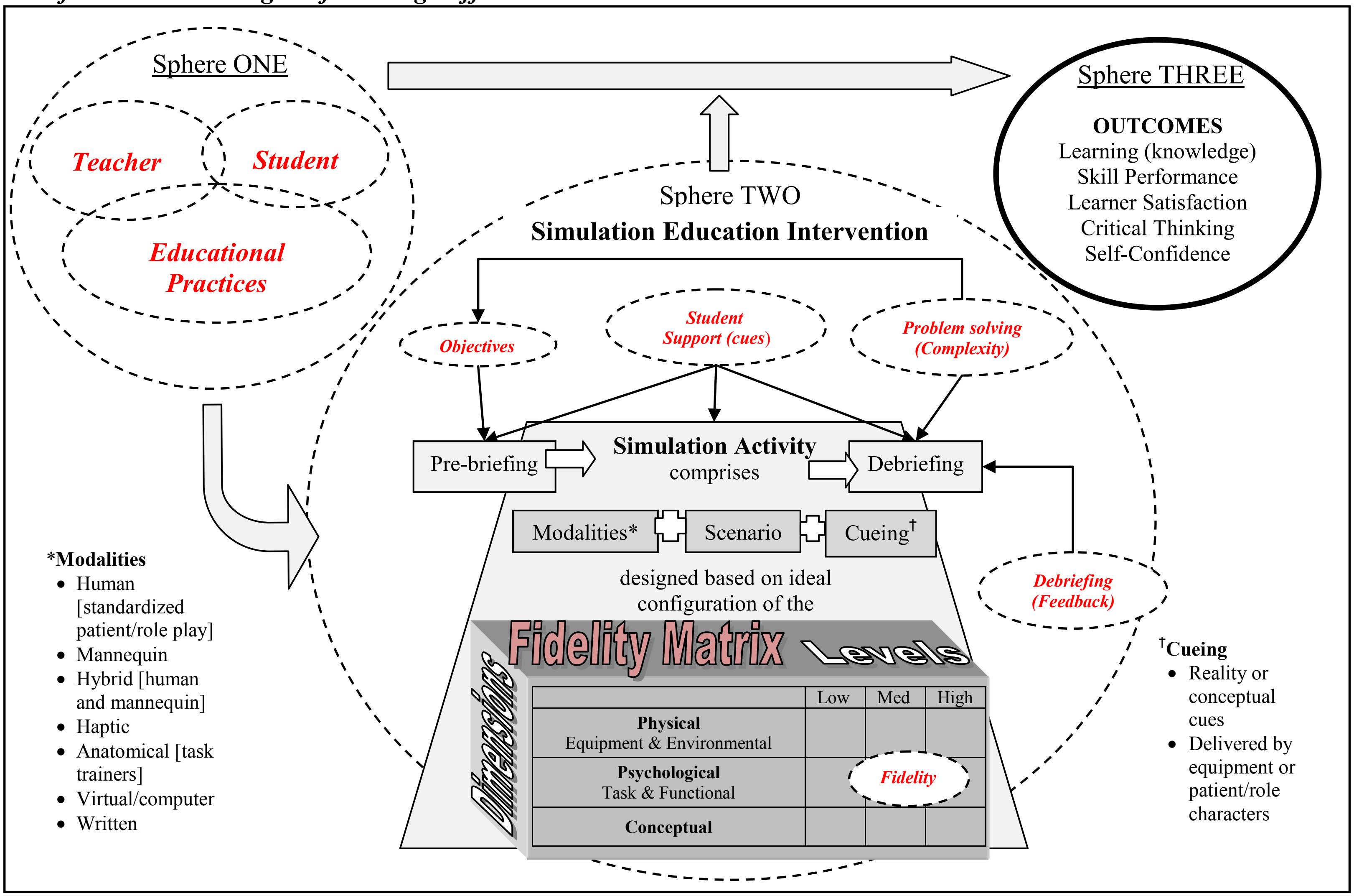
**Figure 1.2**

***Expansion of the National League of Nursing-Jeffries Simulation Framework***



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Expanding the details of what happens in design of the simulation activity itself is undertaken by means of thoughtful selection of modalities (role-play, anatomical, manikin, hybrid, and virtual computer) as well their dimension of realism (fidelity). The Fidelity Matrix, created by this investigator and added to the NLN-JSF sphere two, is bracketed by modes of thinking of reality (physical, psychological, and conceptual dimensions) and a range level in fidelity.

This expanded sphere two of the NLN-JSF positions the five simulation design characteristics (objectives, problem solving, student support, debriefing, fidelity), identified in Figure 1.2, where they are most likely to have an effect. The NLN-JSF provided guidance for this study by identifying how the interaction of the teacher, student, and educational practices has upon simulation design. This interaction cannot be neglected when investigating simulation design characteristics.

**Research Questions**

Four research questions guided this study describing and comparing nurse educators' and nursing students' perspectives about operationalizing design characteristics within simulation based learning educational interventions in nursing education. They were:

1. What are nurse educators' perspectives about operationalizing simulation design characteristics within SBL educational interventions?
2. What are nursing students' perspectives about simulation design characteristics within SBL educational interventions as operationalized by nurse educators?
3. How do perspectives about simulation design characteristics within SBL educational interventions vary between nurse educators and nursing students?

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4. How do perspectives about simulation design characteristics within SBL educational interventions vary based on experience with SBL for nurse educators and number of SBL experiences for nursing students?

## Definition of Terms

For purposes of this study, the following terms and definitions provided a consistent point of reference. Theoretical definitions were selected and/or developed by this researcher. Since perspectives are independent of the researchers' view, operational definitions by the investigator become irrelevant (Brown, 1980).

### Perspective

A perspective is a self-referent point-of-view based on inter-relational sets of beliefs and intentions that give direction and justification to actions (Pratt, 1998). In this study, an individual's perspective becomes operant through his/her arrangement and ranking of opinion statements about simulation design characteristics.

### Shared Perspective

A shared perspective is a common point-of-view held by a group (clustering) of individuals (Brown, 1980; Stephenson, 1953). In this study, a shared perspective becomes operant through the factor that emerges following factor analysis of individual self-referent rankings of opinion statements about simulation design characteristics.

### Simulation Based Learning (SBL)

In this study, SBL is theoretically defined using Bland and colleagues (2010) conceptual definition of simulation as "a dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement, and integrates the complexities of practical and

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theoretical learning with opportunity for repetition, feedback, evaluation, and reflection" (p. 5).

**Simulation Design Characteristics**

Design characteristics for a SBL educational intervention are the five simulation design characteristics theoretically derived from the NLN-JSF and include objectives, student support, fidelity, problem solving, and debriefing (Jeffries, 2005; Jeffries & Rodgers, 2007b; Jeffries & Rogers, 2012). Theoretical definitions follow for each of these five simulation design characteristics.

**Objectives.** Objectives are pre-determined instructional objectives that guide the design, development, and evaluation of the SBL educational intervention (Jeffries, 2005; Jeffries & Rodgers, 2007a; Jeffries, 2011). Objectives are appropriately aligned to students at their expected level within the nursing program and are derived from curricular goals.

**Student support.** Student support is given via information and in instruction provided before (preparatory documents), during (cueing), and after (feedback) the simulation activity to help the student progress through the scenario and increase opportunity to meet the objectives of the SBL educational intervention (Jeffries, 2005; Jeffries, 2012).

**Fidelity.** Fidelity reflects the level of realism incorporated into the simulation scenario considering three dimensions of reality (physical, psychological, and conceptual dimensions) which can range from low to medium to high (Alessi, 2000b; Beaubien & Baker, 2004; Dahl, Alsos, & Svanæs, 2010; Dieckmann et al., 2007). The physical dimension of fidelity encompasses equipment and environmental attributes. Equipment

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attributes include tactile feel for motion, vibration, or dynamic forces (haptic). Environmental attributes include the appearance and layout of the simulated setting. The psychological dimension of fidelity is the learner's engagement in and experience with the simulation. The conceptual dimension of fidelity encompasses whether the information offered to the learner is interpretable as a representation of the concept of interest and the focus for the learning experience.

**Problem solving.** Problem solving happens when students are engaged in the tasks designed and structured to increase knowledge, skills, and attitude. The complexity of problem solving within a SBL activity is designed to give students opportunities to achieve the learning objectives (Jeffries & Rodgers, 2007a).

**Debriefing.** Debriefing follows the simulation and is the process whereby educators and students reexamine the clinical encounter, foster development of clinical reasoning, and judgment skills through reflective learning processes (Jeffries, 2005; Jeffries & Rodgers, 2007a; Jeffries, 2011).

## Nurse Educator

A nurse educator is an educator who facilitates student learning by integrating the art and science of nursing and clinical practice during the teaching-learning process (Billings & Halstead, 2009). In this study, a nurse educator had a BSN or higher level of education and functioned as a nurse educator (teacher) in an academic program or as a nursing lab coordinator.

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**Nursing Student**

A nursing student is the recipient of teaching-learning processes provided by nurse educators. In this study, a nursing student was enrolled in an associate, diploma, or bachelor's degree nursing program.

## Assumptions of Study

Assumptions in this study were drawn from theoretical literature on teaching perspectives as well as the research method selected to answer the research questions. Explicitly stated assumptions identifies to others those taken-for-granted statements as held by the researcher.

1. A perspective of teaching is an opinion or point-of-view that expresses personal beliefs and values (sometimes hidden) related to teaching and learning and consequently influences ones' actions (Brookfield, 2006; Pratt, 1998).
2. Each educator brings different perspectives to their teaching pedagogy. An educator can operate from one or more perspectives that vary based on the intent of the learning activity (Brookfield, 2006; Pratt, 1998).
3. An individual's subjectivity is his/her point-of-view or opinion on a topic. Opinions among individuals cluster (factor) together in a manner that can be objectively investigated (Brown, 1980; Stephenson, 1953).
4. Individuals who volunteer to participate in research freely give their opinions or viewpoints.

## Significance of Study

Perspectives about simulation design characteristics held by nurse educators and nursing students were described and compared in this study. Findings from this study

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exploring perspectives about simulation design can offer greater clarity in how language is used in SBL design, provide guidance for educational development of nurse educators using SBL, critically examine the conceptual components of the NLN-JSF as a new theoretical framework, and suggest further educational research for SBL. Each is further discussed.

**Conceptual Clarity of SBL Language**

As a result of this study, it is anticipated an increase in conceptual clarity in SBL language will occur. Preliminary theoretical definitions of simulation design characteristics have been formulated. Yet, in order for theoretical definitions to be useful for research or practice, definitions that are "precise, understandable to others, and appropriate for the context in which the term will be used" need to develop from a "series of long and intense activities" (Waltz et al., 2010, p. 34). A component of these activities outlined by Waltz and colleagues (2010) involves developing and identifying exemplars and mapping out meanings of concepts. To date, conceptual development of language used in simulation design has not undergone investigation. Findings from this study can offer knowledge that will start to fill this gap. Theoretical definitions require "clarifying statements that supplement definitions [to] help the reader reconstruct…the concept and provide groundwork for subsequent steps in operationalizing the concept" (Waltz et al., 2010, p. 40). One means to start groundwork for operationalizing concepts used in simulation design is collect systematically exemplars of current understanding and usage. This activity was accomplished in this study through the gathering of opinion statements from educators.

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**Educational Development of Nurse Educators in SBL**

As nurse educators become involved in SBL activities (educational interventions) time for individual reflection on teaching/learning practices alongside ongoing faculty development is crucial. In addition to faculty development on the 'nuts and bolts' of simulation, there is need for faculty to engage in reflective exercises that clarify one's perspective about teaching. According to Pratt (1998) an individual teaching perspective (point-of-view) reflects "an expression of personal beliefs and values related to learning and teaching" (p. xii) and "govern what we do as teachers and why we think such actions are worthy or justified" (p. 10). It is important to identify perspectives since perspectives direct what we do (action), what we are trying accomplish (intentions), and why we think as we do (beliefs). Understanding this triad of action, intent, and beliefs is fundamental in forming one's commitment to teaching and learning (Pratt, 1998).

While considering the opinions of others and comparing them to one's own opinions, perspectives about teaching and learning are brought into clearer view. So doing helps locate and uncover beliefs and values underlying teaching and learning. Articulating and understanding one's own perspective influences the comfort and confidence an educator has with different instructional strategies. In addition, understanding one's perspective reduces the chance for misinterpreting the language and literature derived from another person's teaching perspective (Pratt et al., 2007). Collegial discussions frequently occur around the action and intent associated with teaching and learning activities, however recognizing underlying beliefs, many times hidden, that form one's commitment to teaching involves reflexive and meaningful reflection (Lecouteur & Helfabbro, 2001; Pratt, 1998). Locating where or if opinions

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cluster or do not cluster together to form particular perspectives provides the springboard for reflecting on underlying assumptions and beliefs. Brookfield (2006) identifies reflection as one of the core assumptions behind skillful teaching. He claims skillful teachers adopt a critically reflective stance by viewing teaching practice through the eyes of fellow colleagues, literature, one's own self, and their students. In this study a limited number of educators were provided the opportunity to examine and compare their perspectives on operationalizing simulation design characteristics and in so doing were offered insight into their pedagogical orientation (Brookfield, 2006; Broome, 2009; Emerson & Records, 2008; Ironside, 2001; Oermann, 2009).

Background knowledge in educational principles and learning theories along with time to reflect on these principles/theories are foundational to strengthening pedagogical knowledge and understanding. This type of knowledge is necessary to effectively design and deliver instructional strategies and evaluate student learning (Billings & Halstead, 2009). SBL touts a student-centered approach to teaching and learning, and even though educators may agree with this philosophy, deep-rooted assumptions more commonly associated with a teacher-centered approach to teaching and learning, need to be uncovered and possibly challenged. Transitioning from a teacher-centered to a learner-centered approach involves more than gaining knowledge of new strategies. As nurse educators seek to accomplish this transition, delving into one's underlying beliefs, values, and preexisting assumptions about teaching/learning can help this transition. In this study, identification of particular perspectives about operationalizing simulation design characteristics can help pull to the surface personal beliefs and values that may obscure

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one's understanding of what we do (action) and what we are trying to accomplish (intentions) in SBL.

Furthermore, describing and comparing perspectives about simulation design can offer useful information to program developers for faculty development on SBL. Creating cost-efficient, meaningful, and applicable SBL development programs aimed at the particular needs of educators can be enhanced through an awareness of what perspectives educators currently hold about simulation design. For example, determining to what extent similarity or dissimilarity exists in perspectives about simulation design is useful information when creating faculty development programs for SBL. Without awareness of the existence of other perspectives towards teaching (simulation design), collegial understanding and improvement in teaching practices may be difficult (Courneya, Pratt, & Collins, 2008; Pratt, 1998). Determining where nurse educators share (converge) or differ (diverge) in their perspectives about simulation design and incorporating this into faculty development programs can offer greater understanding and optimize use of SBL. If perspectives are found to be similar, educators using SBL can be more confident they share a common point-of-view, and as a result, proceed with SBL design and evaluation more efficiently. On the other hand, if dissimilarity in perspectives exists, then it is essential to allow time for educators to debate and reflect on these different perspectives. If perspectives are at odds with each other, and time is not taken to debate these odds, time and energy is wasted as educators struggle not understanding why someone else is making the decisions they do for SBL design.

Additionally, identifying whether perspectives change as educators gain experience with SBL is relevant for creating initial and ongoing educational development

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programs for simulation. If perspectives in designing simulations change over time or as one gains experience with SBL, this is key information that can influence how faculty are educated. In the words of Covey (1989), seeking first to understand and then be understood is a habit of a highly effective person. As one gains understanding of the points-of-view of others, the likelihood of being effective as an educator is increased.

Considering Brookfield's (2006) claim of the importance of viewing teaching though the eyes of students, it is equally important to investigate how perspectives vary between educator and student. As identified earlier in the problem statement, if student perspectives to teaching/learning practices are misunderstood and misinterpreted by the educator, evaluation and subsequent revision of teaching/learning practices can be based on faulty information. Conversely, if students misinterpret educators' intentions in teaching/learning practices, false learning may occur or go unrecognized.

Faculty development on how to use this pedagogy and do it well is recognized as a missing and often overlooked part of SBL (Jones & Hegge, 2008; King et al., 2008; Parker & Myrick, 2012; Roberts & Greene, 2011; Taibi & Kardong-Edgren, 2013; Waxman, 2010). Determining the learning needs of educators as they take on, or are assigned to SBL, is critical. Gathering current opinions followed by their exploration to determine perspectives held about simulation design is a beginning step to help identify what are the learning needs of those who design and conduct SBL activities. Additionally, determining perspectives about simulation design characteristics, specifically regarding fidelity dimensions, can provide an evidence-base voice to nurse educators as they confer with manufacturing companies on the needs of nursing education. Manufacturing of human patient simulators is driven by available technology

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with design of patient simulators strongly influenced by medical education and their need for technologically advanced simulators. This level of technology may not be what nursing education desires or needs.

**Theoretical Examination of the NLN-JSF**

LaFond and Van Hulle Vincent (2012), in a critique of the NLN-JSF, conclude concepts in this framework need further exploration. This study examined theoretical concepts concerning simulation design by taking a closer look at the educators' perspectives about simulation design characteristics. Sphere two (simulation design characteristics) has been expanded by this investigator to more clearly depict the pre-brief, simulation scenario, and debriefing as components of a SBL activity. The simulation scenario is comprised of different modalities and a matrix depicting fidelity dimensions. As can be seen in Figure 1.2, it is evident there are conceptual linkages between the spheres. However, before undertaking research testing the conceptual linkages in this framework, it is key to have clarity in the concepts used for simulation design (objectives, problem solving, student support, fidelity, feedback). This has been an absent activity as the majority of research has focused on investigating student outcomes from SBL (Flanagan et al., 2007; LaFond & Van Hulle Vincent, 2012; Schiavenato, 2009). This investigator's concern is that without fully understanding the choices educators make with simulation design, the level of confidence that can be placed in achievement or lack of achievement of student learning following SBL is questionable. Gaining this pedagogical understanding of the SBL educational intervention starts with establishing conceptual clarity of language used. As Waltz and colleagues (2010) suggest, a series of long and intense activities are needed to theoretically and

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operationally define concepts, in the case of this study - simulation design characteristics. Identifying exemplars and mapping out conceptual meaning are activities necessary to develop theoretical and conceptual definitions. Accomplishing this starts with gathering current opinions and points-of-view about simulation design, that when clustered together, depict perspective(s) held about simulation design. These perspectives contribute conceptual exemplars for simulation design characteristics. Locating perspectives about simulation design, as a result of this study, will offer information useful for building conceptual clarity of the concepts as depicted in sphere two of the NLN-JSF.

**Future Educational Research in SBL**

Findings from this study can be used to generate questions for further research. The following discusses potential future research efforts. As discussed, examination and testing of the NLN-JSF is essential. Currently, the relationships and mediating effects of the three spheres within this framework are unknown and untested. Following efforts in establishing conceptual clarity of theoretical concepts in the NLN-JSF, testing the linkages between the spheres is in order. As seen in Figure 1.2, sphere two is a mediating variable between sphere one (interaction of teacher, student, and educational practices) and sphere three (outcomes). For example, while considering simulation design, it is unknown what frequency (number of SBL activities), or what strength (fidelity dimensions, problem solving complexity, degree of student support) is needed in simulation design. It is unknown how the interaction between teacher, student, and educational practices impacts simulation design.

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Once identification of different perspectives for simulation design are located and debated among nurse educators, it will then be possible to design and compare SBL activities based on different means to operationalize design characteristics. The proposed study will obtain preliminary evidence about which simulation design characteristics nurse educators recommend more or less in SBL educational interventions. Since there are a large number of design choices to be made, comparing one simulation to another based on a perspective of operationalizing simulation design characteristics is a more efficacious means to compare simulations, rather than one design characteristics at a time. If perspectives are found to be significantly dissimilar (divergent), it becomes apparent more SBL activities, operating under different design choices, require comparative research. Findings from this study can provide direction about these future research efforts.

Determining perspectives about simulation design may offer useful information for studies investigating substitution of SBL as a clinical experience. Currently, nursing programs are deciding how to use SBL as a replacement of clinical experiences as well as the ratio of SBL clinical hours compared to actual clinical experience hours. Determining this acceptable/appropriate ratio of SBL experience to actual clinical experience is a thorny issue for nursing education and regulating bodies, as there is yet no evidence to support or refute these decisions. In part, whether a SBL activity is equivalent as an actual clinical experience is dependent on the incorporation of design characteristics. For example, fidelity level is considered one criterion to determine whether a teaching/learning strategy is a simulation and without clear definitions and understanding of appropriate use of fidelity dimensions, this is difficult. Gaining a greater understanding

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of existing perspectives about simulation design may offer useful information as decisions are made for use of SBL as a substitution for clinical experiences.

Frequently, the focus of educational development programs for nurse educators is directed at instructional techniques with less attention to exploring the underlying values, beliefs, and preexisting assumptions behind teaching/learning. In order to evaluate teaching/learning practices, a greater emphasis is needed for educational research. This is emphasized by Broome (2009) who claims nursing educational research has “an absence of substantial knowledge base, critical mass of trained nurse researchers, and commitment to building a science of nursing education [that is] is costing the profession in so many ways” (p. 177). Broome, Ironside, and McNelis (2012) recently reaffirmed this paucity of nursing educational research while Schneider, Nicholas, and Kurrus (2013) suggest ways to strengthen the methodological quality of educational research. Patterson and Klein (2013) identified that a portion of nurse educators are uncertain about the difference between evidence-based practice and evidence-based teaching practice. Considering these matters, Patterson and Klein attest research in nursing education should be forefront and valued at the same level as research in nursing practice.

Educational research also needs to focus on the educator. As nurse educators, we ask students all the time to reflect on their perspectives and decision-making processes. However, taking the time to determine and reflect upon our actions, intentions, and particularly our beliefs behind pedagogical decision-making for SBL is an activity given insufficient attention. This is consistent with Amundsen and Wilson’s (2012) systematic review of higher educational literature. They identified reflection as one of six focus areas for educational development of faculty. Reflection goes beyond focusing only on

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teaching skills and techniques and is a prerequisite to changing teaching practices. Particularly interesting is Amundsen and Wilson's assertion that there is minimal sharing of knowledge gained from learning experiences by healthcare educators compared to other academic disciplines.

Exploring, describing, and comparing perspectives towards teaching/learning practices is a key element in understanding the pedagogy with SBL. What remains undiscovered is what constitutes different perspectives on designing simulations and how my perspective differs from yours. If perspectives go unexplored, it is possible there are viewpoints precluded or overshadowed by more obvious and extreme viewpoints. In this case, a concern exists that not all voices are being heard as best practices for simulation design are established. In order to investigate perspectives, a method that can systematically tease out prevalent discourses and subjectivities was needed. Given this focus, Q-methodology as a research approach that investigates subjectivity and allows undiscovered perspectives to emerge (Brown, 1980; Newman & Ramlo, 2010; Petit dit Dariel, Wharrad, & Windle, 2010; Stephenson, 1953) was applied in this study.

## Chapter Summary

A study to describe and compare nurse educators' and nursing students' perspectives about operationalizing design characteristics within SBL educational interventions in nursing education was introduced in this Chapter. The problems this study addressed revolved around lack of clarity in language used in SBL such as fidelity, student support, cueing along with limited pedagogical understanding of the design of SBL activities. Though description and comparison of perspectives held by nurse educators about simulation design, nurse educators gain a better understanding of what

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actions, intentions, and beliefs underlie their design choices. These perspectives are subsequently compared to perspectives held by nursing students. The knowledge gained from uncovering perspectives may be useful in offering greater clarity on language used in simulation design, provide guidance for educational development of nurse educators as they conduct SBL activities, and generate further research. Since perspectives manifest in the subjective communicability on a particular topic of interest, Q-methodology was a research approach appropriate to investigate this subjectivity and was applied in the study.

## Structure to Dissertation

This dissertation is comprised of five chapters within which are five manuscripts readied for and/or accepted for publication. The literature on simulation based learning and perspectives of teaching are reviewed in Chapter 2.0 concluding with two systematic reviews (Manuscripts One and Two). The focus of Chapter 3.0 is on Q-methodology as the research approach conducted across three phases. Phase I (pre-dissertation activity and not reported in this dissertation) involved the gathering of a concourse of opinion statements on simulation design from nurse educators. Phase II involved the drawing out of the Q-sample from the concourse of opinion statements (Manuscript Three) and a test of its feasibility. Concluding Chapter 3.0 is the research design for Phase III, the actual Q-study. The results of the study are reported in Chapter 4.0 that include Manuscripts Four and Five. The manuscripts comprised in this dissertation were prepared and formatted as individual manuscripts. This formatting included author's note, abstract, body of manuscript, references, and tables and figures. Although different journals may request particular formatting adjustments, in order to offer a uniform structure to this

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dissertation, the five manuscripts were similarly formatted. Finally, a synthesis of the manuscripts is the focus of Chapter 5.0 with a discussion of the anticipated significance of the study as introduced in Chapter 1.0.

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# CHAPTER 2.0 REVIEW OF LITERATURE

## Chapter Introduction

The purpose of this study was to describe and compare nurse educators' and nursing students' perspectives about operationalizing design characteristics within simulation based learning educational interventions in nursing education. This chapter offers background on issues that support and provide theoretical structure for this study. This chapter is comprised of five sections. Section 2.1 offers a review of the literature on SBL in healthcare education, Section 2.2 provides a comprehensive discussion of the NLN-JSF, and Section 2.3 reviews teaching perspectives and why exploring perspectives was necessary. Lastly, this chapter concludes with two systematic reviews prepared as manuscripts for publication. Cueing and fidelity in the context of SBL are reviewed in the first manuscript (Section 2.4) and frameworks that have emerged to guide SBL are analyzed in the second manuscript (Section 2.5).

## Section 2.1 Review of Literature on SBL

The review of literature on SBL is structured according to background on SBL, driving forces behind the proliferation of SBL, and what are known and established aspects of SBL as well as aspects that remain unclear. The search process undertaken for this review is outlined.

### Search Process

The escalated use of SBL in healthcare education has resulted in a proliferation of literature on SBL as well as the launching of two professional organizations whose primary missions are directed at SBL. Consequently, strategic search strategies were

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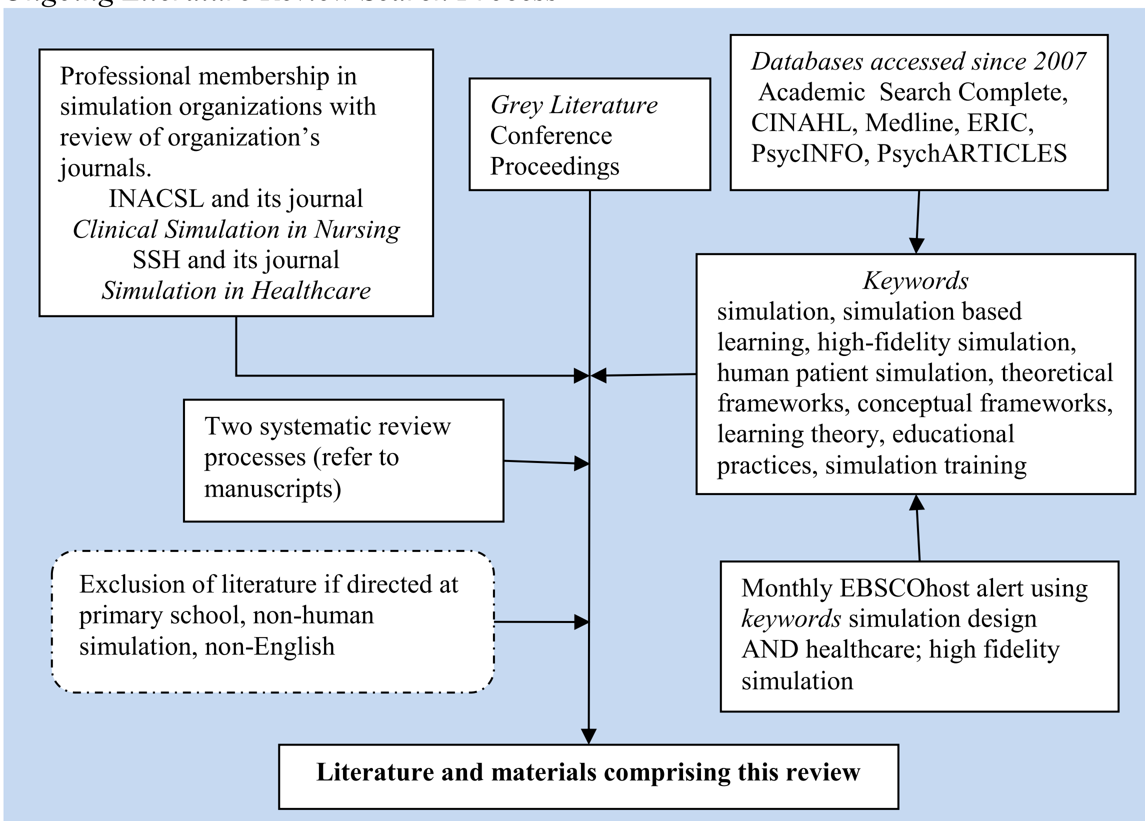
necessary to appraise current issues and the literature. The following outlines measures undertaken for this ongoing review of literature using Figure 2.1 to depict the process.

Figure 2.1

*Ongoing Literature Review Search Process*




Starting in 2007, databases accessed on a regular basis included Education Resources Information Center (ERIC), MEDLINE, Academic Search Complete, and Cumulative Index to Nursing and Allied Health Literature (CINAHL), and PsycINFO, and PsychARTICLES. A variety of keywords, listed in Figure 2.1, were selected to serach the databases. An ongoing search alert managed through EBSCO Host has been in place since 2007. Review sources have included the grey literature from conference proceedings and investigator's membership in two international simulation organizations, the *International Association for Clinical Simulation and Learning* (INASCL) and the

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*Society for Simulation in Healthcare* (SSH) and their associated journals. As a member of INACSL, this investigator has been involved in a national project though INASCL and funded by the NLN to analyze the NLN-JSF (Ravert, 2011).

**Background**

Simulation as a teaching/learning tool and strategy for healthcare education has had an exponential growth around the world (Dieckmann, 2009). Medical simulators started in the 1960's (Issenberg & Scalese, 2008) and have been a consistent tool in anesthesiology education since the 1970s (Gaba, Howard, Fish, Smith, & Sowb, 2001; Nehring & Lashley, 2010). Nursing education did not use simulation technology extensively until approximately a decade ago (Nehring & Lashley, 2010). However, SBL as a teaching/learning strategy is not unique to the education of healthcare professionals, but has been used in business (Adobor & Daneshfar, 2006; Stainton, Johnson, & Borodzicz, 2010), aviation (Rehmann, Mitman, & Reynolds, 1995), engineering (Alessi, 2000a), by the military (Bruce, Bridges, & Holcomb, 2003), and in general education (Adams et al., 2008a). The technology used in SBL activities is traceable to flight simulators developed for aviation (Rehmann et al., 1995). However, irrespective of the discipline, there are common educational principles (Hertel & Millis, 2002) and in a broad context, simulation is "not a novel approach to teaching" (Schiavenato, 2009, p. 388). Therefore, in order to review the literature on SBL, one must consider literature from a variety of disciplines.

Upon literature review, it becomes apparent authors use various terms when they speak about simulation. These terms include simulations (Jeffries, 2005), simulators (Beaubien & Baker, 2004), high-fidelity simulation (Issenberg et al., 2005), human

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patient simulation (initially derived from a simulator manufacture) (Brannan, White, & Bezanson, 2008; Monti, Wren, Haas, & Lupien, 1998), simulation based training (Kiat, Mei, Nagammal, & Jonnie, 2007; Salas et al., 2005), and simulation based learning (Bligh & Bleakley, 2006). Although these terms vary in scope, from referencing a piece of equipment to a pedagogical approach, they are frequently used interchangeably and consequently contribute to semantic confusion.

Various definitions of simulation have been put forth. For example, Gaba (2004), as a frequently cited source, defines simulation as, "…a technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion" (p. 12). This compares to a definition by Jeffries (2005) as "activities that mimic the reality of a clinical environment and are designed to demonstrate procedures, decision-making and critical thinking through techniques such as role playing and the use of devices such as interactive videos or mannequins" (p. 97). The National Council for State Boards of Nursing (NCSBN) (2005) uses Jeffries's definition within their position statement on clinical instruction, however, the statement; "[simulation] shall not take the place of clinical experiences with actual patients" (p. 2) was added. A conceptual analysis of simulation as a learning strategy produced this definition, "a dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement and integrates the complexities of practical and theoretical learning with opportunity for repletion, feedback, evaluation, and reflection" (Bland et al., 2010, p. 5).

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The INACSL (2011) organization published seven standards for simulation use in nursing education. Members of INACSL recently updated and expanded these standards (Meakim et al., 2013). Standard I addressed terminology and in the 2013 revision, two different but closely related terms were defined: simulation and simulation-based learning experience. The definition of simulation is, "a pedagogy using one or more typologies to promote, improve and/or validate a participant's progression from novice to expert," (p. S9). A simulation-based learning experience is defined as "an array of structured activities that represent actual or potential situations in education and practice and allow participants to develop or enhance knowledge, skills, and attitudes or analyze and respond to realistic situation in a simulated environment or through an unfolding case study" (p. S9). Comparing all these definitions, simulation can be defined as broadly as a pedagogical method or as specific as an instructional technique. As a result of this variation in meaning and language used in SBL, it becomes evident conceptual clarity of language needs examination.

**Driving Forces**

A variety of driving forces has propelled the use of SBL in healthcare education. These include: (a) the ability to design and develop innovative educational technology (Gaba, 2004); (b) increased patient acuity including the need to provide a safe practice environment for learners to learn skills especially high risk/low volume (Decker, Sportsman, Puetz, & Billings, 2008; Flanagan et al., 2007; Larew, Lessans, Spunt, Foster, & Covington, 2006; Shearer, 2013); (c) diminished availability of clinical placement sites thus limiting students' clinical experiences (Bearnson & Wiker, 2005; Hovanscek et al., 2009; Issenberg et al., 2005); (d) preparation of students for clinical experiences

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(Dearmon et al., 2013), (e) hospital cost containment initiatives that reduce the availability of supervising and mentoring resources for students; and (f) patient safety issues (Bearnson & Wiker, 2005; Feingold, Calaluce, & Kallen, 2004; Issenberg & Scalese, 2008; Jeffries, 2005; Seropian, Brown, Gavilanes, & Driggers, 2004). In addition, forces specifically relevant for medicine include the need for training on use of new diagnostic equipment (McGaghie et al., 2006).

Another driving force that has taken on greater impetus more recently is the need for interprofessional training and education. This initiative stems from two reports from the Institute of Medicine (IOM), *To Err is Human (Kohn, Corrigan, & Donaldson, 2000)* and *Crossing the Quality Chasm* (Corrigan, Donaldson, Kohn, Maguire, & Pike, 2001). Both reports recommend interprofessional training where "people should be trained in the kinds of teams in which they will provide care" (p. 211). Benner and colleagues (2010) reiterate this need for interprofessional training in a call for transforming nursing education. As a result, healthcare education is changing, evident in the growth of simulation technology, white papers on interprofessional education, simulation centers and joint ventures for interprofessional training (Baker et al., 2008; Pattillo, Hewett, McCarthy, & Molinari, 2009; Petri, 2010; Robertson et al., 2010).

**What is Known and What Remains Unclear about SBL**

The growth in the breadth and depth of knowledge for utilizing SBL to educate healthcare professionals is evident in a number of state-of-science and systematic reviews. Additionally, the August 2011 supplement to the *Simulation in Healthcare* journal was devoted to reporting results from the first research consensus summit of the *Society for Simulation in Healthcare* (SSH). This multidisciplinary yearlong endeavor

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reviewed the literature for priority topics that need future simulation research. Investigators who jointly conducted these systematic reviews included members of medical, nursing, allied health, and educational psychology disciplines. Based on the conclusions from the SSH research consensus reports, in addition to 16 systematic reviews (Cannon-Diehl, 2009; Cant & Cooper, 2009; Cook et al., 2011; Dieckmann et al., 2011; Flanagan et al., 2007; Harder, 2010; Issenberg et al., 2005; Issenberg, Ringsted, Ostergaard, & Dieckmann, 2011; Lapkin, Levett-Jones, Bellchambers, & Fernandez, 2010; Laschinger et al., 2008; Olejniczak, Schmidt, & Brown, 2010; Shinnick, Woos, & Mentes, 2011; Weaver et al., 2010), and theoretical and empirical literature on SBL, the following discusses of a number of clear and commonly agreed upon aspects of SBL. Learner outcomes, educator/program, and simulation design characteristics categorize these aspects.

When reviewing the literature, it is important to consider the level of evidence reported. Evidence hierarchies that rank levels of evidence according to the strength of study are cornerstone for evidence-based medical practice (The Cochrane Library, Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000) with level of evidence ranging from Level 1, (systematic review of randomized control studies) down to Level VII (opinions from authorities or experts). However, Polit and Beck (2012) emphasize universal adoption of this hierarchy may not always be appropriate for certain types of questions. Similarly, Flanagan and colleagues (2007) acknowledge educational researchers have limited ability to conduct randomized control studies. Oermann and colleagues (2012) concur plus admit to additional barriers in nursing education such as limited funding, lack of expertise in faculty, poorly developed and tested evaluation tools,

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and differences in teachers and learners. Alternatively, two other ranking frameworks have been applied to evaluate educational research. These include Kirkpatrick's (2006) levels of transfer of learning and more recently the adoption of the Translational Science Research (TSR) (McGaghie, Issenberg, Cohen, Barsuk, & Wayne, 2012; National Institute of Health, 2011) used to evaluate the progression of science from laboratory to bedside practice to impact on improving patient and population outcomes (Table 2.1). McGaghie and colleagues (2012) contend that an essential element of TSR is the human capital embodied in competent healthcare providers. Both of these ranking frameworks have been applied to evaluate the efficacy of SBL research (Adamson, Kardong-Edgren, & Wilhaus, 2013; McGaghie, Draycott, Dunn, Lopez, & Stefanidis, 2011). As studies are reviewed for this literature review, levels of evidence, levels of learning, and levels of translational science research are reported.

Table 2.1

*Ranking Frameworks for Research*

| *Modified Kirkpatrick Level of Learning Evaluation Used in SBL Research* | | *Translational Science Research (TSR) Adapted for SBL Research* | |
|---|---|---|---|
| Level 1 | Participant reaction – satisfaction | | |
| Level 2a | Attitude/Perception | | |
| Level 2b | Knowledge/skill | T1 | Results in simulation lab |
| Level 3 | Behavioral change – transfer from classroom to practice | T2 | Transfer of results to patient care practices |
| Level 4a | Change in organizational outcome | T3 | Improved patient and public health |
| Level 5 | Benefits to clients | | |

**Known aspects regarding the student.** Investigators who have studied SBL have reported a significant increase in student confidence and self-efficacy following SBL experiences (Adobor & Daneshfar, 2006; Bambini, Washburn, & Perkins, 2009; Flanagan et al., 2007; Jeffries & Rizzolo, 2006; Schoening, Sittner, & Todd, 2006). This

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is coupled with SBL being reported as a positive and preferred experience by students as compared to other teaching methods (Howard et al., 2009; Jeffries, 2006; Kardong-Edgren, Starkweater, & Ward, 2008; Kiat et al., 2007; Laschinger et al., 2008; Schoening et al., 2006). These types of studies have seen the greatest number of investigations and have reported consistent findings. Therefore, further studies on self-confidence and student preference are deemed unnecessary as new knowledge is not expected to be developed (Kardong-Edgren, 2010b). These types of studies fall within Kirkpatrick's Level 1 and Level 2a learning levels that investigate participant reaction and perception and level of evidence in these studies range from IV to VI.

**Known aspects regarding the educator and program.** Initial and ongoing faculty development is essential for educators as they design, conduct, and evaluate SBL activities (Beaubien & Baker, 2004; Cannon-Diehl, 2009; Dillard et al., 2009; Jones & Hegge, 2008; McNeill, Parker, Nadeau, Pelayo, & Cook, 2012; Stainton et al., 2010). Educators require training on adult learning theory and principles in debriefing (Issenberg et al., 2011). Issenberg (2011) contends without ongoing educator training, simulation programs will not achieve optimal success. In addition to allocating funds for educational development, it is also essential to budget for costs associated with ongoing equipment maintenance and replacement (Harlow & Sportsman, 2007; Howard et al., 2009; Pattillo et al., 2009; Rothgeb, 2008; Seropian, Driggers, Taylor, Gubrud-Howe, & Brady, 2006). However, resources for faculty development are variable and limited (Cannon-Diehl, 2009; McNeill et al., 2012). The National Council of State Boards of Nursing (NCSBN) surveyed nursing program and reported many prelicensure programs do not have long-range support or strategies for sustainability of simulation programs (Kardong-Edgren et

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al., 2012). Review of studies investigating educator and program aspects have mainly been descriptive.

**Known aspects regarding simulation design.** Various modality options exist for SBL and include human/standardized patients (role-play), manikin, hybrid (human and manikin), anatomical (task trainer), virtual (computer), and written (case study) (Alinier, 2007; Decker et al., 2008; Flanagan et al., 2007). Consistent with educational principles, the selection of modality option and simulation design features should be matched to the purpose and objectives of the SBL activities (Jeffries, 2005; Salas et al., 2005). Issenberg and colleagues (2005) conducted a landmark, systematic analysis (Level III evidence) of simulation use and identified ten features in the design of high-fidelity simulations that lead to effective learning. These ten features include repetitive practice, curriculum integration, range of difficulty, multiple learning strategies, capture of clinical variation, controlled environment, individualized learning, defined outcomes, and simulator validity. In addition, different methods to conduct debriefing have been investigated. For example, debriefing with good judgment (Rudolph, Simon, Dufresne, & Raemer, 2006), debriefing for meaningful learning (Dreifuerst, 2010), and the debriefing assessment for simulation in healthcare (DASH) (Simon, Rudolph, & Raemer, 2009) are structured models that have undergone investigation. Inspection of findings from these Level II-VI evidence studies reveal structured debriefing to date has had the greatest impact on learning outcomes (Kirkpatrick Level 3 and T2) (Beaubien & Baker, 2004; Cantrell, 2008; Fanning & Gaba, 2007; Issenberg et al., 2005).

It is evident common and agreed upon aspects of SBL have been established. However, issues remain that are unclear and continue to evade the establishment of best

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educational practices. The following discusses these unknown aspects of SBL. Again, learner outcomes, educator/program, and simulation design characteristics categorize these aspects.

**Unclear aspects regarding the student.** Comparison studies investigating SBL for a gain in cognitive knowledge of the learner that compare SBL to traditional teaching methods have been inconclusive (Blum & Parcells, 2012; Cant & Cooper, 2009; Laschinger et al., 2008). Some investigators report a significant learners' gain in knowledge (Brannan et al., 2008; Elfrink, Kirkpatrick, Nininger, & Schubert, 2010; Gates, Parr, & Hughen, 2012; Hoffmann, O'Donnell, & Kim, 2007; Radhakrishnan, Roche, & Cunningham, 2007), while others report equivocal findings (Brannan et al., 2008; Dobbs, Sweitzer, & Jeffries, 2006; Hick, Coke, & Li, 2009; Hoadley, 2009; Jeffries & Rizzolo, 2006; Kuiper, Heinrich, Matthias, Graham, & Bell-Kotwall, 2008; Scherer, Bruce, & Runkawatt, 2007; Sportsman, Schumacker, & Hamilton, 2011; Wong & Chung, 2002). However, no studies reported traditional teaching methods significantly increased cognitive knowledge or skill acquisition over SBL. A lack of valid and reliable instruments that measure learning outcomes following simulation activities has been identified as a barrier to SBL research (Adamson & Kardong-Edgren, 2012; Kardong-Edgren, Adamson, & Fitzgerald, 2010). This is a uniform concern across disciplines researching SBL and one that continues to demand development and testing of assessment tools.

Investigators who have systematically reviewed the literature and research on SBL for its effect on learning outcomes conclude the majority of studies involved one-time learning encounters (Laschinger et al., 2008), small sample sizes, and non-

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randomization (Flanagan et al., 2007) (Level of evidence II-VI). When repetitive practice is conducted, improvement in learner outcomes for skill acquisition is observed (Kirkpatrick Level 3 and T2) (Flanagan et al., 2007; Kneebone, Scott, Darzi, & Horrocks, 2004; McGaghie et al., 2006). However, the number of hours of practice or number of exposures to a SBL to achieve long-term skill acquisition is unknown. Determining this would require longitudinal studies to track achievement and retention of learning outcomes (Blum & Parcells, 2012; Laschinger et al., 2008). Cook and colleagues (2011) conducted a large systematic review and meta-analysis from 92 studies across healthcare disciplines and modalities of technologically enhanced simulations and reported large effect sizes for outcomes on knowledge, skills, and behaviors and moderate effects on patient care outcomes. Cook proposes research direction now be directed at how to use simulation most efficaciously and cost-efficiently.

Nestel, Groom, Eikeland-Husebø and O'Donnell (2011), in a SSH research consensus report, concluded simulation resulted in improved knowledge and skill when learning procedural skills (Kirkpatrick Level 2b). This consensus report drew from both medical and nursing studies. However, of the 81 studies reviewed, 52 were case study or posttest with no control group. Similarly, McGaphie and colleagues (2011) reported in another SSH research consensus report the impact of simulation on translational patient outcomes and concluded T2 (also Kirkpatrick Level 3 Learning) and T3 (also Kirkpatrick Level 5 Learning) can be achieved by educating providers in thematic, sustained, deliberate, and cumulative simulation programs. An interesting conclusion reported by Harder (2010) in her systematic review, was the discovery that nursing studies tended to include both quantitative and qualitative techniques, whereas, medical studies tended to

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be more quantitative in nature. The need for skill mastery in surgical and diagnostic procedures and treatments most likely drives the need for these types of empirical studies.

**Unclear aspects regarding educator and program.** It is unclear what level of knowledge, experience, and training is essential for educators using SBL. As such, it is uncertain if educators should have certificates for use of simulation. Certificate programs for educators and training courses on SBL have gained interest (Jeffries, 2008) with several institutions offering certificates in simulation technology and learning (Bryan Health College of Health Sciences, 2013; College of Nursing and Health Professions, University of Southern Indiana, 2010; NLN-SIRC, 2013). However, an argument against this is that educators are not required to have certificates for teaching in the actual clinical environment. This raises the question of whether SBL, as an alternative clinical experience, is being held to a different standard.

It is unclear how many SBL experiences/hours can be shifted from clinical hours to simulation. This is a heightened discussion between educators and program administrators with program ramifications (Hayden, 2010). Currently, nursing programs are debating how to use SBL as a replacement of clinical experiences including the ratio of SBL clinical hours compared to actual clinical experience hours. Faculty from various nursing programs are commenting within the INACSL list serve about their program's decisions to allow two to three hours of SBL as an equivalent replacement to one hour of actual clinical hours. Yet, there is no evidence to support or refute these decisions. Several state Boards of Nursing (BON) have placed limits on this ratio. In 2009, the National Council of State Boards of Nursing (NCSBN) surveyed state BON on whether they have administrative rules related to simulation (Hanberg & Baraki, 2009). Of the 40

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state BONs that responded, seven had rules that addressed simulation. In addition, six state BONs reported a limit on how much simulation can replace clinical experiences. The limit ranged from one state with less than 10 percent, two states with 11-20 percent, and five states allowing up to 21-30 percent. In a 2010 nationwide survey administered by the NCSBN (Hayden, 2010), 77 percent of nursing programs indicated they were or were planning to use SBL as a substitute for clinical experiences. According to Laschinger (2008), SBL can be used as an adjunct and not a replacement to clinical practice in pre-licensure health education programs. In fall of 2011, the NCSBN (2010b) initiated a national, multi-site, longitudinal simulation study. This study follows undergraduate nursing students with SBL as clinical substitutions from less than 10 percent, to 25 percent, to 50 percent. These students will be examined on whether the amount of SBL affects outcomes on knowledge and clinical competency during their nursing education and at end of first year of practice.

**Unclear aspects regarding simulation design.** It is unclear what educational theories and theoretical frameworks provide the best guidance for SBL design, implementation, and evaluation. Questions remain about whether certain educational theories are better suited for specific SBL activities than others are and how and where they fit in SBL frameworks (Issenberg et al., 2011). Flanagan and colleagues (2007) recommended the need "…to identify educational theory relevant to the use of SBL activities… [as] a critical piece of work that should precede implementation studies" (p. 26). In SBL studies in which learning or educational theory were reported, experiential learning theory predominated (Brannan et al., 2008; Cioffi, Purcal, & Arundell, 2005; Flanagan, Nestel, & Joseph, 2004; Medley & Horne, 2005; Waldner & Olson, 2007).

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Experiential learning included components of learning theories such as behaviorism, constructivism, apprenticeship, situated cognition, and social cognitive theory. Other educational frameworks employed with SBL have included Schon's (1987) theory of reflective thinking (Decker, 2007), Kolb's (1984) experiential learning theory (different from experiential theory used in a general sense) (Waldner & Olson, 2007); Lave's (1988) situated cognition (Elfrink et al., 2010; Kuiper et al., 2008; Monti et al., 1998; Paige & Daley, 2009; Woolley & Jarvis, 2007), Bandura's (1977) self-efficacy theory (Bambini et al., 2009; Sinclair & Ferguson, 2009), and Ericsson's (1993) deliberate practice (McGaghie et al., 2006; Oermann et al., 2010). However, authors have been discussing the need for explicit incorporation of learning theories into SBL more frequently in the literature (Zigmont, Kappus, & Sudikoff, 2011). In one example, Parker and Myrick (2012) offer a mid-range theory of the social/psychological processes involved when selecting SBL as a teaching/learning modality. They challenge educators to examine the meaning behind their teaching schemes as they empower students though the use of fading support within SBL activities.

It is unclear how much realism is needed to optimize student learning (Adams et al., 2008a; Adobor & Daneshfar, 2006; Beaubien & Baker, 2004; Dieckmann et al., 2007; Grant et al., 2008; Neill & Wotton, 2011; Salas et al., 2005; Waxman, 2010). Some educational researchers assert use of higher fidelity incorporating simulation technology does not lead to greater learning (Adobor & Daneshfar, 2006; Beaubien & Baker, 2004; Bligh & Bleakley, 2006; Cook et al., 2011; Dieckmann et al., 2007; Dieckmann, 2009). Other researchers assert increasing the realism in SBL cannot compensate for a poorly designed one (Beaubien & Baker, 2004). Furthermore, it is unclear how much support

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should be offered to the student during the SBL activity, for example in the form of cues (Adams et al., 2008a; Adams et al., 2008b; Elfrink et al., 2010; Foronda, Siwei, & Bauman, 2013; Jeffries, 2005; Jeffries & Rodgers, 2007b). The issues introduced in Chapter 1.0 relate, in part, to the lack of conceptual clarity of simulation language and in part to the lack of best educational practices for SBL.

In summary, upon review of what is known about SBL and what aspects of SBL remain unclear, it is evident SBL research is just in its infancy. However, multidisciplinary research efforts are in process, evident by the first ever SSH research consensus conference (Dieckmann et al., 2011). Because of the nature of educational research with the number of confounding variables that can influence learning (student ability, student motivation, learning environment, educator skill along with their various perspectives toward teaching and learning), it comes as no surprise that there are a number of challenges that exist in designing and conducting educational research. Longitudinal research investigating the connection of SBL to achievement of learning outcomes or more importantly improvement in patient outcomes has yet to be determined.

**Section 2.2 National League for Nursing-Jeffries Simulation Framework**

As introduced in Chapter 1.0, the NLN-JSF was developed by nursing scholars from eight institutions in collaboration with Laerdal™ to guide their three year, multisite national study (Jeffries & Rizzolo, 2006). Since the initial publication of the NLN-JSF in 2005, this framework has and continues to evolve as the concepts and theoretical relationships in this framework are refined (Jeffries, 2012). The name changed from Nursing Education Simulation Framework (NESF) (Jeffries & Rodgers, 2007b) to the

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National League for Nursing-Jeffries Simulation Framework (NLN-JSF) decided at the June 2011 INASCL conference. The following describes the development and evolution of this framework and its five conceptual components. During this discussion, Figures 1.1 and 1.2 (Chapter 1.0 pages 14 and 15) are referenced.

**Sphere One – Teacher, Student, and Educational Practices**

As depicted in sphere one (Figure 1.1 or 1.2), the NLN-JSF depicts an interaction between teacher (renamed facilitator), student (renamed participant),[2] and educational practices. The output of this sphere subsequently affects sphere two (simulation design characteristics) and sphere three (outcomes).

**Teacher.** The role of the teacher in SBL can range from a designer, a facilitator, a role character, to an evaluator of SBL. This role entails a student-centered approach rather than a teacher-centered approach, thus the impetus to rename teacher to facilitator. At the time of the development of this framework, characteristics or demographics on what the teacher role entailed were uncertain, thus only "demographic" was listed within the visual of sphere one. Questions persist on characteristics of the teacher role, such as the level of educational preparation needed and the manner in which to offer support to the students.

**Student**. The student role in SBL activities can be as a student in an academic program or as a healthcare provider as a learner participating in a continuing education offering, thus the impetus to rename student to participant. The student role requires self-direction and entails group work and reflective activities. Similar to the teacher role, the role of the student needs further development and research (Jeffries & Rodgers, 2007b).

[2] The use of teacher and student from initial version of the NLN-JSF will be retained in this dissertation since the opinion statements were derived using these terms prior to the 2012 revision of the NLN-JSF.

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Questions persist, for example, about what are ground rules for role assignment, how does competition between students play out in SBL, how is stress and anxiety a factor in learning with SBL, and what are other student variables that influence learning.

**Educational practices.** Educational practices are based on the seminal work of Chickering and Gamson (1987). These seven educational practices include active learning, feedback, student/faculty interaction, collaboration, high expectations, diverse learning, and time of task. Upon development of the NLN-JSF, these seven practices were collapsed into four and include active learning, diverse learning styles, collaboration, and high expectations (Jeffries & Rodgers, 2007b). These four practices became the items measured in the Educational Practices in Simulation Scale (EPSS) (Jeffries & Rodgers, 2007a). The following discusses each of these four practices.

***Active learning.*** Through active participation in simulations, students become engaged and receive immediate feedback both during and after the simulation. Feedback encourages students to make connections between concepts and provides opportunity for faculty to assess student's problem-solving and decision-making skills (Jeffries, 2005; Jeffries & Rodgers, 2007a; Jeffries & Rodgers, 2007b).

***Diverse learning.*** Diversity in student learning styles whether visual, auditory, tactile or kinesthetic learners can be accommodated in a simulation (Jeffries, 2005; Jeffries & Rodgers, 2007b). Additionally, nursing students today have varying cultural backgrounds with new millennium ideals and expectations that can be advantageous for incorporating into simulated experiences (Jeffries & Rodgers, 2007b; Parker & Myrick, 2009).

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***Collaboration.*** Upon review of the literature discussing the NLN-JSF, it is unclear what the concept of collaboration is in reference too. For example, collaboration is used when speaking about the student-faculty interaction and the collaboration needed during feedback (Jeffries & Rodgers, 2007b). Collaboration is also in reference to the teamwork between students and between different disciplines during the simulated activity (Jeffries, 2005; Jeffries & Rodgers, 2007a). Therefore, when rating and evaluating the concept of collaboration it is unclear whether this concerns the student/faculty interaction, collaboration as a teamwork concept, or both.

***High expectations.*** High expectation is referred to as a "self-fulfilling prophecy," both on the part of the student and on the part of the educator as a designer, the operator and the facilitator of the simulation (Jeffries, 2005; Jeffries & Rodgers, 2007a; Jeffries & Rodgers, 2007b). In other words, holding high expectations can lead to positive results. Although it is not completely clear in the literature, time on task, as an educational practice, appears to have been incorporated into this area.

Relevant for this discussion is the linkage of these educational practices (active and diverse learning, collaboration, high expectations) to extant learning theories. Initially, learning theories were not explicit in this framework. Early publications by Jeffries and colleagues (2007b) briefly identified constructivism, cognitive learning, information processing, and the importance of socio-cultural learning as concepts used to develop this framework. More recently, Jeffries (2011) illustrated how three learning theories (learner-centered, constructivist theory, and socio-cultural perspectives with technology) and their underlying assumptions guided the development of this framework. This recent illustration by Jeffries exemplifies the point that in the past use of learning

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theory was obscured in the readings on SBL, but now the need for its explicit description is being more appreciated.

**Sphere Two – Simulation Design Characteristics**

This sphere represents the five design characteristics objectives, student support, fidelity, problem solving, and debriefing. Together, these characteristics comprise the simulation as an educational intervention. These are the phenomena of interest for this study. Each of these characteristics was theoretically defined in Chapter 1.0. What follows is a discussion of the evolution of each of these characteristics. The positioning of each of these characteristics, as interpreted by this investigator in the expanded sphere two, is depicted in Figure 1.2.

**Objectives.** Objectives are pre-determined instructional goals that guide the design, development, and evaluation of the SBL educational intervention. Objectives focus the purpose of the simulation and should relate to curricular goals (Jeffries, 2005; Jeffries & Rodgers, 2007a; Jeffries, 2011). Both the terms *objectives* and *information* are used in reference to this design characteristic. Objective is a well-recognized and used term in education. However, what is meant by information is unclear when reviewing the literature on the NLN-JSF. At times, information refers to what the student needs to learn (Jeffries & Rodgers, 2007a), other times information is in reference to what is provided to the student before and during the simulation. Visually (arrow depicted in Figure 1.2 expanded sphere two), objectives are provided to the student in the pre-briefing.

**Student support.** Support is given to the participant via information provided before, during, and after the simulation in order to help the participant progress through the scenario and increase opportunity to meet the objectives of the SBL educational

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intervention (Jeffries & Rodgers, 2007a). Note that in the revised NLN-JSF, student was renamed participant, yet student support (as opposed to participant) remained as a design characteristic in the model but was referred to as 'participant support' in the second edition. The educator determines how much and when to provide student support. Support is offered in preparatory documents prior to the SBL educational intervention (Jeffries, 2005; Jeffries & Rodgers, 2007a). However, it is unclear how this differs from the information that is associated with the *objective* design characteristic. Cueing is a component of student support and consists of responses or actions that help the student progress through the SBL educational intervention by offering more information for the student but not interfere with the student's independent thought (Jeffries & Rodgers, 2007b). The term cue was originally used for this characteristic (Jeffries, 2005), then evolved into student support (Jeffries & Rodgers, 2007b), and now reappears in conjunction with 'participant support' (Jeffries & Rogers, 2012). In addition, the term feedback, defined by INACSL (Meakim et al., 2013) as "information given or dialogue between participants, facilitator, or the simulator with the intention of improving the understanding of concepts or aspects of performance" (p. 56) obscures with the concept of student support. Further discussion on use of the terms student support and feedback occurs in Manuscript One. Visually (arrow depicted in Figure 1.2 expanded sphere two), student support is offered during the pre-briefing, simulation activity, and during the debrief.

**Fidelity.** Fidelity as defined in the NLN-JSF refers to the extent that a simulation mimics reality (Jeffries & Rodgers, 2007b). Based on the lack of clarity in how this term is used in the literature, this investigator developed a Fidelity Matrix that is visually

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represented within the expanded sphere two (Figure 1.2) and discussed further in Manuscript One. The Fidelity Matrix is bracketed by modes of thinking of reality (physical, psychological, and conceptual dimensions) with each on a range from low to medium to high. Jeffries reported at the June 2011 INACSL conference similar thoughts of how these realism concepts, posited by Beaubien and Baker (2004) and Rudolph and colleagues (2007), contributed to clarifying fidelity as a design characteristic. These thoughts continued with her second edition (Jeffries & Rogers, 2012).

**Problem Solving.** Problem solving (originally called complexity) happens when opportunities are created to engage students in tasks that are structured to increase knowledge, skills, and challenge beliefs. The level of complexity designed into a simulation activity is matched to the learning objectives (Jeffries & Rodgers, 2007a). A model entitled *Nursing Skill Development and Clinical Judgment Model* (Meakim et al., 2013) developed by the INACSL organization offers guidance to educators as they design problem solving into simulation activities. This model is comprised of critical thinking, problem solving, psychomotor skills, clinical reasoning, and clinical judgment as five interactive levels of learner development. Groom and colleagues (2013), in a state of the science review of the NLN-JSF simulation design characteristics, suggest reverting back to the term complexity as it is a more appropriate term for this design characteristic. In their explanation for this suggestion, complexity is a broader and more comprehensive term, whereas problem solving reflects one of five components evident in the *Nursing Skill Development and Clinical Judgment Model*. Visually (arrow depicted in Figure 1.2 expanded sphere two), problem solving occurs during the simulation activity as well as during the debriefing session.

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**Debriefing.** Debriefing is an activity that follows simulation experiences and is led by a facilitator who encourages participants' reflective thinking and offers feedback on participants' performance (Meakim et al., 2013). Guided reflection is the process conducted during the debriefing that reinforces critical aspects of the simulation activity, promotes insightful learning and assimilates theory into practice (Meakim et al., 2013). Visually (depicted in Figure 1.2 expanded sphere two), debriefing occurs as its own entity following the simulated activity.

**Sphere Three – Outcomes**

Sphere three is the final component and output of the NLN-JSF. Currently, five outcome measures are represented in the NLN-JSF and include learning (knowledge), skill performance, learner satisfaction, critical thinking, and self-confidence outcomes. As this sphere is not the phenomena of interest for this study, only general discussion points are offered on outcome measures. Educational research that investigates learning outcomes is complicated by a variety of confounding variables that lead to methodological challenges (Flanagan et al., 2007). Evaluation of learning outcomes considers a variety of domains referred to as (a) cognitive/knowledge/'minds-on', (b) psychomotor/skill/'hands-on', and (c) affective/attitude/'hearts-on' domains of learning (Kiat et al., 2007; Kraiger, Ford, & Salas, 1993). Various instruments to measure clinical judgment and clinical performance have been designed. Some of these instruments include: (a) outcome present state test model debriefing tool (Kuiper et al., 2008); (b) Lasater's clinical judgment simulation tool (Lasater, 2007a); (c) clinical simulation evaluation tool (Radhakrishnan et al., 2007); and (d) objective structured clinical evaluation (OSCE) (Alinier, Hunt, Gordon, & Harwood, 2006; Moule, Wilford, Sales, &

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Lockyer, 2008). However, the challenge with these instruments is establishment of reliability and validity as well as their use for a variety of SBL topics. The lack of valid and reliable tools (Harder, 2010) has resulted in a proliferation of clinical performance/judgment tools for SBL. A literature review by Kardong-Edgren and colleagues (2010) resulted in location of 22 instruments that are currently in use or in development for measuring learning outcomes following a SBL experience. Based on their review, Kardong-Edgren and colleagues recommended a moratorium on the indiscriminate development of new evaluation tools for SBL and instead encouraged research efforts to test the validity and reliably of these tools. It is worth noting more effort has been invested in the design and psychometric testing of SBL evaluation instruments than what has been invested in actual clinical evaluation instruments (Kardong-Edgren, 2010b).

Jeffries and other nurse scholars from INACSL have recognized the need to review and refine this framework (Jeffries, 2011; Ravert, June 2011). As a result, evaluation of the NLN-JSF simulation framework was undertaken (2011-2013) with the purpose to further define the concepts/constructs in this framework as well as evaluate its potential as a theory. In 2013, a 'think tank' endeavor began to advance this framework into a theory (Ravert & McAfooes, 2013) and efforts remain in process. In the meantime, Lafond and Van Hulle Vincent (2012) analyzed the NLN-JSF and concluded this framework offers educators a structure for constructing and implementing simulation experiences. However, congruent with this current review, they identified the need for consistent use of terminology and establishment of clarity in conceptual definitions.

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## Section 2.3 Perspectives on Teaching

Lastly, perspectives[3] on teaching are reviewed. A perspective is the lens through which we, as educators, view our work (Pratt, 1998). It is the lens looked through verses looked at. Pratt (1998) gives the analogy, "just as the world above the pond is invisible to a fish, so too are other perspectives invisible to those who only know one perspective on teaching" (p. 34). Therefore, in order to understand one's own perspective, one needs a reference point for comparison. These reference points are the perspectives of others.

Perspectives on teaching were introduced in Chapter 1.0 and take into account a variety of elements (teacher, learner, content, context, beliefs) and the relationship between these elements (Pratt, 1998). Perspectives are based on action, intent, and beliefs that form one's commitment to teaching (Pratt, 1998). Of these three components of commitment, beliefs are the most stable, least flexible, yet often remain hidden from view (Pratt, 1998). Without gaining an understanding of underlying beliefs (ideals and values) behind teaching practices, educators are at risk for misunderstanding the reasons behind their teaching practices. Therefore, personal introspection on one's own beliefs and those of others broadens one's awareness and understanding of what constitutes effective teaching. This can subsequently enhance the ability to provide effective feedback to colleagues (Courneya et al., 2008).

Exploring epistemic beliefs is not as obvious or as easy as one may think. It takes time and effort on the part of the educator to reflect on teaching/learning practices. This is consistent with Keskitalo's (2011) discovery while investigating healthcare educators'

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[3] Perspectives and perceptions are terms both located when reviewing literature on teaching perspectives. Dictionary definition of perspective refers to the interrelation in which a subject or its parts are mentally viewed or a point-of-view (Merriam-Webster, 2012). Definition of perception includes the act of apprehending by means of the senses or of the mind, cognition, understanding (Merriam-Webster, 2012). Based on these definitions, perspectives is the term selected for use in this study.

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use of virtual learning techniques. It became apparent educators have difficulty formulating and expressing one's concept of learning.

In order to facilitate reflective thought, Pratt, Ball, and Collins (2007) provide a series of questions specifically generated for nurse educators to ask themselves as they delve into and uncover beliefs. A sampling of these reflective questions is represented in Table 2.3. Pratt and colleagues consider it not just sufficient to identity one's perspective but to ask, "what difference does it make where I stand [in perspective(s)] as a nurse educator?" (Pratt et al., 2007, p. 57).

Table 2.3

*Sampling of Reflective Questions to Uncover Epistemic Beliefs*

- How does prior knowledge influence what students learn?
- What personal theories or assumptions do students bring to their training that are most resistant to change?
- What characterizes the "novice to expert" professional thinking in nursing practice?
- How would students know themselves, which level of professional thinking they had achieved?
- Should students be involved in deciding what forms of evidence are fair indicators of their learning or performance? If you as an educator believe this so, why or why not?
- What is the nature of the role between the teacher and student?
- How do you know you have been successful as a teacher?
- Do you view students as wanting to learn or as if they have to learn? (added by this investigator)

*Note*. Source (Pratt, 1998, p. 267-268; Pratt et al., 2007, p. 58)

Pratt (2007) notes, upon his review of nursing educational literature, that educators use teaching and learning strategies that are widely generalized across settings, content, and educators. In light of this assertion, Pratt considers it essential for educators to expose their underlying values and biases behind use of these teaching/learning strategies. Teaching strategies are only tools and these tools cannot be separated from the educator's understanding of how to effectively use the tools (Pratt et al., 2007). Without

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first gaining this understanding, educators "risk interpreting the literature base as though it were a set of universally appropriate guidelines that apply equally well across all types of learning… and teachers" (Pratt et al., 2007, p. 50).

As a notable educational researcher with over 20 years of research, Pratt (1998) located five perspectives of teaching derived across a variety of educators, disciplines, and counties. These five perspectives include transmission, apprenticeship, developmental, nurturing, and social reform. Within each of these perspectives, educators vary on four dimensions called *BIAS*es (Pratt et al., 2007). More specifically, *beliefs* about the roles of the learner and teaching, the learning process, and the content and skills to be learnt, *intentions* on what the teacher is trying to accomplish and *action* as the particular ways the teacher uses techniques and methods to help learners learn. Combining *b*eliefs, *i*ntention, and *a*ctions used by an educator results in his/her *strategies* for strategic thinking, decision-making, and instructional practices (Pratt et al., 2007).

A fundamental difference in perspectives held by one educator compared with another educator comes from the importance each educator assigns to the elements; teacher, learner, content, context, beliefs, and their relationships (Pratt, 1998). Perspectives can be studied from a variety of means. Each means provides a different angle for consideration. For example, surveys with likert-type scales, obtain quantitative data such as frequency and distribution of perspectives. A large majority of studies on SBL have investigated preferences for SBL as a teaching/learning strategy and student's self-assessment of their confidence and gain in cognitive knowledge (noted earlier in this chapter). A few studies have explored the phenomenological experience of participating in SBL (Baxter, Akhtar-Danesh, Valaitis, Stanyon, & Sproul, 2009; Kiat et al., 2007;

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Lasater, 2007b; Moule et al., 2008). A study by Cordeau (2010) investigated the student lived experience of participating in a graded SBL experiences. These qualitative studies offer a different angle for understanding phenomenon, how manifested, and underlying processes (Polit & Beck, 2012).

Q-methodology is a research approach that applies both qualitative and quantitative techniques (Watts & Stenner, 2012). Q-methodology allows for investigation of phenomena that other survey or phenomenological studies are not able to explore, that is the salience of consensus and opposing viewpoints determined from self-referent rank-ordering of opinion statements (Akhtar-Danesh, Baumann, & Cordingley, 2008; Brown, 1980). Two studies by Akhtar-Danesh and colleagues (2009) and Baxter and colleagues (2009) investigated faculty and nursing student perceptions of SBL. Both studies drew Q-sorts (opinion statements) from the same concourse of 104 statements. Akhtar-Danesh and colleagues (2009) found four perspectives held by nurse faculty: positive enthusiastics, supporters, traditionalist, and help seekers. Baxter and colleagues (2009) found four perspectives held by nursing students; reflectors, reality skeptics, comfort seekers, and technology savvies. These two studies investigated perspectives of simulation from a broad overview. To date, no studies in nursing education have deconstructed the simulation experience and investigated perspectives toward design features or have compared perspectives held by nurse educators to nursing students.

In the following sections of Chapter 2.0 are two manuscripts prepared for publication. The first manuscript is a review of the literature about simulation fidelity and cueing. Manuscript One was accepted for publication in the journal *Clinical Simulation in Nursing* and became available online ahead-of-print in April 2013 and official

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publication in November 2013. This journal is the official publication of the International Association for Clinical Simulation and Learning (INASCL) having its inaugural issue in 2009. Manuscript One, as included in this dissertation, is identical to the manuscript that was published in *Clinical Simulation in Nursing*.

The second manuscript is a review of the literature about theoretical frameworks developed to offer guidance to educators employing simulation pedagogy. Manuscript Two was submitted to the *Simulation in Healthcare* journal. This journal is the official publication of the Society for Simulation in Healthcare (SSH) having its inaugural issue in 2006. This multidisciplinary journal encompasses all areas of simulation applications as well as basic, clinical, biomedical, and translational research in healthcare simulation (SSH, 2012). Based on feedback from reviewers for the journal *Simulation in Healthcare,* the editor asked that the manuscript be revised and resubmitted for review. Manuscript Two, as included in this dissertation, is the original submission to *Simulation in Healthcare* without revisions for resubmission.

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**Section 2.4 - Manuscript One "Simulation fidelity and cueing: A systematic review of the literature"**

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This article was a component of the doctoral dissertation by Jane B. Paige titled *Simulation design characteristics: Perspectives held by nurse educators and nursing students*. This study is in process with requirements for dissertation anticipated for completion fall 2013 for submission to the University of Wisconsin-Milwaukee.

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**Abstract**

Even as simulation use in healthcare education has proliferated, there are terms used in simulation design that often lack clarity, in particular - fidelity and cueing. To gain a better understanding of these terms this article reports a systematic review of the literature for attributes and definitions of fidelity and cueing. Inclusion criteria included theoretical, educational, and empirical literature across disciplines that use simulation for educational/training purposes. Excluded were publications with a non-human, non-educational, or primary/secondary school focus. Search strategies yielded 248 publications of which 13 met inclusion criteria. Results indicate fidelity is a multi-dimensional concept forming a matrix comprised of physical, psychological, and conceptual dimensions. Cueing is comprised of two types, reality and conceptual cues, with mode of delivery enacted via equipment, environment, or patient/role characters. This article offers implications for simulation design considering the attributes of fidelity and cueing.

*Keywords*: fidelity; cueing; simulation; instructional support

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## Simulation fidelity and cueing: A systematic review of the literature

Despite the proliferation of simulation in healthcare education there remain terms used in simulation design that are ambiguous and often lack clarity (Alinier, 2007; Dieckmann et al., 2011; Jeffries, 2005; LaFond & Van Hulle Vincent, 2012; Schiavenato, 2009). In particular, the terms *fidelity* and *cueing* are frequently seen in the literature but often it is difficult to discern their meaning. Given the frequency of these terms, it is possible that authors assume readers understand what comprises fidelity and what constitutes cues. However, when ambiguity in terminology exists it becomes difficult to surmise, evaluate, and incorporate knowledge about fidelity and cueing gained from various sources into educational practice and research. In order to gain a better understanding of the extent of this ambiguity we systematically reviewed the literature for attributes and definitions of fidelity and cueing as used in educational simulations.

### Background

Simulation as a teaching/learning tool and strategy for healthcare education has grown exponentially worldwide (Dieckmann, 2009). However, use of simulation is not unique to the education of healthcare professionals, but is used in business (Adobor & Daneshfar, 2006; Stainton et al., 2010), aviation (Alessi, 2000b; Rehmann et al., 1995), engineering (Alessi, 2000a), by the military (Bruce et al., 2003), by those investigating human-computer interactions (Dahl et al., 2010), and in general and higher education (Adams et al., 2008a). Simulation as defined by Gaba (2004) is "…a technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion" (p. i2). Additionally, simulations are designed based on dimensions

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of applications (Gaba, 2004), typology of technological simulation levels (Alinier, 2007), and modalities of use (Decker et al., 2008). Simulation, as an educational intervention, typically involves a pre-briefing, the simulation activity itself, followed by a debriefing (Harder, 2010; Neill & Wotton, 2011).

When designing and conducting simulations, fidelity becomes an important concept (Alessi, 2000b; Issenberg et al., 2005; Jeffries, 2005). Historically, conversations about fidelity began in the field of aviation (Rehmann et al., 1995), but entered the vocabulary of other disciplines as they incorporated simulation into training and education (Beaubien & Baker, 2004; Dieckmann et al., 2007; Jeffries, 2005). Likewise, the term cueing, prevalent in aviation (Rehmann et al., 1995), computer sciences (Alessi, 2000a), and human factor (Ho, Nikolic, Water, & Saerter, 2004) literature, has recently joined the vocabulary of healthcare educators. However, the degree of conceptual clarity in language when used by healthcare educators is unknown.

Recognizing the need for conceptual clarity, recent efforts to define simulation terminology for healthcare education exist (INACSL Board of Directors, 2011; NLN-SIRC, 2012). Additionally, instruments evaluating simulation design characteristics are available. As an example, the Simulation Design Scale (SDS) (Jeffries & Rodgers, 2007a) provides quantitative data about simulation design characteristics. Such an instrument asks raters whether “the scenario resembled a real-life situation” or “cues were appropriate and geared to promote my understanding” (Jeffries & Rodgers, 2007a, p. 95). However, when interpreting SDS scores, the conceptual meaning raters attribute to items is unknown. Since rating of items is influenced by raters’ subjectivity of what are real-life situations or what is a cue, it is possible raters and educators may be thinking of

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different things when scoring and interpreting the items. Consequently, uncertainty may exist in what, if any, revisions in simulation design are necessary. Moreover, across studies that have used the SDS to evaluate simulation activities, scale ratings consistently fall at or above agree (range 1 [strongly disagree] to 5 [strongly agree]) with minimal variation (Dobbs et al., 2006; Reese, Jeffries, & Engum, 2010; Sittner, Schmaderer, Zimmerman, Hertzog, & George, 2009; Smith & Roehrs, 2009). This minimal variability in ratings may reflect the limited discriminatory ability of the SDS. Even with established reliability and content validity (Jeffries & Rodgers, 2007a), its construct validity is unknown. Construct validity refers to whether what is being measured accurately represents a theoretical construct (Waltz et al., 2010). Since conceptual analysis of fidelity and cueing has not been undertaken, establishing construct validity is difficult. Reviewing the literature for attributes and definitions of fidelity and cueing is a start toward greater conceptual clarity.

## Method

### Review Questions

The Best Evidence Medical Education (BEME) Guide No. 13 (Hammick, Dornan, & Steinert, 2010) indicates formulated review questions are vital for conducting systematic reviews. Considering our aim to examine the attributes and definitions of fidelity and cueing in literature discussing healthcare simulation, the following questions guided our review:

1. What are attributes and definitions of fidelity used in the context of healthcare educational simulations?

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2. What are attributes and definitions of cueing used in the context of healthcare educational simulations?
3. Considering attributes of fidelity and cueing, what are implications for design of educational simulations?

**Search Strategies**

A systematic process to search the literature optimizes the ability to locate relevant literature while providing a transparent and replicable process (Hammick et al., 2010). In this comprehensive review, we performed separate literature searches for fidelity and cueing using the databases and keywords identified in Figure 1. We limited the search to scholarly publications from 2000-2012, in English, and inclusive of theoretical, educational, and empirical literature. Since it was important to access various disciplines that use simulation for educational and/or training purposes, search strategies were not limited to any specific discipline or country. Furthermore, when conducting systematic reviews on educational topics, the BEME guide suggests supplementation with hand searches due to the newness of pedagogical research. Based on this suggestion, ancestral searching of reference lists and hand searching of two journals, *Simulation in Healthcare* and *Clinical Simulation in Nursing,* supplemented our process.

These search strategies produced 248 publications. We screened these sources and excluded ones that had a non-human, non-educational focus, and/or were limited to primary or secondary school students. Applying these exclusions yielded 59 publications. Ancestral and hand searching added seven publications and one web-based resource. Following a second round of exclusion criteria for absence in defining or describing fidelity and/or cueing, 13 publications constituted our final sample.

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### Data Collection

Extracted data were organized by author, type of publication, discipline and context, definitions, attributes, and implications for simulation design (Tables 1 and 2). Entries in tables were purposely ordered by date of publication to reflect topic discussion over time. Note three authors had more than one publication reviewed for cueing, while two authors and one professional organization had publications reviewed for both fidelity and cueing.

## Results

### Review question one -Fidelity

This question addressed the assessment of attributes and definitions of fidelity used in the context of healthcare educational simulations. Six publications provided information about fidelity including one publication added (Rehmann et al., 1995) as a reoccurring reference and the Simulation Innovation Resource Center (SIRC) as a web-based resource center (NLN-SIRC, 2012). Since attributes of a concept typically drive its definition, they are discussed first.

**Attributes**. As one reviews the literature, the complexity of fidelity and its variability in description becomes apparent. Depending on the source, the number, type, and means to categorize attributes of fidelity dimensions vary (Table 1). For example, Rehmann (1995) in the context of aviation, conceptualized fidelity as having two major dimensions: equipment and environmental. He considered fidelity a function of the degree to which equipment and environmental cues distinguish information as real (objective fidelity) or as subjectively experienced (perceptual fidelity).

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Alessi (2000b), as an educational psychologist, conceptualized perceptual, functional, and model attributes of fidelity. Perceptual attributes of fidelity include the degree to which the simulation feels, appears, and sounds like the real thing, functional attributes of fidelity describe how to operate the simulator and provide responses to learner actions, while model attributes of fidelity captures the extent the logical model replicates the particulars of the real thing.

Building on Rehmann's (1995) conceptualization of physical and environmental fidelity, Beaubein and Baker (2004) added in a psychological dimension, or the degree to which the learner perceives the simulation as real. This psychological dimension is similar to Rehmann's (1995) and Alessi's (2000b) attributes of a perceptual dimension.

Conversely, Dieckmann, Gaba, and Rall (2007) connected simulation fidelity to Laucken's (1995) three modes of thinking of reality: physical, phenomenal, and semantical. The physical mode of thinking compasses the degree to which the simulator and/or simulation environment displays physical attributes. The phenomenal mode of thinking embraces the emotions, beliefs, and self-awareness of learners in the simulation experience, while the semantical mode of thinking concerns how concepts and their relationships are seen as real. Dieckmann et al. used the phenomenal and sematical modes of thinking to further differentiate attributes of a psychological dimension of fidelity. They considered participation in a simulation a complex social experience. They stressed the need to match simulation fidelity dimensions with desired learning outcomes but acknowledged uncertainty exists in how this is best accomplished.

Recognizing categorization of fidelity dimensions may be specific to a simulator itself (i.e. cockpit or virtual simulator); Dahl, Alsos, and Svanaes (2010) categorized

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fidelity dimensions in a more general sense. Drawing from the works of Rehmann (1995) and Beaubien and Baker (2004), Dahl and colleagues conceptualized two major dimensions of fidelity: physical (engineering) and psychological dimensions. In this categorization, equipment and environmental attributes are subsumed under the physical (engineering) dimension and task and functional attributes of fidelity are subsumed under the psychological dimension.

**Definitions**. Alessi (2000b) defined fidelity as the "degree to which a simulation replicates reality" (p. 203). This is a simple and clear definition. Recently, the International Association for Clinical Simulation and Learning (INACSL) developed standards for simulation use (2011). A definition of fidelity presented in Standard I states:

> Fidelity is believability, or the degree to which a simulated experience approaches reality...involves a variety of dimensions…physical factors such as environment, equipment, and related tools; psychological factors such as emotions, beliefs, self-awareness; social factors such as…motivation and goals; culture of group; degree of openness and trust, modes of thinking (p. S5).

As can be seen in these two definitions, fidelity is the degree to which a simulation replicates or approaches reality. Even though Alessi's (2000b) definition may seem simple, he acknowledges fidelity is actually quite "deceptive" (p. 203). This becomes apparent in the more elaborate definition offered by INACSL. In the INASCL definition, the physical and psychological attributes are consistent with this review; however, social factors, although not explicit in this review, are similar to what Dieckmann et al. (2007) described as the social practice of a simulation experience. Whether these social factors, identified in the INACSL definition, are antecedents of

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fidelity or a consequence of fidelity remains unclear. Additionally, what appears absent in this definition is the idea of a conceptual dimension of fidelity.

**Fidelity Dimensions**. Making sense of the attributes of fidelity as found in the literature could be somewhat perplexing for the reader. At least twelve different descriptors for attributes of fidelity dimensions are noted (italics in Table 1). However, commonalities among the attributes exist. Considering these commonalities, the following is our categorization of fidelity attributes into three major dimensions. These dimensions form a matrix (Figure 2) comprised of physical, psychological, and conceptual dimensions. Two of these dimensions are further divided; the physical dimension (sub-dimensions of equipment and environment attributes) and the psychological dimension (sub-dimensions of task and functional attributes). Across dimensions range a level of application from low to medium to high. The following details the three major dimensions with examples given for a healthcare context.

***Physical dimension.*** The first dimension of fidelity is a physical dimension that encompasses equipment and environmental attributes. Equipment, for example, is characterized by level of manikin technology or haptic devices that provide tactile feel for motion, vibration, or dynamic forces. Environmental attributes however, are characterized by appearance and layout of the simulated setting as in visuals, sounds, smells, lighting, props that represent the clinical setting. Across the physical dimension, the level of design can range from low to high based on type of equipment and environmental appearances and characteristics. For example, a low physical dimension of fidelity occurs when equipment such as partial task trainers or static mannequin are used by learners to practice and gain competency in simple techniques and procedures (Decker

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et al., 2008). High physical and environmental attributes of fidelity occur with incorporation of computerized full-body mannequins programmable to provide realistic physiologic responses to learner's actions and an environment (Decker et al., 2008) that contains alarm sounds and signals, smells similar to those found in hospital settings, automatic dispensing units for medications, and electronic medical records.

***Psychological dimension.*** The psychological dimension of fidelity is the learner's engagement in and experience with the simulation. This dimension is comprised of task and functional attributes. Task attributes are characterized by the extent to which events and scenario plot reflect real situations, whereas functional attributes are characterized by the extent to which the simulator or simulation facilitator reacts to or provides realistic responses to the actions by learners. Each of these attributes contributes to the level of learner engagement. For example, a situation in which learners experience a well-written simulation scenario, in real-time, while prioritizing a number of tasks contributes to a higher level of psychological engagement. This psychological dimension draws out the learners' emotions, values, beliefs, self-awareness, and motivation (Alessi, 2000b; Dieckmann et al., 2007; Rudolph et al., 2007).

***Conceptual dimension.*** The conceptual dimension of fidelity is the category least described in the literature. This dimension was initially suggested by Dieckmann et al. (2007) employing Laucken's (1995) semantical mode of thinking, but reworded as conceptual by Rudolph et al. (2007). Dieckmann et al. illustrate attributes of conceptual fidelity with this example. A patient simulator with high physical fidelity is programmed to display a drop in blood pressure and reduction in pulse strength with the intent to represent a patient in a state of shock. In this example, the simulation activity has high

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conceptual fidelity if the information offered to the learner is interpretable as representing the concept of a shock state. This level of high conceptual fidelity is central to developing clinical reasoning skills where connecting theoretical concepts, their meaning and relationships are of upmost importance to the learning process.

**Review Question Two - Cueing**

This question addressed the assessment of attributes and definitions of cueing used in the context of healthcare educational simulations. Different terms such as clues, triggers, prompts, hints, and instructional support have been found in the literature associated with the concept of cueing in a simulation activity (Adams et al., 2008a; Alessi, 2000a). Due to the variability in terms surrounding concept of cueing, locating sources defining or describing cueing posed more challenging compared to locating sources discussing fidelity. Nine publications comprised this review.

**Attributes**. Upon review of these publications, attributes of cueing are found when discussions on instructional support occur and when discussions on fidelity occur. For example, Jeffries (2005) talked about cues when she discussed student support as a simulation design characteristic. Cues help the learner reestablish what step he/she is on or offer more information to progress the learner in the scenario (Jeffries, 2005). Alessi (2000a; 2000b) referred to terms such as hints, prompts, help features, feedback, and coaching when he discussed instructional support. Alessi distinguished instructional support from a procedural or conceptual approach by the degree in which hints, prompts, and help features are offered.

Adams et al. (2008a; 2008b) referred to clues and little puzzles as features that encouraged the learner to explore further. They considered it important to distinguish

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between cues that enhance learning and cues that distract learning. Although they did not define cues, we surmised that their intent behind cueing was similar to the intent of cueing as described by Jeffries (2005) and Alessi (2000a).

Dieckmann et al. (2010) used the unique phase "scenario life savers" (p. 219) to describe situations where unexpected learner actions occurred in simulations driving the need to offer learner assistance. According to Dieckmann et al., scenario 'life savers' were necessary when comprehension or acceptance of the scenario by learners becomes compromised or when unanticipated actions by the learner occurred. Although the term cue was not found in this article, the discourse of Dieckmann et al. seemed consistent with others' use of the term cueing.

Furthermore, cues help the learner interpret and clarify the simulated reality. For example, Rehmann (1995) referred to cues when describing how equipment can give reality cues via appearance, feel, motion, and sounds. Similarly, Dieckmann et al. (2007) distinguished fiction cues and reality cues. They defined fiction cues as artifacts, actions, perceptions, and/or structures that emphasize the artificial character of the experience. Conversely, they defined reality cues as plausible artifacts, actions, perceptions, and/or structures that emphasize comparable experiences between the simulated experience and real clinical experiences. For example, if physiological parameters change too quickly from what would be expected in a real patient, this is a fiction cue and contributes to the lack of realism. Similarly, exaggerated non-plausible role-playing is another example of a fiction cue. As can be seen here, Dieckmann et al. used the term cue (reality and fiction) as a means to evaluate the realism of the simulation.

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**Definitions**. Initial efforts to define cueing exist. For example, Jeffries (2007b) defined cues as responses or actions that "offer enough information for the learner to continue with the simulation but do not interfere with his/her independent thought" (p. 29). Members of INACSL (2011) defined cuing [spelling variation] in Standard I as, "information provided that helps the participant progress through the clinical scenario to achieve stated objectives" (p. S4). However, what remains absent is further description of what this information may be, how cues should be executed, and what the relationship between cueing and fidelity is.

**Types of Cueing.** Even as descriptions of cueing exist along with two definitions (INACSL Board of Directors, 2011; Jeffries & Rodgers, 2007b), the definitions remain underdeveloped. As opposed to fidelity as a concept with multiple dimensions, this review reveals the concept of cueing has two distinct purposes. One purpose relates to instructional support (conceptual cues) and the other purpose relates to simulation fidelity (reality cues). The following describes each of these purposes.

***Conceptual cues.*** Conceptual cues help the learner reach instructional objectives. Conceptual cues can be planned *a priori* or enacted *ad hoc* through programmable equipment, environment, or storyline events. Cueing, in this respect, is a form of instructional support with the intent to provide the learner further information or feedback that will move him/her forward in the scenario to reach instructional objectives and/or deal with anticipated and/or unanticipated actions. Cueing can be delivered in one of two ways. First, as delivered via equipment or the environment and second, as delivered via role character responses orchestrated by the simulation facilitator. For example, a mannequin programmed to increase urine output reflects the pharmacological response to

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a diuretic. Alternatively, the mannequin can state, "last time I felt like this the nurse checked my blood pressure" to cue the learner to check the blood pressure when a patient complains of lightheadedness.

***Reality Cues.*** Reality cues help the learner clarify and interpret the simulated reality. Reality cues are features embedded into equipment and the environment designed to offset the limitations between a simulator and what it is simulating. Similar to how conceptual cues can be delivered, reality cues can be triggered technologically via simulator equipment/software or via role character responses orchestrated by the simulation facilitator. For example, a mannequin provides reality cues through palpable pulses or the haptic feel for vein cannulation. Alternatively, as physical assessment findings cannot always be simulated, reality cues can fill this gap in realism. For example, when assessing a patient's strength the mannequin voices, "I am squeezing both your hands equally," thus filling the gap in assessment realism. A summary of the distinction between conceptual from reality cues along with methods to deliver cues is provided in Table 3.

**Review Question Three – Implications for simulation design**

This question addressed design implications for healthcare educational simulations considering the attributes of fidelity and cueing. The following are a few key design implications based on this review.

**Design of cues incorporates fidelity dimensions.** As the simulation activity is configured based on fidelity dimensions, so too should design of cues consider dimensions of fidelity. In other words, we suggest that cues be designed considering physical dimensions of fidelity (equipment or environmentally driven), psychological

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dimensions of fidelity (functional and task responses to anticipated or unanticipated learner action), with the goal to enhance the conceptual dimension of fidelity.

**Pre-test the simulation scenario and cueing execution.** This review offers support for careful pretesting of simulation scenarios. Simulation facilitators should discuss with learners the nuances that exist between simulated reality and actual reality. If learners are not able to make this distinction, it is possible false learning will happen. Dieckmann (2007) applies the concept of ecological validity when explaining this phenomenon. There is no guarantee that the simulated experience is comparable to the actual clinical experience. Investigating this comparison for ecological validity is crucial.

Adams et al. (2008a; 2008b) provide some cautionary measures for execution of cueing. Inconsistent cues between simulations can be confusing for the learner. This confusion can occur when an object or concept is represented differently from simulation to simulation. If the simulation misrepresents reality and this misrepresentation was not explained to the learner from the onset, mistrust in the simulation activity or facilitator may happen.

**Define and report fidelity dimensions.** Evidence from this review supports using multidimensional definitions to describe fidelity. This was a recommendation initially suggested by Rehmann in 1995 but remains unutilized. Typically, when fidelity is addressed in the literature, the descriptors high, medium, or low have been used. It is unclear whether this leveling is in reference to physical (equipment/environmental), psychological (task/functional) or conceptual fidelity. Whether this was due to lack of awareness of fidelity as a multidimensional concept or based on an assumption readers comprehend fidelity remains unclear. This lack of clarity can contribute to reader

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confusion on what dimensions of fidelity are incorporated into various simulations. Hence, it is vital to develop quantifiable means to measure simulation fidelity across each of the different dimensions and sub-dimensions.

**Appropriately configure fidelity dimensions and levels.** Simulation designers should thoughtfully consider what matrix, or range in level (low to high), of physical, psychological, and/or conceptual fidelity dimensions each simulation needs. High levels across all dimensions may not be necessary. For example, an ideal fidelity matrix for learning a new skill (e.g. feeding tube placement) may involve high physical, low psychological, and medium conceptual fidelity. However, as learning progresses, the level of psychological and conceptual fidelity dimensions maybe increased according to the complexity of the situation (e.g. feeding tube placement in a confused and restless patient). Applying insights gained from this review, Figure 3 embeds the fidelity matrix within the larger context of a simulation. As mentioned earlier, a simulation is comprised of a pre-brief, simulation activity, and debrief. This fidelity matrix provides guidance to design the ideal configuration of modalities, scenario storyline, and execution of reality and conceptual cueing for a simulation activity. These are just a few design implications gleaned from this review. Further implications are bulleted in Tables 1 and 2.

## Conclusion

As we evaluated the literature drawn from various disciplines, several patterns became apparent. When members of a discipline first start thinking about fidelity, the initial thoughts are directed at a physical dimension of the concept. However, as disciplines engage in simulation use they become increasingly cognizant that attributes of the physical dimension are not sufficient to capture the complexity of the concept of

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fidelity. Further reflection has led to the recognition of a psychological dimension and more recently a conceptual dimension of fidelity. Furthermore, design of reality cues and conceptual cues need development with fidelity dimensions in mind.

Research is needed to develop a knowledge base about fidelity matrix configurations for a well-designed simulation. Many times, sophisticated technological options for equipment and environments may be unnecessary. It is important to understand and appropriately incorporate design features, since costly full mission simulations are not always necessary for all training goals (Alessi, 2000a; Beaubien & Baker, 2004; Dieckmann et al., 2007). Cueing, on the other hand, lacks investigation evident by the minimal attention given in the literature to the design and execution of cueing. This review offers educators and researchers a visual of a fidelity matrix and a description of two types of cueing. Employing this fidelity matrix while considering the two types of cueing and method of delivery may offer educators further conceptual clarity to advance the pedagogy of educational simulations.

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Figure 1

*Literature Search Process for Fidelity and Cueing*

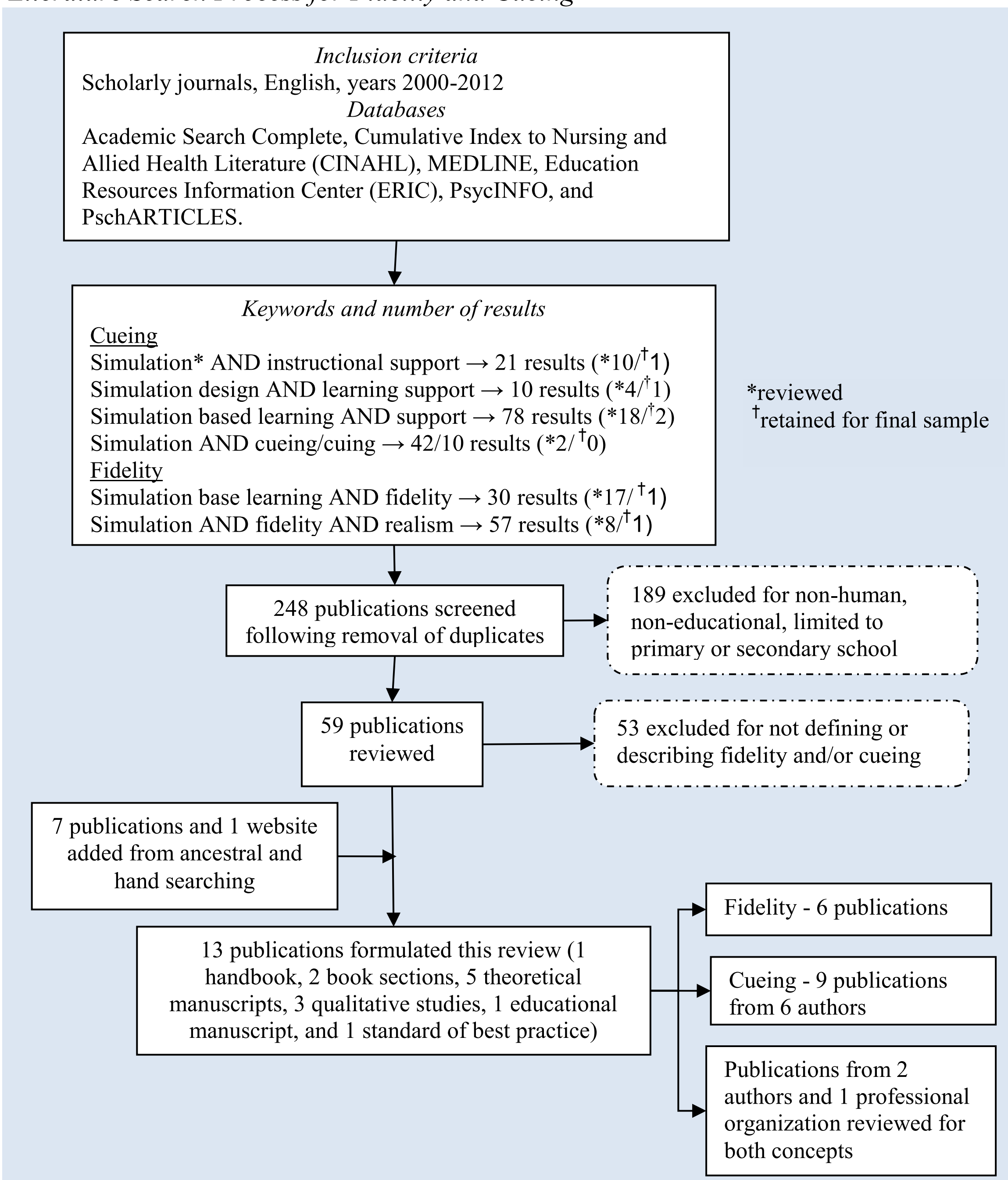


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Figure 2

*Fidelity Matrix*

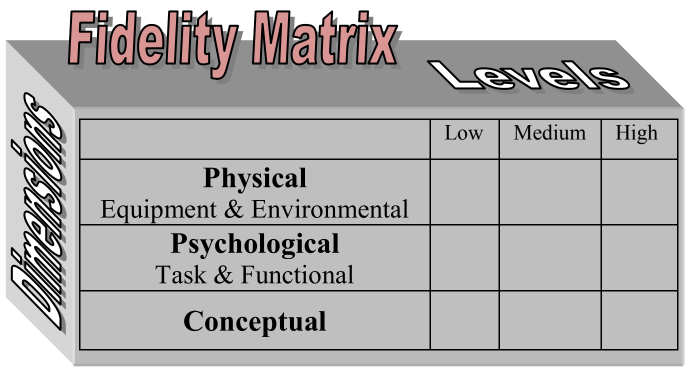


Figure 3

*Simulation Educational Intervention*

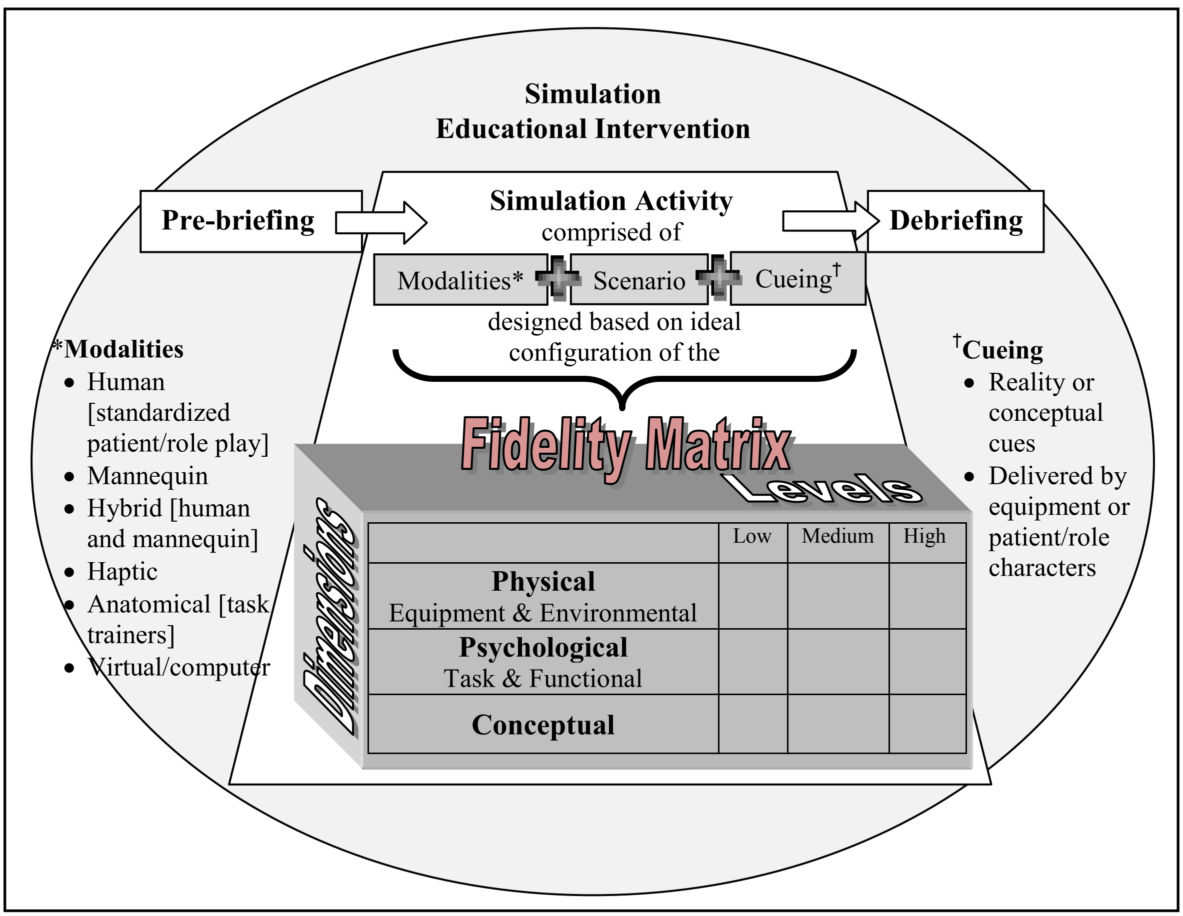


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Table 1

*Fidelity as a Simulation Design Concept*

| Author(s) Publication | Discipline Context | Definition | Attributes | Implications for Simulation Design |
|---|---|---|---|---|
| **Rehmann, Mitman and Reynolds** (1995)<br><br>Handbook | Aviation<br><br>Flight training | *Fidelity* is a multivariant construct that can be configured into two main dimensions - *equipment* and *environmental*.<br><br>Rehmann also refers to different components of fidelity such as *task*, *functional, perceptual, psychological,* and *scenario* fidelity. | ▪ Behavioral processes determine the fidelity components needed.<br>▪ User does not generally accept a deviation in fidelity from a real event unless it is identified at the beginning of simulation activity.<br>▪ Fidelity is a function of degree equipment and environmental cues are distinguished as real (objective fidelity) or as subjectively experienced (perceptual fidelity). | ▪ Change up fidelity requirements depending on the objectives of the simulation activity.<br>▪ Strive for a full-mission simulation with high fidelity in all dimensions including scenario fidelity.<br>▪ Quantitative methods of defining and classifying fidelity need investigation.<br>▪ Utilization of too high fidelity can result in unwanted variance in the behavior being evaluated.<br>▪ Dimensions for fidelity evaluation include three areas - the simulator, the operator (specific tasks the operator will conduct), and the processes or events external to the simulator itself. |
| **Alessi** (2000b)<br><br>Book section | Educational psychology<br><br>Flight training Virtual simulations | *Fidelity* is the degree to which the simulation replicates reality.<br><br>*Perceptual fidelity* - the degree the simulation looks, feels, and sounds like the real device or phenomenon.<br><br>*Functional fidelity* - how to control or operate the simulation and responses to actions. | ▪ Fidelity varies for different parts of a simulation. A simulation may need high fidelity for some aspects of the simulation and low fidelity for other aspects.<br>▪ Learners' perception of fidelity is more critical than actual fidelity.<br>▪ Perception of fidelity is relative to the complexity of the phenomenon, to the learners' prior experience | ▪ Higher fidelity is more important for advanced learners, transfer of knowledge, and assessment. |



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| Author(s) Publication | Discipline Context | Definition | Attributes | Implications for Simulation Design |
|---|---|---|---|---|
| | | *Model fidelity* – the extent to which the math or logical model replicates the intricacies of the real device or phenomenon | with simulation, and the mode of delivery of the simulation. | |
| **Beaubien and Baker** (2004)<br><br>Theoretical manuscript | Industrial and organizational psychology<br><br>Healthcare providers and teamwork training | *Equipment fidelity* is the degree simulator duplicates the appearance and feel of the real system.<br><br>*Environmental fidelity* is the degree simulator duplicates the motion, visual and other sensory information from the environment.<br><br>*Psychological fidelity* is the degree trainee perceives the simulation a believable surrogate. | ▪ Psychological fidelity most important for team training.<br>▪ Fidelity dimensions have profound implications for simulation design<br>▪ Simulation training is categorized into three levels: 1) case studies/role play, 2) part task trainers, and 3) full mission simulation. Within each of these levels, different dimensions of fidelity are incorporated. | ▪ Select the most appropriate category of simulation fidelity best suited for the purpose of the learning activity.<br>▪ Selection of the simulation modality is based in training needs, available resources, and number of learners.<br>▪ Research is needed to empirically validate fidelity dimensions and how/when they overlap with each other. |
| **Dieckmann et al.** (2007)<br><br>Theoretical manuscript | Educational Psychology<br><br>Healthcare providers, social aspects and practices involved in simulations | Simulation realism considers modes of thinking of reality based on the works of Laucken (1995).<br><br>*Physical mode* – simulator and simulation environment described by physical characteristics.<br><br>*Semantical mode* –concepts and their relationships. Happens when information presented is reasonably interpretable for real.<br><br>*Phenomenal mode* –emotions, beliefs, self-awareness of rational thought one experiences in a situation. | ▪ Simulation is considered a social endeavor.<br>▪ As long as learners understand how the experience in a simulation scenario is related to a real clinical experience, they will likely accept physical, semantical and phenomenal differences between the simulated and real setting.<br>▪ The "as-if" concept or what can be called the ability to suspend disbelief, allows for creating semantical and phenomenal reality in scenario design that can compensate for limited physical realities in a simulation compared to real life. | ▪ Establish rituals and rules of the simulation game to help learners move "into and out of" the semantical and phenomenal modes of reality. This reduces learners from developing miss-assumptions from the experience.<br>▪ During debriefing analyze the simulation scenario within the semantical sense the learners constructed and their phenomenal experience. |



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| Author(s) Publication | Discipline Context | Definition | Attributes | Implications for Simulation Design |
|---|---|---|---|---|
| | | | ▪ If learners sense that the simulation was not run according to the rules of the simulation game, they might consider the simulation a deception. | |
| **Dahl et al.** (2010)<br><br>Theoretical and review manuscript | Healthcare providers<br><br>Concept of fidelity dimensions in simulation-based usability assessment of mobile information and communication devices. | *Physical (engineering) fidelity*<br>Subcategories:<br>*Equipment fidelity* (extent to which appearance and feel of real tools is replicated)<br><br>*Environmental fidelity* (extent visual, auditory, and motion stimuli are replicated)<br><br>*Psychological (cognitive) fidelity*<br>Subcategories:<br>*Task fidelity* (extent to which events/tasks/scenarios reflect real situations)<br><br>*Functional fidelity* (extent to which the simulator or simulation facilitator reacts to or provides realistic responses to actions of learners) | ▪ High functional fidelity is required in order for users participating in a simulation to gain understanding of the consequences of their action.<br>▪ Functional and task fidelity are essential for credibility of the simulation.<br>▪ A significant degree of simulation fidelity is necessary for learners to accept the simulation as a replacement for real-world experiences. | ▪ Simulation fidelity needs to be carefully matched to the objectives, content of the training, and training levels of the learners.<br>▪ Increasing psychological (cognitive) fidelity rather than prioritizing engineering fidelity is a more cost-effective approach to simulation design.<br>▪ A simulation-training program requires different levels of simulation fidelity for users as they progress. |
| **INACSL Board of Directors (2011)**<br><br>Standard of best practice | Nursing | *Fidelity* is believability, or the degree to which a simulated experience approaches reality (NLN-SIRC, 2012); as reality increases, realism increases. The level of fidelity is determined by the environment, the tools and resources used, and many factors associated with participants. Fidelity can involve a variety of | ▪ As reflected in definition | ▪ Not applicable |



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| Author(s) Publication | Discipline Context | Definition | Attributes | Implications for Simulation Design |
|---|---|---|---|---|
| Referencing NLN-SIRC (2012) glossary | | dimensions including (a) physical factors such as environment, equipment, and related tools; (b) psychological factors such as emotions, beliefs, self-awareness; and (c) social factors such as participant and instructor motivation and goals; (d) culture of the group; and (e) degree of openness and trust, as well as modes of thinking (p. S5). | | |

Table 2

*Cueing as a Simulation Design Concept*

| Author(s) Publication | Discipline Context | Definition | Attributes | Implications for Simulation Design |
|---|---|---|---|---|
| **Alessi** (2000a; 2000b)<br><br>Theoretical manuscript<br><br>Book section | Relevance for aviation, medicine, engineering<br><br>Virtual simulations | Instructional support includes terms such as hints, feedback, coaching.<br><br>Cues not defined. | ▪ Instructional support (in context of virtual simulations) entails giving hints/prompts (cues) on learner actions, feedback following learner action, offering a 'help' system, providing dictionaries and glossaries, explain or demonstrating the phenomenon or procedure, giving a summary or debriefing.<br>▪ Amount of instructional support offered is based on educational philosophy of discovery (opaque/Black box) or expository (transparent/Glass box) approach. The "black box" is where user sees the inputs and output only (procedural, the how). The "glass | ▪ Simulations for educational purposes need to include instructional support features.<br>▪ Amount and design of instructional support is a function of the philosophy of discovery (black box) or expository (glass box) approach to learning. |



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| Author(s) Publication | Discipline Context | Definition | Attributes | Implications for Simulation Design |
|---|---|---|---|---|
| | | | box" is where user also sees the internal workings of what is happening (conceptual, the why). | |
| **Jeffries** (2005); **Jeffries & Rodgers** (2007b)<br><br>Theoretical manuscript<br><br>Book section | Nursing<br><br>Education | *Cues* are responses or actions that help the learner progress through the simulation by offering more information but that do not interfere with the learner's independent thought. | ▪ Learner support occurs in the form of cues during the simulation such as lab report, phone call, change in vital signs, comments from patient and/or family member.<br>▪ Cues help the learner progress through the simulation by providing information about the step the student is on. | ▪ The simulation facilitator needs to determine how and when to provide cues. |
| **Dieckmann et al.** (2007)<br><br>Qualitative research study | Anesthesio-logists<br><br>Study comparing the experience of participating in a clinical simulation to an actual clinical experience. | *Fiction cues* are elements (artifacts, actions, perceptions) that emphasize the artificial character of the simulation.<br><br>*Reality cues* are elements (artifacts, actions, perceptions) of the simulation that support an experience comparable to clinical experiences. | ▪ Ecological validity considers the subjective experience of the participant in a simulated setting, as known to the researcher, and how this subjective meaning can be generalized to other settings.<br>▪ Learners in a simulation may assign a meaning to simulation scenario unintended by the researcher/educator.<br>▪ The social experience of participating in a simulation follows different rules than the social experience of a real clinical situation. | ▪ Fiction cues should be minimized, while reality cues maximized.<br>▪ Need to investigate how to best use role-playing characters during simulation scenarios. |
| **Adams et al.** (2008a; 2008b) | Higher education for teaching physics | Describes design features such as little puzzles/clues that stimulate learner to explore further | ▪ Small features (cues) encourage user to explore meaning.<br>▪ Cues direct the user to form questions relating to learning | ▪ Eliminate potential distracter cues by avoidance of adding interesting but unnecessary material to simulations. |



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| Author(s) Publication | Discipline Context | Definition | Attributes | Implications for Simulation Design |
|---|---|---|---|---|
| Qualitative research study | Virtual simulations | Cues not defined. | objectives.<br>▪ If features (cues) are too "fun" user may be distracted from learning. A fine line exists between features (cues) that stimulate learning and features (cues) that distract learning.<br>▪ Users look at all features (cues) relevant or non-relevant equally if they do not understand a concept. The irrelevant cues may even be ones experts do not notice.<br>▪ Users place trust in design. If design misrepresents reality, users can be misled. | ▪ Avoid inconsistent cues between simulations. When an object is represented differently from simulation to simulation, users perceive it as two different objects. |
| **Dieckmann et al.** (2010)<br><br>Educational manuscript | Healthcare providers<br><br>Simulation scenarios | Scenario "life savers" are interventions delivered or controlled by the simulation facilitator to help learners achieve learning goals. | ▪ Scenario "life savers" are necessary when comprehension or acceptance of the scenario by learners is compromised or when there are unanticipated actions by the learner.<br>▪ Scenario "life savers" bring learners back on track to the objectives of the simulation.<br>▪ Scenario "life savers" can be given as part of the scenario (inside) or as external to the scenario (outside).<br>▪ Use of a scenario "life saver" requires attention and judgment by the simulation facilitator whether designed *a priori* or created ad hoc or 'on the fly' by the simulation facilitator. | ▪ Simulation designers need to anticipate where users are likely to do something unexpected and be prepared with one or more options for how to respond. |



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| Author(s) Publication | Discipline Context | Definition | Attributes | Implications for Simulation Design |
|---|---|---|---|---|
| **INACSL Board of Directors (2011)**<br><br>Standard of best practice<br><br>Referencing NLN-SIRC (2012) glossary | Nursing | *Cuing* (note spelling variation) is information provided that helps the participant progress through the clinical scenario to achieve stated objectives (p. S4).<br><br>This definition references definition from the NLN-SIRC glossary (2012) which defines a *cue* as information provided by instructors or designated participants in the simulation that helps the student progress through the simulation activity by providing information about the step the student is on or is approaching. | ▪ As reflected in definition | ▪ Not applicable |



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Table 3

*Types of Cueing and Mode of Delivery*

| **Conceptual Cues**<br>(information provided to help learner reach instructional objectives) | **Reality Cues**<br>(information to help learner interpret or clarify simulated reality) |
|---|---|
| *Mode of Delivery* - enacted through programmable equipment, environment, or storyline events.<br><br>Examples of conceptual cueing:<br>• Lung sounds are reprogrammed with crackles and silicone spray added to appear as diaphoresis for patient developing pulmonary edema<br>• Increase in urine output is programmed to occur in response to administration of a diuretic | *Mode of Delivery* - embedded into equipment and environment designed to offset limitations in simulated reality.<br><br>Examples of reality cues:<br>• Patient simulator i.e. mannequin with pulses, heart and lung sounds, ECG reading.<br>• Hospital environment set up with automated medication dispensing unit, phones, suction equipment, supplies, etc<br>• Haptic feel for vein cannulation when performing venipuncture |
| *Mode of Delivery* - enacted through patient responses or role characters.<br><br>Examples of conceptual cueing:<br>• Patient states, "last time I felt like this the nurse checked my blood pressure."<br>• Family member states, "I noticed Sally is breathing faster than she did before."<br>• Nurse walking by room says, "It looks like Sally is having hard time breathing. I wonder if sitting her in a semi-fowlers position would help." | *Mode of Delivery* - delivered through patient or role characters when bewilderment over simulated reality identified by learner and recognized by the facilitator.<br><br>Example of reality cueing:<br>• When there is inability of the mannequin to give realistic assessment findings. The facilitator can provide this information via other means. Example, when assessing patient's strength/movement - patient can state, "I am squeezing both your hands equally." |

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**Section 2.5 - Manuscript Two "Theoretical frameworks for simulation based learning in healthcare education: A systematic analysis"**

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This article was a component of the doctoral dissertation by Jane B. Paige titled *Simulation design characteristics: Perspectives held by nurse educators and nursing students*. This study is in process with requirements for dissertation anticipated for completion fall 2013 for submission to the University of Wisconsin-Milwaukee.

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**Abstract**

Simulation based learning (SBL) in healthcare education has seen an exponential growth. Advancement of educational and engineering technology in creating a real world experience has generated conceptual, theoretical, and pedagogical questions and challenges. Theoretical frameworks have emerged to guide SBL; however, no systematic analysis of frameworks has been published. Five theoretical frameworks developed in response to SBL as a technologically complex, evolving pedagogy are analyzed. This analysis employed Fawcett's criteria for framework origin, unique focus, and content. Inclusion criteria included frameworks applicable for varieties of educational topics, spanning healthcare disciplines, and considered simulation design, implementation, and evaluation. The search strategy located 129 publications of which five frameworks met inclusion criteria. Results indicate frameworks continue to evolve, have unique foci, with further conceptual development needed. This analysis provides comparative information useful for selecting framework(s) within which to place SBL intra and interdisciplinary education and research.

*Keywords*: simulation, simulation based learning, theoretical frameworks, conceptual models

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**Theoretical frameworks for simulation based learning in healthcare education: A systematic analysis**

Higher education prepares students to be safe, effective, and efficient professionals in a chosen field of study. One means by which to prepare students for their professions is to employ teaching/learning experiences that simulate or represent the real work experience and environments. Hertel and Millis (2002) call these teaching/learning experiences educational simulations, examples of which include role-play, skill performance, immersive simulation and simulation based learning (SBL) or training activities. However, the advancement of educational and engineering technology in creating a real world experience generates conceptual, theoretical, and pedagogical questions and challenges. For example, authors acknowledge theoretical inconsistency (Bligh & Bleakley, 2006; Dieckmann et al., 2007; Dieckmann et al., 2011; Kaakinen & Arwood, 2009; Kneebone, 2005; Rourke et al., 2010; Schiavenato, 2009), inconsistent use of terminology (Beaubien & Baker, 2004; Feinstein & Cannon, 2002), and note descriptive rather than critically reflexive discussions on SBL (Bligh & Bleakley, 2006). As a result, educators struggle to increase pedagogical literacy (Ironside, 2001) while they try to make sense of beliefs and assumptions that underpin SBL (Bligh & Bleakley, 2006; Grant et al., 2008).

One means to increase pedagogical literacy is through use of theoretical frameworks that guide knowledge and theory development as well as direct research projects (Fawcett, 2005; Merriam et al., 2007). Recently, experts have focused attention on developing theoretical frameworks in response to challenges associated with SBL (Bligh & Bleakley, 2006; Issenberg et al., 2011). However, no systematic analysis or

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evaluation of these frameworks has been undertaken. The authors aim to fill this void by analyzing theoretical frameworks developed in response to SBL as a technologically complex, evolving pedagogy. Because of this analysis, educators and researchers become better informed of theoretical frameworks, their underlying philosophies, and unique foci for use in designing, conducting, evaluating, and investigating SBL activities.

## Background

Teaching/learning activities, strategies, or instructional methods that use simulation are not unique to just one profession but have been used in business (Adobor & Daneshfar, 2006; Stainton et al., 2010), aviation (Rehmann et al., 1995), by the military (Bruce et al., 2003), engineering (Alessi, 2000a), education (Adams et al., 2008a), and healthcare (Issenberg & Scalese, 2008; Jeffries, 2005). Descriptive use of SBL is well represented in the literature (Kneebone, 2005), however theoretical guidance incorporating evidence-based educational practices for SBL remains in development. Without the evidence and the understanding of how a new pedagogy works, educators are reluctant to try it, being most comfortable with their predominant model of teaching (Ironside & Jeffries, 2010). At present, theoretical considerations to guide simulation design, implementation, and evaluation are underdeveloped and not easily located in the literature. In order to advance SBL as a new (expanded) pedagogy, locating, evaluating, selecting, and applying theoretical frameworks is paramount.

Using SBL theoretical frameworks is beneficial for the educator and the researcher. For the educator, theoretical frameworks provide guidance in instructional design, teaching methodology, and evaluation of learning. For the researcher, theoretical

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frameworks generate questions by identifying relevant variables, concepts, and relationships for investigation (Fawcett & Garity, 2009).

Theoretical frameworks can vary in terms of specificity and abstraction. For example, Fawcett (2005) depicts a structural holarchy of knowledge based on level of abstraction. A holarchy includes parts that are whole in themselves but also parts that comprise a larger system. Within this holarchy, Fawcett portrays paradigms as most abstract and influenced by particular philosophies and their ontological and epistemic claims. Moving down the level of abstraction, conceptual models are a set of relatively abstract concepts with their general relationships addressing phenomena of particular interest. Conceptual models provide alternative ways to view phenomena and provide the structure and rationale for scholarly and practical activities (Fawcett, 2005). Theories develop from conceptual models and include one or more concrete and specific concepts and their testable relationships. Presently, conceptual considerations and frameworks for SBL have emerged (Bligh & Bleakley, 2006; Issenberg et al., 2011) but theories for SBL have yet to be developed. Thus, this analysis is limited to the emergence of conceptual models or frameworks to guide use of SBL in healthcare education.

## Method

### Criteria for Analysis

Fawcett (2005) outlines a systematic method to analyze conceptual models. Based on Fawcett's recommendations, the following criteria guided this analysis: (a) origin of model, (b) unique focus of model, and (c) content of model. Scholars describe theoretical/conceptual models and frameworks similarly and Fawcett considers them

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synonymous, thus the term framework, when used in this article, also encompasses conceptual models.

**Data Sources and Search Process**

A systematic search process was conducted using combinations of key words - simulation, simulation based learning, nursing, medicine, conceptual framework, and theoretical framework from the following databases: Education Resources Information Center (ERIC), MEDLINE, Academic Search Complete, and Cumulative Index to Nursing and Allied Health Literature (CINAHL). Publications were limited to peer-reviewed, English language articles published from 2000-2011. Ancestral searching and familiarity (dissertator with an interest in SBL) with the literature base supplemented this process.

Inclusion criteria were publications that described a framework applicable (a) for a variety of educational/learning topics, (b) across healthcare disciplines, and (c) considered simulation design, implementation, and evaluation. The reasons for these inclusion criteria included a desire for a comprehensive framework relevant to any healthcare topic or healthcare discipline. Clearly, multidisciplinary training for healthcare education is crucial (Benner et al., 2010; Corrigan et al., 2001; Kohn et al., 2000), thus a framework that could meet the needs of all or most healthcare disciplines as they collaborate with interdisciplinary training and research would be beneficial. In addition, locating frameworks that consider the multiple phases that comprise the simulated learning process from pre-planning, to implementing, to evaluation was desired. Therefore, frameworks that provide a comprehensive view of the simulated learning process was an inclusion criterion rather than frameworks addressing a singular snapshot

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of one particular phase. Seeking these types of comprehensive frameworks acknowledges the multi-factorial nature of learning and educational processes.

Employing the search strategy yielded 129 publications and upon application of inclusion criteria, five frameworks were located. These five frameworks include: (1) Kneebone's (2004; 2005) theory-based approach (unnamed), (2) Jeffries's (2005; 2007b) and colleagues Nursing Education Simulation Framework, (3) Campbell and Daley's (2009; 2010) Framework for Simulation Learning in Nursing Education, (4) Dieckman's (2009) Model of the Simulation Setting, and (5) Guimond, Sole, and Salas's (2011) Pre-Training Analysis Framework. During this analysis, frameworks are referred to by name of first author. A table depicting analysis criteria compliments this discussion (Table 1).

## Analysis

### Framework Origin

When analyzing a framework, its historical evolution and philosophical claims are important considerations (Fawcett, 2005). These considerations provide insight into the author's motivation for developing a framework as well as the underlying beliefs and values on the nature of knowledge. The following introduces each of the five frameworks by its historical evolution, philosophical claims as in underlying assumptions, and influences from other disciplines/scholars. A philosophical tenet of particular interest for this analysis is the inclusion of learning/education theory. As this analysis seeks comprehensive framework application across a variety of educational topics as well as the simulation learning process, educational/learning theory becomes particularly valuable for understanding SBL pedagogy (Clapper, 2010).

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Kneebone (2004, 2005) offers a framework (unnamed) to evaluate the effectiveness of new and existing simulations. Kneebone wanted to create a closer link between simulation and clinical practice and argued an iterative process needed to occur where the learner went “to-and-fro” (Kneebone, 2004, p. 1101) between a simulated learning activity and clinical practice. Even though Kneebone claims this framework is not comprehensive, it has evolved based on 25 years of professional and teaching experience of physicians with use of simulation in the United Kingdom. Kneebone was concerned about the danger of task-based simulations being disconnected from the clinical experience. Kneebone’s framework explicitly links the ‘zone of proximal development’ (Vygotsky, 1978) and ‘legitimate peripheral participation’(Lave & Wenger, 1991) to his assumptions and principles. Using these learning/educational theories as underlying philosophical tenets, Kneebone’s framework addresses four key principles. These include (a) gaining and retaining technical proficiency, (b) place of expert assistance in task-based learning, (c) learning within a professional context, and (d) affective learning.

Jeffries (2005, 2007b) developed, in collaboration with scholars from eight nursing institutions, the National League for Nursing (NLN), and a mannequin manufacturer (Laerdal™), the Nursing Education Simulation Framework. This framework was developed to provide systematic guidance for a collaborative national study on incorporation of simulation in nursing education that was undertaken between 2003-2006. Jeffries applied an eclectic approach drawing from information processing, cognitive skill, experiential growth, and social-cultural practices in the development of this framework. Educational practices, based on the seminal work of Chickering and

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Gamson (1987), provide a specific component in this framework. Early publications (Jeffries, 2005; Jeffries & Rodgers, 2007b) did not explicitly discuss the theoretical development of underlying assumptions, however; more recently, Jeffries[4] expounded on underlying assumptions of this framework. These assumptions (Table 1) consider learning as information processing, developmental growth, a social-cultural experience, with use of technology to provide near real-world experiences.

Campbell and Daley (2009, 2010) developed the Framework for Simulation Learning in Nursing Education. This framework takes a comprehensive student-focused approach to guide curriculum development and evaluation with an eclectic combination of learning, ecological, and nursing theoretical tenets. This framework was developed by nursing scholars from Fairfield University and Western Connecticut State University and reflects the collective experiences of these authors. Determining and understanding what the learner brings to the learning situation, both in terms of individual experiences and in terms of the new millennial digital culture, is a key principle in this framework. Fink's (2003) six dimensions for significant learning (learning to learn, foundational learning, human dimension, integration, application, and caring) guide the learning process. Vigilance, as a broader concept studied in nursing, is a learning outcome that if met, can result in improved patient safety, excellence in nursing care, and reflective practice.

Dieckmann (2009) developed a conceptual model for simulation center operation that evolved alongside his research activities in Denmark. As an educational psychologist, Dieckmann has been involved with design, education, and research in medical simulations. He places his framework within the larger context of social and

[4] Jeffries P: State of the nursing science in simulation: Review of Jeffries simulation framework. Conference Proceedings 10th Annual International Nursing Simulation/Learning Resource Center Conference June 2011, Orlando, FL

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organizational factors. Learning in a social context, drawn from the works of Laucken (1995), Lewin (1997), and ecological validity (Bronfenbrenner, 1979) provides the underpinning philosophical tenets for this framework. For example, Dieckmann explicitly states simulation is a social practice in which participants need prior knowledge, skills, and attitude as well as an understanding of how to participate in a simulation experience. Although not explicitly identified as an assumption, but clearly described, Dieckmann considers simulation as having a reality of its own. Explaining further, Dieckmann is concerned that learning in a simulated environment is different from learning in the real environment. Consequently, he stresses the need to conduct investigations comparing learning in a simulated environment with learning in a real clinical environment. Dieckmann explicates the dynamics involved when considering realism for simulation design and outlines several different models of reality.

Finally, Guimond (2011) considers the importance of upfront analytic efforts before simulation based training (SBT) starts which is the foundation for her framework. Guimond is concerned with the inattention given to conducting pre-training analysis prior to developing SBT activities. This framework derives from a larger body of knowledge on transfer of training literature by organizational, military, and aviation disciplines drawn from publications by Ford, Baldwin, and Kaiger (1988; 1998; 1993), Dreyfus and Dreyfus (1986), and Gagne (1992). The theoretical underpinnings within these bodies of literature include metacognition, trainee characteristics, training design, work environment, mastery and performance orientation, as well as the cognitive, skill-based, and affective learning outcomes – or what is readily known in healthcare education as knowledge, skills and attitudes (KSA). Guimond identifies four assumptions/principles.

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These principles, derived from the transfer of training literature, call for (a) systematic approach for pre-assessment of knowledge and learning needs with targeted outcome measures; (b) recognizing that the level of learner expertise impacts effectiveness of training; (c) transfer of training that is dependent on learner motivation, self-efficacy, and organizational support; and finally (c) full evaluation of learning includes behavior change, organizational results, and impact of client outcomes. This last principle reflects Kirkpatrick's (2006) learning levels. It is also worth noting the term *training* in the name of this framework as opposed to the term *learning*. This choice in terms most likely relates to the body of literature from which this framework derives.

**Unique Focus of Framework**

According to Fawcett (2005), the second step when analyzing frameworks is to examine the unique focus. Generally, even though frameworks may address similar topics, each framework's unique approach may place higher relevance in one area over another.

The focus of Kneebone's (2005) framework is to offer evaluation criteria to judge (his term) the effectiveness of simulations. He is concerned that by the time formal evaluation of simulations are completed, the "landscape surrounding the original product has changed radically" (p.552). Kneebone (2005) is concerned about the uncritical acceptance and emphasis on "technological sophistications at the expense of theory-based design" (p. 549) in SBL. Kneebone considers it essential for learner evaluation to be ongoing and iterative as the learner alternates between simulation experiences and actual clinical practice experiences. Kneebone offers evaluation criteria in four key areas. First, the learner requires feedback that is timely, focused, and provided by experts. These

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experts need to be able to find and create the zone of proximal development in different learning encounters, whether actual or simulated. So doing closes the gap between theory and practice. Second, learners need sustained and deliberate practice. Learners need to repeat skills in repetitive practice in order to reduce decay. Third, learning occurs in a professional (social) context. Drawing from Lave and Wenger's apprenticeship ideals, legitimacy must be reflected in the simulation. Finally, the affective component of learning cannot be ignored.

Jeffries's (2005) framework, developed in response to the need for a theoretical framework to guide a national study of simulation in nursing education, has a comprehensive focus as it identifies how the interaction between teacher, learner, and educational practices affect learning outcomes. This relationship is mediated by a simulated learning intervention that considers five design characteristics. Associated with the development of this framework are three instruments (psychometrics reported) (Jeffries & Rodgers, 2007a) that measure educational practices, simulation design characteristics, and student self-confidence. Since its publication, Jeffries's framework has become one of the most frequently cited frameworks in nursing educational research studies (Dobbs et al., 2006; Hayden, Kenward, Spector, Jeffries, & Kardong-Edgren, 2010; Reese et al., 2010).

Campbell and Daley's (2009) framework offers a comprehensive student-focused approach for simulation use in nursing education. Its focus is to provide curricular direction and guidance for instructional design. Its use as a framework for guiding SBL education or research, beyond use by its developers, has not been located in the literature.

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Dieckmann's (2009) framework provides direction for stepwise simulation course planning that ties together planning, design, and conducting of simulations. This framework focuses on features of simulators, simulation scenarios, and the concepts of fidelity and realism. Dieckmann's framework considers a larger simulation center operating purpose that integrates a seven phased-based approach, both for a national and global scale.

Guimond's (2011) framework provides structure in analyzing pre-training needs. This upfront analysis consequently defines the instructional design of the simulation activity. Guimond considers it vital to understand who to train, what to train, and how to best deliver the training. This requires completing a training needs analysis comprised of cognitive task analysis, individual, team, and organizational assessments. For example, task and cognitive analysis, based on subject matter experts, determines and breakdowns the steps the learner must complete. Organizational analysis identifies what resources are available to complete the training. Team and individual analysis assess what people bring to the learning situation and from there, along with the task analysis, the desired KSA objectives are formed. In order to operationalize the pre-training framework, Guimond developed a checklist to direct this pre-training analysis thus avoiding any oversight of necessary assessments.

**Content within Frameworks**

The third step according to Fawcett (2005) calls for an analysis of content within frameworks for level of abstraction of concepts and their propositions. Concepts, following the definition offered by Fawcett, are "mental images in which "words or phrases summarize ideas, observations, and experiences" (p. 4). Propositions are

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statements about concepts or statements on the relationship between two or more concepts (Fawcett, 2005). Concepts in theoretical frameworks are expected to be abstract and, in general, are not amenable to direct observation or test (Fawcett, 2005). The following analyzes frameworks for concepts, propositions, and visual representations. Key content and concepts, as represented in each framework, are presented in Table 1.

Kneebone (2004, 2005) offers a visual diagram for his framework where learners go 'to and fro' from clinical environment to simulated environment. Kneebone identifies relational propositions by linking learning needs and skills identified in the actual clinical experience to a simulated practice of this need or skill by the learner, and then reapplication back in the actual clinical environment. All this 'to and fro' is guided by expert feedback that is withdrawn over time. Feedback, as described in Kneebone's framework, is crucial, given from an expert, and tailored to the learner's needs. Feedback fades as it is no longer needed. Kneebone considers the learner to take 'center stage' in the feedback process (Kneebone & Nestel, 2005, p. 88). Feedback is drawn directly from the learner, the observers (on technical and communication skills), and the simulated patient.

Jeffries's (2005, 2007b) framework depicts five conceptual components, each being operationalized through a number of variables. These five conceptual components, depicted in a visual diagram, include teacher, student, educational practices (one sphere), simulation design characteristics (second sphere), and outcomes (third sphere). Sphere one (interaction of teacher, student and educational practices) has an effect on sphere three (outcomes). This effect is mediated by sphere two (simulation design characteristics) as the simulation educational intervention. Thus, relational propositions

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are visually apparent in this framework. Concepts within Jeffries's framework continue to evolve. For example, in the first publication by Jeffries (2005), cues and complexity were two simulation design characteristics that have since been renamed student support (formally cues) and problem solving (formally complexity). Jeffries and other nurse scholars have called for the need to review and refine this framework. As a result, a two-year project[5] is underway (2011-2013) formally evaluating this framework.

Campbell and Daley (2009) offer a framework that identifies 22 concepts captured in a visual diagram. This diagram offers relational propositions represented in the arrows and interlocking shapes. For example, the student is in the center surrounded by three broad goals (depicted as circles) to think critically, communicate effectively, and intervene therapeutically. The simulation contains three fidelity levels (depicted as a triangle) as equipment, environment, and psychological. Fink's six dimensions of learning are displayed in a hexagon around the student. Clinical outcomes (products) include vigilance that can lead to safety, excellence, and reflective practice. Broader outcomes include translation to practice and nursing program outcomes. A feedback loop is incorporated if outcomes are not met. What the learner brings, such as individual experiences and culture, influences the learning situation. Upon review of sources for this framework, definitional propositions are not explicit for the numerous concepts within this framework. Since this framework was recently developed and evolved from specific nursing programs, it is possible further explicit definition of these concepts is located elsewhere.

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[5] Ravert, P. State of the science surrounding the NLN-Jeffries Simulation Framework project: The Kick Off. Conference Proceeding 10th Annual International Simulation/Learning Resource Center Conference, June 2011, Orlando, FL

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Dieckmann (2009) provides a series of diagrams depicting different aspects of his simulation-setting model. One diagram depicts an ‘off-the-job’ setting of a simulation course and its relationship to a participating organization. He has another diagram outlining seven phase-based simulation modules for a simulation-based course. These modules include: (a) setting introduction, (b) simulator briefing, (c) theory input, (d) scenario briefing, (e) simulation scenario, (f) debriefing, and (g) ending. Dieckmann admits not all these modules are necessary and their order of offering can vary. He defines simulation setting and simulation scenario (Table 1) in another manuscript (Dieckmann et al., 2007). Dieckmann describes in detail different models for thinking about reality.

Guimond’s (2011) framework visually depicts four types of analysis that need completion prior to training. These four analysis (task and cognitive, organization, team, and learner) feed (relational propositions) into the center of the visual diagram that represents the subsequent steps in the SBT process. These steps include establishing KSA outcomes, developing learning objectives, designing the instructional strategy, evaluation of learning, and finally transfer of knowledge. Specific concepts are not clearly defined in this framework. For example, Guimond referenced a definition of simulation by Decker (2008). Upon review of SBT literature, a definition of SBT was located (Table 1) in a manuscript by one of the authors, Salas (Weaver et al., 2010).

**Discussion**

When summarizing this analysis several conclusions are drawn. These conclusions are presented within the context of criteria employed in this analysis: origin,

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unique focus, and content. Within the content criterion, three concepts, simulation, feedback, and realism, are further reviewed.

**Origins**

Analysis of the origin of frameworks considers its historical evolution and philosophical claims. Inclusion of learning/educational theory is a particular philosophical interest for this analysis.

The historical evolution of frameworks occurred alongside the exponential growth of SBL in healthcare education. The recent development (since 2005) of four frameworks, Jeffries (2005), Campbell and Daley (2009), Kneebone (2005), and Dieckmann (2009) arose in response to a need for more structure to guide use of SBL in healthcare education. The historical evolution of Guimond's pre-training analysis framework draws from a larger literature base on transfer of training literature traceable to a few decades back to Gagne (1992), Dreyfus and Dreyfus (1986), and Ford, Kraiger and Baldwin (Baldwin & Ford, 1988; Ford et al., 1998; Kraiger et al., 1993). Guimond's pre-training analysis framework is applicable on a larger scale for a variety of purposes in military and aviation training. This framework now has been adapted for use in SBL as used in healthcare education.

Philosophical tenets are present in all the frameworks, however in-depth background on underlying assumptions and principles and how they were derived are not clearly elucidated. Most likely, this relates to the evolving nature of these frameworks as assumptions and principles are yet to be established. As a philosophical tenet, educational/learning theory is explicit in three of the five frameworks (Campbell & Daley, 2009; Guimond et al., 2011; Kneebone, 2005). Jeffries (2005, 2007b) discusses

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educational practices in her framework, but the underlying learning theory behind these practices was not apparent in early publications. Several reasons for explicit or implicit inclusion of learning theories in these frameworks may exist. First, it is possible that each developer valued or appreciated educational/learning theory to a different degree thus influencing whether explicit depiction was considered necessary or not. Alternatively, it could be possible that publication page limits restricted the in-depth discussion of educational/learning theory. Even though the selected educational/learning theories used in these frameworks are from different theorists (Vygotsky, 1978), Lave and Wenger (1991), Fink (2003), and Laucken (1995) all have common learner-centered and social or contextually based themes. As these frameworks continue to evolve and develop, it would be beneficial for explicit linkage of educational/learning theory to assumptions, principles, and concepts in these frameworks. By elucidating these linkages, healthcare educators are offered a stronger foundation on which to base their educational practices. This is especially important since majority of healthcare educators come from a practice-focused educational background verses one grounded in educational theory (Caputi, 2010).

**Unique Focus**

Each of the five frameworks has a unique focus. Kneebone's (2005) framework focuses on the link between use of SBL and the clinical experience. With this focus, Kneebone's framework has implications for curricular design in order to have this seamless back and forth process between simulations and clinical experiences. Jeffries's (2005) framework focuses on providing guidance for simulation design and evaluation for educational purposes and research endeavors. Campbell and Daley's (2009)

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framework focuses on integrating simulation pedagogy with nursing curricular and program outcomes. Dieckmann (2009) provides a series of simulation models that focus on organization and simulation course planning. Guimond's (2011) framework focuses on pre-training assessment.

**Content**

Analysis of framework content considers whether concepts are defined and whether the relationships between concepts are explicit (Fawcett, 2005). In addition, level of complexity is analyzed relative to the number of concepts and their relationships. Frameworks typically use visual representations to enhance clarity and display relationships in a logical and consistent manner (Fawcett, 2005). The following discusses level of complexity and use of visual representation followed by a review of selected concepts across frameworks.

All five frameworks have visual diagrams that represent concepts and relationships. The level of complexity within these visuals varies across frameworks. Campbell and Daley's framework is the most complex and takes effort to work through its numerous (22) concepts. Its focus for simulation learning embeds the program outcome of vigilance unique to the developers' nursing program. Jeffries's (2005) framework has a visual that displays three spheres that are simple, yet comprehensive. It shows direction of flow from the educational practice/teacher/student sphere, to simulation design characteristics sphere, to the outcome sphere. Jeffries's framework identifies the importance of the interaction between teacher, student, and educational practices. Relationships are depicted by use of arrows between the conceptual components in the frameworks by Jeffries and Campbell and Daley. However, clear

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propositional statements depicting these relationships need further development. Guimond's (2011) framework has a simple and clear diagram that captures its breath in application to task analysis, individual, team, and organizational training. Drawn from organizational psychology, this framework and its visual diagram would be useful to a variety of disciplines, not just healthcare educators. The frameworks by Kneebone (2004) and Dieckmann (2009) have visual diagrams that address not just a singular simulation activity, but also the larger picture of SBL use and flow across educational and curricular programs. Kneebone's visual diagram links the 'to and fro' nature of simulation learning and clinical learning. Dieckmann's framework provides a visual for simulation use in an organizational setting, but additionally embeds a phased-based model for a simulation course. Overall, the visual diagrams appear to be logical and consistent with the content in each framework.

Even though each framework has a unique focus, there are commonalities in concepts across these frameworks. These concepts can be organized around instructional or educational design features (fidelity/realism/technology/feedback) and learning outcomes (knowledge/ skills/attitude/self-confidence/communication/decision-making/critical thinking). Although analysis of these concepts in the context of SBL would be a worthwhile endeavor, for purposes of this article, three concepts are further reviewed. These include simulation, feedback, and realism. Although generally, conceptual definitions are unique to its conceptual model, it is beneficial to compare these concepts across frameworks. This is especially important if educators and researchers are drawing knowledge and guidance from more than one framework at a time.

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**Simulation**. Four of the five frameworks Jeffries (2005), Campbell and Daley (2009), Dieckmann (2009), and Guimond (2011) specifically define simulation (Table 1). Definitions are all similar in reference to simulation as an activity, event, instructional technique, or a set of conditions. Yet, these definitions of simulation vary in their level of detail and/or terms used. For example, Jeffries's definition links the definition of simulation to a clinical experience and learning outcomes. Daley and Campbell bring in pedagogical principles and student accountability for his/her own learning to their definition. Dieckmann defines simulation setting and simulation scenario. His definition of simulation setting includes purposes for education, assessment, and research and the need to consider social context. Guimond references another author's definition for simulation, although upon further review of the transfer of training literature base, simulation-based training has been clearly defined (Table 1). Simulation based training focuses on developing expertise in knowledge, skill, and attitude. Jeffries captures the realism or authenticity of the simulation in her definition as 'mimic' while the definition of simulation based training (by Salas, co-author with Guimond) is captured as 'replicating' (Weaver, 2010).

**Feedback.** All five frameworks define feedback. In general, feedback is a concept happening during and after the SBL activity. During the SBL activity, feedback is given to the learner in forms of cues, clues, hints, prompts from either the simulator or information provided by the instructor or other role characters. Following the SBL activity, feedback occurs during a debriefing. Debriefing, as a form of feedback, has undergone investigation (Bond et al., 2006; Fanning & Gaba, 2007; Kuiper et al., 2008). Common findings from these investigations determine debriefings are essential and

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contribute to increased learning (Cantrell, 2008; Dreifuerst, 2009; Rudolph et al., 2006). In Kneebone's (2005) framework, the tutor (faculty) provides expert feedback to the learner. This feedback is tailored to what the learner needs and is withdrawn over time. Dieckmann (2009) identifies debriefing (with video feedback) as one of the seven modules in his framework for a simulation course. Debriefing facilitates analysis of participants' mental models. Jeffries (2005) and Campbell and Daley (2009) include feedback (debriefing) as an explicit component incorporated in their frameworks. Guimond's (2011) pre-analysis framework, although not directly discussing feedback, does use task analysis to develop the cues through which feedback is provided to the learner. However, upon review of definitions of feedback (debriefing) (Table 1) and as discussed in the literature, blurred lines exist in conceptual use such as when it occurs, how it occurs, and in what manner (Cantrell, 2008; Dreifuerst, 2009; Fanning & Gaba, 2007; Rudolph et al., 2006). Additionally, the type, degree, and manner of feedback (cues, clues, hints or prompts) offered during the simulation remains elusive (Jeffries, 2005).

**Realism.** One of the goals of SBL is to create a realistic learning environment. Creating a realistic environment is dependent on the incorporation of fidelity levels. As such, fidelity defines the level of reality for the SBL environment. Three of the five frameworks Jeffries (2005), Dieckmann (2009), Campbell and Daley (2009) address realism. Of all framework originators, Dieckmann has investigated realism to the greatest extent. He discusses the idea of ecological validity, or the degree to which the artificial environment, as experienced by the participant, compares to an actual clinical environment. Dieckmann uses an equation (Table 1) that considers what learning may

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occur in a simulated activity that is beyond what may occur in the clinical setting. Dieckmann outlines, in specific detail, different models for thinking of realism. Fidelity has varying dimensions that include physical, conceptual, psychological, and environmental elements (Dieckmann et al., 2007; Rudolph et al., 2007). Jeffries (2005, 2007b) in the first publication of her framework discussed physical fidelity. Since that time, Jeffries has elaborated further on other dimensions of fidelity (psychological, conceptual, emotional). Campbell and Daley (2009) depict equipment, environmental, and psychological fidelity levels in their framework. Overall, when SBL frameworks first emerged in 2005, the concept of fidelity initially focused on the physical characteristics of the simulator on a range from low to medium to high. However, more recently, the conceptual and psychological dimensions of fidelity have received greater attention (Alinier, 2011; Roberts & Greene, 2011).

Conceptual analysis and development of concepts common across frameworks for SBL need to occur. At this time, only four conceptual analyses were located on concepts common for SBL. Those located were debriefing (Dreifuerst, 2009), simulation (Bland et al., 2010; Nickerson, Morrison, & Pollard, 2011), and interdisciplinary collaboration (Petri, 2010). As there currently has been little to no conceptual analysis undertaken for fidelity, cueing, student support in the context of SBL, these frameworks have developed without benefit of theoretically and operationally defined concepts.

## Limitations

Several limitations to this analysis need to be recognized. One limitation relates to the confidence in location of relevant frameworks. Even though literature search strategies employed reduced this limitation, it is possible other frameworks that are either

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unpublished or not easily located exist. Another limitation is the accuracy of identification of assumptions and principles within frameworks. Since definitions of assumptions and principles vary, as well as this author's interpretation of implied assumptions, originators of these frameworks may have differing views. A possible third limitation is use of a framework designed for analyzing nursing conceptual models (Fawcett, 2005) selected because other systematic means for analyzing frameworks were not located. Since Fawcett's (2005) criteria for framework analysis is applicable across disciplines, use of this criteria was deemed appropriate.

## Recommendations

Theoretical frameworks provide a distinctive or unique frame of reference about phenomena of interest (Fawcett, 2005). This unique focus provides alternative ways to view phenomena. Originators of frameworks identify concepts and propositions they consider most relevant. Thus, it is important for educators and researchers to review, consider, and select one or more framework that best match their needs. Based on this analysis, the following recommendations are offered to educators and researchers as they employ any of these theoretical frameworks for SBL healthcare education or research. A sampling of guiding questions, derived from each framework's unique focus, are offered to educators (Table 2) for use when designing SBL activities.

At a minimum, educators and researchers should select a framework and provide rationale for their choice. Choosing a framework(s) needs to be thoughtfully done in order to avoid the trap of uncritical acceptance or adoption of frameworks in any situation (Fawcett, 2005). Reviewing underlying assumptions and principles of frameworks helps identify congruency between beliefs, intentions, and actions that form one's commitment

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to teaching (Pratt, 1998). Employing a comprehensive framework helps assure necessary steps are not overlooked, whether in planning, conducting, or evaluating SBL activities.

Framework selection needs to be congruent with the purpose of the SBL activity. If the SBL activity is for training or learning purposes (formative), then selection of a framework that helps the educator and learner figure out why learning did or did not occur is crucial. A framework that provides direction on how to probe into the mind of the learner can be more useful than one that only recognizes whether learning occurred or not. Such a perspective supports why educational or learning theory, embedded in a framework, can provide direction and increase framework utility. In this case, frameworks incorporating learning theories such as Kneebone (2005) or Campbell and Daley (2009) would be beneficial. Jeffries's framework clearly identifies the relevant elements for simulation design and depicts the influence of teacher, student, and educational practices for this design activity. If the purpose of the SBL activity were for competency or licensing (summative) assessment, then a framework that clearly identifies learning outcomes (KSA) would be most beneficial. Upfront pre-simulation analysis on the level of KSA necessary to achieve outcomes is a prerequisite in order to determine competency. In this case, use of the Guimond (2011) pre-training analysis framework would be ideal. If there is need to develop a simulation center and offer ongoing simulation courses for multiple stakeholders, then those organizers would benefit from use of Dieckmann's (2009) framework.

Pairing a comprehensive framework with a more specific framework could complement each nicely. For example, the Guimond (2011) pre-training analysis framework paired with any of the other four frameworks, Campbell/Daley (2009)

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Dieckmann (2009), Jeffries (2005), or Kneebone (2005) could serve to identify the outcomes needed and subsequently direct the design of the SBL. No other framework has the detail and structure necessary for key preplanning analysis, as does Guimond's pre-training analysis framework.

## Conclusion

This analysis was not done to select one framework preferred over another, but to assist the educator and/or researcher in examining frameworks and selecting one or more that are well suited to guide one's endeavors whether for education, research or both. When selecting a framework, the educator or researcher should consider the purpose of the SBL activity and thoughtfully select the framework or a grouping of frameworks that would be most relevant and congruent to guide the design and purpose of the SBL activity or research project.

For a variety of reasons, SBL is expanding as a pedagogical option in healthcare education. However, on a cautionary note, the ability to create a simulated healthcare setting has generated conceptual, theoretical, and pedagogical questions and challenges that need attention by healthcare educators and researchers. In order to design studies to answer these challenging questions, theoretical or conceptual frameworks are essential. Being able to select a framework that has undergone analysis using established criteria offers the educator and researcher greater confidence in its underlying philosophical claims, unique focus, and content. As these frameworks are not fully developed, further framework evaluation will be needed. This analysis was guided by Fawcett's (2005) framework for analyzing conceptual models for origin, unique focus, and content. Fawcett additionally provides criteria for framework evaluation that includes logical

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congruence, generation of theory, credibility, and contributions to discipline(s). As these SBL frameworks continue to evolve, their evaluation with these additional criteria will be warranted. Educators and researchers can benefit from the analysis that provides useful, comparative information when reviewing and selecting frameworks or grouping of frameworks for conducting intra-disciplinary and inter-disciplinary education and/or research (Howard et al., 2009).

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Table 1

*Simulation Based Learning Theoretical Frameworks*

| **Model**<br>Name/<br>Author(s) | **Origin**<br>Philosophical origins and claims [assumptions] | **Unique Focus (purpose)** | **Content**<br>Abstract and general concepts and propositions.<br>Specifically reviewed for concepts of simulation, realism, and feedback |
|---|---|---|---|
| **No specific name for framework**<br><br>**Drawn from articles by Kneebone** (2004, 2005) | Vygotsky (1978) zone of proximal development<br>Lave and Wenger's (1991) situated learning - legitimate peripheral participation<br>Theoretical assumptions.<br>1. Clinical procedures require sustained deliberate practice.<br>2. Expert feedback is crucial component to learning.<br>3. Simulation must reflect contextual realities of everyday practice.<br>4. A strong affective element to a learning situation exerts a powerful positive or negative effect. | To offer a theoretical/concept-ual (uses both terms) framework for SBL with a set of criteria for evaluating the effectiveness of existing and new simulations.<br><br>To create a closer link between task-based practice and the clinical setting | Linkages between an identified learning need/skill, simulated practice of this need/skill, followed by opportunity to reapply skill in the actual clinical environment, all guided by expert feedback.<br><br>Simulation –not defined.<br><br>Feedback – occurs from expert tutors is crucial and tailored to the learner's needs. Feedback as a form of support fades when no longer needed.<br><br>Realism – contextually based |
| **Nursing Education Simulation Framework**<br><br>**Jeffries** (2005, 2007b) | Constructivist theory<br>Learner-centered theory<br>Socio-cultural perspectives on collaborative technology<br>Chickering & Gamson's 7 practices of effective teaching<br>Theoretical assumptions<br>1. Learning is information processing. This calls for instruction to provide efficient communication of | To design, implement and evaluate simulations used for teaching strategies in nursing education.<br><br>To provide a framework to help | Visually, three spheres with 5 conceptual components each operationalized though a number of variables<br>1. Sphere One: teacher factors (demographics), student factors (program, level, and age), educational practices based on (active learning, feedback, student/faculty interaction, collaboration, high expectations, diverse learning and time on task)<br>2. Sphere Two - simulation design characteristics (objectives, fidelity, problem solving, student support and debriefing)<br>3. Sphere three: outcomes (learning [knowledge], skill performance, learner satisfaction, critical thinking and self-confidence) |



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| Model Name/ Author(s) | **Origin**<br>Philosophical origins and claims [assumptions] | **Unique Focus (purpose)** | **Content**<br>Abstract and general concepts and propositions.<br>Specifically reviewed for concepts of simulation, realism, and feedback |
|---|---|---|---|
| | information and effective strategies for remembering.<br>2. Learning is experiential growth. This calls for learning experiences and activities to promote individual development.<br>3. Learning is social-cultural. This calls for instruction that embeds realistic tasks in a community of practice.<br>4. Technology provides the student near real-world environments and mentoring situations. | scholars conduct research on SBL in an organized and systematic fashion | Simulation - are "Activities that mimic the reality of a clinical environment and are designed to demonstrate procedures, decision-making and critical thinking through techniques such as role playing and the use of devices such as interactive videos or mannequins" Jeffries, 2005 p. 97)<br><br>Feedback - occurs during the SBL activity in the form of student support via cues. Feedback following the SBL activity occurs in a debriefing session facilitated by the educator.<br><br>Realism – considers fidelity is the extent to which a SBL activity mimics reality. It is defined on a range from low to medium to high. Fidelity considers 3 elements ; relatively little information initially available, student allowed to investigate freely employing questions in any sequence, and clinical information is provided over time. |
| **Framework for Simulation Learning in Nursing Education**<br><br>**Daley & Campbell** (2009) | Multiple components with an eclectic combination of learning, ecological, and nursing theory.<br>Fink's (2003) six dimensions of learning.<br>Social ecological theory.<br>Vigilance<br><br>Implied assumption:<br>1. What the learner brings to learning include – individual experiences, culture including the digital culture. | To integrate simulation pedagogy in nursing approach curriculum with a student-focused | Visually, a complex diagram with 22 concepts.<br>1. Student interacting with nursing education is the central portion surrounded by 3 broad goals (depicted as circles in model) – think critically, communicate effectively, intervene therapeutically.<br>2. Simulation represented as a triangle that encompasses the student and contains 3 fidelity levels – equipment, environment, and psychological.<br>3. Dimensions of learning are a hexagon around the central portion (student) as a supportive structure. Dimensions include learning to learn, foundational knowledge, human dimension, integration, application and caring.<br>4. Clinical outcomes (products) include – vigilance that leads to safety, excellence, and reflective practice. Broader outcomes include translation to practice and program outcomes.<br>5. A feedback loop is incorporated if outcomes are not met. |



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| Model Name/ Author(s) | Origin<br>Philosophical origins and claims [assumptions] | Unique Focus (purpose) | Content<br>Abstract and general concepts and propositions.<br>Specifically reviewed for concepts of simulation, realism, and feedback |
|---|---|---|---|
| | | | Simulation - use of the term *simulation-focused pedagogy*, "a method of utilizing simulation and scenarios to integrate content and multiple concepts in all areas of nursing care to provide an interactive environment by which students are held accountable to use the information they are learning"(Campbell & Daley, 2009)<br><br>Feedback - a feedback loop is a component of this framework and is triggered when there is a failure to rescue during a SBL activity. Debriefing is not visually apparent in this framework's diagram but is described as an activity occurring after the simulation. Developing the student as a reflective practitioner is one of the components of vigilance that is this framework's ultimate product<br><br>Realism - fidelity considers equipment, environment and psychological elements that are foundational for suspension of reality. |
| **Dieckmann** (2009) | Ecological validity (how does the artificial environment compare to the actual clinical environment), derived from Bronfenbrenner (1979)<br>Simulation is a social practice (Lauckan, 1995, Lewin, 1997)<br>Theoretical assumptions.<br>1. Participants need to process certain knowledge, skills, and attitudes related to their professional background prior to simulation activity.<br>2. Participants need to understand basic principles of simulated learning and how to interpret what | To provide a model for simulation settings alongside a module-based course tying simulation design, planning, and conducting to organizational and professional contexts. | Phase-based simulation modules<br>1. Setting introduction<br>2. Simulator briefing<br>3. Theory input<br>4. Scenario briefing<br>5. Simulation scenario<br>6. Debriefing<br>7. Ending<br><br>*Simulator setting* as a "spatiotemporally and socially limited event during which humans interact in a goal-directed way with each other, a simulator, and other equipment for educational, research, or assessment purposes." (Dieckmann et al., 2007, p. 149). Defines *simulation scenario* as one element within a simulator setting. |



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| Model Name/ Author(s) | Origin<br>Philosophical origins and claims [assumptions] | Unique Focus (purpose) | Content<br>Abstract and general concepts and propositions. Specifically reviewed for concepts of simulation, realism, and feedback |
|---|---|---|---|
| | they encounter.<br>3. Social practices are anchored within an organization.<br>4. Simulation has its own reality.<br>5. Simulation can offer learning that the clinical experience cannot provide. | | Feedback - occurs during the debriefing through use of video-assisted group discussion for reflection. Actions and mental models of participants are analyzed.<br><br>Realism - takes into account the ecological validity of the simulation experience - or how does the artificial environment as experienced by the participant compare to an actual clinical environment.<br>Simulation reality = (clinical reality – X) + Y.<br>X= limited means to simulate reality.<br>Y = relevant learning that goes beyond the clinical setting. |
| **Pre-Training Analysis Framework**<br><br>**Guimond, Sole, & Salas** (2011) | Derived from a large body of knowledge on transfer of training literature from aviation, military, artificial intelligence, and organizational psychology. These works include Gagne (1992) instructional design, Dreyfus and Dreyfus (1986) deliberate practice, and Ford and Baldwin (1988, 1998, 1993). Educational tenets include metacognition, trainee characteristics, training design, work environment, mastery and performance orientation, as well as the cognitive, skill-based, and affective learning outcomes. Theoretical assumptions/principles:<br>1. Systematic approach considers all components of instruction and results in outcomes specific to identified needs.<br>2. Level of expertise of learner impacts | To provide structure for instructional design to create SBT experiences. Framework intended to complement other strategies for planning a comprehensive approach to simulation.<br><br>Pre-training analysis to include, task and cognition, individual, team, and organization needs. | Results of the pre-training analysis (task and cognition, individual, team, and organization) lead to subsequent steps in simulation design process:<br>1. Knowledge, skills, attitudes<br>2. Learning objectives<br>3. Instructional strategy<br>4. Evaluation of learning<br>5. Transfer of knowledge<br><br>Simulation – Guimond referenced the definition by Decker presented at a conference as “an experience that imitates the real environment, requiring individuals to demonstrate the procedural techniques, decision-making, and critical thinking needed to provide safe and competent patient care” (p. 110) Simulation-based training –“instructional technique designed to accelerate expertise by allowing for skill development, practice, and feedback in settings replicating real work clinical environments” (Weaver et al, 2010, p. 370).<br><br>Feedback - framework does not directly discuss feedback. However, pre-training cognitive task analysis formulates the objectives for the SBL activity and from these objectives; cues are generated as a means to provide feedback to the learner. |



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| Model Name/ Author(s) | Origin<br>Philosophical origins and claims [assumptions] | Unique Focus (purpose) | Content<br>Abstract and general concepts and propositions. Specifically reviewed for concepts of simulation, realism, and feedback |
|---|---|---|---|
| | effectiveness of training.<br>3. Evaluation should directly relate to outcomes and include trainee reactions, learning, behavior change, and organizational needs.<br>4. Transfer of learning occurs when learner applies training to the clinical environment.<br>5. Self-efficacy, motivation, and organizational support positively affect transfer. | | Realism - framework does not discuss realism. |



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Table 2

*Guiding Questions for SBL Derived from Theoretical Frameworks*

| Framework | Unique Focus | Question(s) [not an inclusive list] |
|---|---|---|
| Kneebone (2005) | Relationship between going 'to and fro' from simulated experience to actual clinical experience | What is similar or different in the role of the educator who conducts the SBL activity and the role of the educator who supervises learners in the actual clinical experience? Should this educator be one of the same? If not, what communication needs to happen between the educators working with learners between the simulated and actual clinical experiences? |
| Jeffries (2005, 2007) | Interaction of teacher/student/educational practices on learning outcomes that is mediated by a simulated educational intervention. | How do educators incorporate different levels/dimensions of simulation design characteristics based on student learning needs? How do different levels/dimensions of simulation design characteristics mediate achievement of learning outcomes? What is the interaction between teacher and student that should happen before a simulation is undertaken? |
| Campbell and Daley (2009) | To integrate simulation-focused pedagogy into nursing curriculum | What prior experiences and culture values do students bring to the learning situation that needs to be taken into account for design of simulation experiences? How can simulated learning be incorporated into nursing curriculum to enhance vigilance in a way other learning experiences do not offer? |
| Dieckmann (2009) | Upon selecting one framework focus - ecological validity of simulation | What factors influence how one learner interprets simulated cues different from another individual? Using the equation simulation reality = (clinical reality – X) + Y, what comprises X and Y? |
| Guimond (2011) | Importance of pre-training analysis | What is the level of knowledge, skills, and attitudes (KSA) the individual or team needs? Once this KSA is determined, how can cognitive task analysis generate the cues, mental models for outcome measurement and guidance of feedback? |

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## Chapter Summary

The issues that support and provide theoretical structure for this study that explored perspectives held by nursing educators and nursing students about simulation design characteristics were described in this Chapter. Background and driving forces for SBL use, what is known and what remains unclear in SBL and a review of the NLN-JSF as a theoretical structure that guided this study along with an expansion of this framework by this investigator to more clearly depict what comprises Sphere Two - simulation design characteristics were described. In addition the necessity of exploring perspectives (individual and shared) about teaching were elucidated, including how gaining a better understanding of actions, intentions, and beliefs that form one's commitment to teaching can enhance teaching and learning practices. Two manuscripts developed to facilitate dissemination of this knowledge end this Chapter. One manuscript reviewed fidelity and cueing in the context of SBL and the other systematically analyzed emerging frameworks that guide SBL.

Summarizing this review of literature of SBL in healthcare education, it is evident there is an abundance of unanswered pedagogical questions and issues on SBL that need further exploration. It is important to break these identified issues into researchable questions with the goal of establishing evidence based educational practices for SBL. While SBL in nursing education has definite benefits as an innovative teaching/learning strategy, its "wholesale" and "uncritical" (Berragan, 2011, p. 661) adoption needs thoughtful consideration by nurse educators and administrators. Part of this consideration comes from gaining a better understanding of perspectives held by nurse educators and

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nursing students about simulation based learning and being the particular interest of this study, perspectives towards operationalizing simulation design characteristics.

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# CHAPTER 3.0 METHODS

## Chapter Introduction

The purpose of this study was to describe and compare nurse educators' and nursing students' perspectives about operationalizing design characteristics within simulation based learning educational interventions in nursing education. A Q-methodological design was employed. A pre-dissertation activity (Phase I) involved the gathering (theoretically guided by the NLN-JSF) of a concourse of opinion statements about operationalizing simulation design characteristics from the review of literature and nurse educator interviews. The present study commenced following this pre-dissertation activity and was divided into two remaining phases. Phase II involved the selection and refinement of opinion statements from the concourse to construct the Q-sample followed by a test of its feasibility. Phase III was the actual Q-study. Four sections comprise this chapter. In Section 3.1, an overview of Q-Methodology is presented and why it was an appropriate method to answer this study's research questions. Section 3.2 is prepared as a manuscript and details the construction of the Q-sample from the concourse of opinion statements. In Section 3.3, the feasibility study is reported that tested the Q-Sample, recruitment strategies, and Q-sorting process. Concluding this chapter is Section 3.4, in which the details for the Q-Method research design for Phase III are described.

## Section 3.1 Q-Methodology

Q-methodology, hereafter referred to as *Q*, is a research method that permits investigation of subjectivity in a systematic and rigorous approach (Brown, 1980; Stephenson, 1953). Reason for selection of this approach is provided along with *Q's*

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historical origin, assumptions and principles unique to this methodology, distinct terminology used in *Q* methodology, and measures to evaluate the design of a *Q* study.

**Q-Methodology as Research Approach**

In chapter 1.0, the analogy of a "Rubik Cube" was used to exemplify all the twists and turns (decisional choices) a nurse educator makes when operationalizing simulation design characteristics. Different educators may select different twists and turn options as they design, develop, and put into action a SBL educational intervention. For various reasons, not all design options or choices are always available (equipment availability, space limitation, educator comfort level, student group numbers). Therefore, educators are forced to decide between one choice over another. Consequently, a SBL intervention may turn into a significantly different type of learning activity based on individual educators' personal choices. The basis behind these decisional choices derives from individual subjectivity manifesting itself as a particular perspective (Brown, 1980). Perspectives are self-referent points-of-view based on inter-relational sets of beliefs and intentions that give direction and justification to actions (Pratt, 1998). It is of upmost importance to understand varying perspectives and the underlying assumptions, values, and beliefs that form particular perspectives. In order to meet new ideas in simulation design, we as educators, must understand our own perspective(s), be able to explain our perspective(s) to others, and see beyond our own perspective to those of other educators as well as the perspectives of our students as recipients of our teaching efforts.

In order to investigate perspectives, a method that could systematically tease out prevalent discourse to allow for exploration of subjectivity was needed. Q-methodology allowed for such an investigation (Brown, 1980; Newman & Ramlo, 2010; Stephenson,

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1953). As will be delineated in this chapter, nurse educators and nursing students were asked to sort opinion statements on a variety of simulation design characteristics from most recommend to most not recommend. This decision-making during the sorting and rank ordering of these statements is analogous to the decision-making nurse educators undertake in simulation design. As opposed to rating individual items in a questionnaire or survey, in Q-methodological studies, items become interactive as participants rank and order items (i.e. opinion statements) and in so doing reveal personal choice, feelings, and underlying beliefs.

**Historical Origin of Q-Methodology**

Q-Methodology is a research method with unique historical and philosophical underpinnings (Brown, 1980; Stephenson, 1953; Watts & Stenner, 2012). Grounded in *Q* are philosophical tenets from quantum mechanics and psychology first introduced by William Stephenson, a physicist and psychologist (Stephenson, 1935; Stephenson, 1953). Quantum mechanics brought to *Q* the idea that one can never know the exact location of a particle but only predict its behavior (Newman & Ramlo, 2010). In other words, one cannot know, in advance, the significance of each statement until an individual compares that statement with all other statements. Also a psychologist, Stephenson (1953) wanted to study the individual where "in principle [a person] can be made the subject of detailed factor and variance analysis" (p. 2). In other words, a person in an operant activity (Q-sorting) reveals his/her own subjective (self-referent) viewpoint.

Historically, *Q* had a rather rough start as its philosophical underpinnings employing both qualitative and quantitative techniques lead to quibbling over "statistical specificities" (McKeown & Thomas, 2013, p. 51). It is important to distinguish *Q* from

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conventional factor analysis sometimes referred to as R-methodology (*R*). *R* looks for correlations between variables (by-variant correlations) across a sample of people whereas *Q* looks for correlations between people (by-person correlations) across a sample of variables (statements). Without recognizing these differences, confusion and misconception in understanding *Q* and its purpose can result (McKeown & Thomas, 2013). The statements in Table 3.1 distinguish *Q* from *R* and the definitions in Table 3.2 define *Q*'s unique terminology.

**Assumptions in Q-Methodology**

Stephenson (1953) assumes man to be a "concrete thinking and behaving being" (p. 86). The observable behaving part of human behavior has long been investigated. Yet, Stephenson also considered *thinking* a testable inner form of behavior. In other words, thoughts are measureable. In *Q*, it is assumed people are unique in their own thoughts. This self-referent nature of *Q* represents a person's point-of-view, which Brown (1980) describes as "neither a trait nor a variable" (p. 46). He calls it "pure behavior" that appears, for example, when a person remarks, "In my opinion… [about such as such]" (p. 46).

**Principles in Q-Methodology**

*Q* has contextual and dynamics principles. First, contextuality connotes the *gestalt* principle where the meaning of any detail depends upon its relation to the whole (Brown, 1980). In other words, one cannot break up subject matter into a series of variables or themes. Instead, *Q* is a means to show how groupings of people prefer particular configurations of themes (Watts & Stenner, 2005). In *Q*, factors are groupings of people who reflect different categories of subjectivity (Brown, 1980). The dynamic principle

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implies that opinion statements are interactive since the person doing the Q-sort is constantly making comparisons between the statements (Brown, 1980).

Table 3.1

*Conceptual Differences Between Q and R*

| ***Q*** | ***R*** |
|---|---|
| Describes a population of viewpoints | Describes a population of people |
| Purpose to locate different viewpoints | Purpose to locate proportion of people who have a particular viewpoint |
| Main question is, "what is the relationship between your overall viewpoint and mine?" (Brown, 1980, p. 173). | Main question is, what is the inter-relationship among a large set of observed variables. |
| A small number of people are given a large number of items | A large number of people are given a small number of tests |
| Who the people are determines the relevance | The number of people determines the relevance |
| People are purposely selected | People are randomly selected |
| Statements are the unit of analysis | People are the unit of analysis |
| Statements in a Q-sort are interactive | Statements in a survey are independent |
| Scores are approximately normally distributed with respect the person's Q-sort (Stephenson, 1953, p. 58) | Scores are normally distributed with respect to the sample of people (Stephenson, 1953, p. 58) |
| Need a sufficient number of items (opinions) to determine differences among people (Brown, 1980; Newman & Ramlo, 2010) | Need a sufficient number of people to determine differences among items |
| Provides an internal perspective from the subject's standpoint. Participant assigns a score (Brown, 1980, p. 176) | Provides an external perspective from the observer's standpoint. Participant receives a score (Brown, 1980, p. 176) |

*Note*. Sources Brown (1980), Newman & Ramlo (2010), and Stephenson (1953)

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Table 3.2

*Unique Terminology in Q-Methodology*

| **Term** | **Definition** |
|---|---|
| *Subjectivity* | The sum of behavioral activity that constitutes a person's current point-of-view. |
| *Concourse* | A population of statements, typically opinion-based rather than fact-based, about a particular phenomenon of interest. |
| *Q-Sample* | A representative subset of statements sampled from the concourse. |
| *P-Set* | A P-Set (P stands for people or participants) is a purposely selected group of participants whose viewpoints matter in relation to the phenomena of interest. |
| *Q-Sorting* | The operant process by which a participant ranks and orders the Q-sample statements. |
| *Sorting Grid* | A quasi-normal distribution grid, typically numbered from a negative to a positive value, and contains the same number of placement spots as the number of Q-sample statements. |
| *Condition of Instructions* | The particular set of instruction, developed by the investigator, that participants are asked to follow as they rank and order the statements and place into the sorting grid. |
| *Q-Sort* | The Q-sort is the product of the sorting activity undertaken by each participant. Each Q-sort is each participant's unique arrangement of the statements sorted based on the condition of instruction, from his/her point-of-view. |
| *Factor Array* | A reconfigured Q-sort based on the composite and weighted z scores from all the participants who define a particular factor. A factor array can be displayed as a composite Q-sort in a reconfigured grid formation or as a table in which the z scores have been converted back into whole numbers within the confines of the sorting grid. |
| *Distinguishing Statements* | Statement(s) placed in the sorting grid in a statistically significant different position compared to all other factors. |
| *Consensus Statements* | Statement(s) placed in the sorting grid in a statistically significant similar position compared to all other factors. |
| *Characterizing Statements* | Statements placed at the two polar ends of the sorting grid of each factor. |

*Note*. Sources Brown (1980), McKeown & Thomas (2013), Watts and Stenner (2012)

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**Measures to Evaluate a Q-Methodological Study**

When evaluating or critiquing the design of a *Q* study one must consider both the philosophical underpinnings of Q-methodology as well as the more technological and mechanical procedures used by investigators. Upon review of the *Q* literature base (Brown, 1980; McKeown & Thomas, 2013; Watts & Stenner, 2012) as well as *Q* list-serve discussions (ISSSS, 2013), it becomes evident Q-methodologists have been cautious in the use of terminology common in quantitative and qualitative research. For example, in qualitative research one evaluates studies for credibility and trustworthiness (Polit & Beck, 2012). For quantitative research, one evaluates studies for different types of validity, reliability, and statistical power (Polit & Beck, 2012). However, in *Q* studies evaluation of evaluation of reliability and validity is framed differently from conventional factor analysis and consequently long-standing debates have occurred (Brouwer, 1992/1993; Dennis, 1992/1993; Storksen & Thorsen, 2011; Thomas & Baas, 1992/1993). Certain *Q* methodologists (Brown, 2013; McKeown, 2013) consider standardized evaluation criteria for *Q* studies futile and nonessential. According to McKeown (2013) “in *Q*, the experts are not the researchers but [rather] the participants doing the Q-sorting [are the experts] and there is no standard judgment other than the participants’ own.”

Yet, there are technological procedures to consider when designing and undertaking *Q* studies. The following are questions worth asking with evaluating a *Q* study. For purposes of comparison, similarities to qualitative/quantitative terms are listed.

1. Does the concourse represent the breadth and depth of opinions on the topic of interest? (similar to data saturation).

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2. Is the Q-sample a representative and balanced sample from the concourse that applies Brunswik's (1955) concept of representative design?
3. Do Q-sample statements retain the essence of the opinion statement as provided by the original source? (similar to face validity). Evaluation of face and content validity occurs during the construction of the Q-sample (Akhtar-Danesh et al., 2008). Face validity is preformed to evaluate whether the essence of the opinion statement as provided by the original source remains, while content validity is preformed to evaluate whether the Q-sample is a valid representation of the concourse. Frequently, use of domain experts helps with such validity evaluations (Akhtar-Danesh et al., 2008).
4. Are participants purposely selected who may hold varying views about the topic of interest? (purposeful sampling plan).
5. Are the participants clear on what they are asked to do, i.e. sort statements according to a set of condition? (reliability of instructions). If participants are not properly instructed on or understand and follow the directions for the Q-sorting process reliability may be compromised (Dennis, 1986). Therefore, pilot testing of the Q-sorting process and conditions of instruction becomes an important reliability issue to assure participants are clear in what they are asked to do.
6. Does factor interpretation merge factor array scores and participants' explanation for statement placement? In other words, the merging of statistical data with human data (similar to triangulation of data).
7. Is factor interpretation reviewed by another researcher and/or compared to relevant theory? (similar to triangulation for investigator and theory).

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In summary, *Q* is an appropriate method to answer the questions in this study because it provides a vehicle to access perspectives or points-of-view nurse educators and nursing students hold about simulation design. By asking educators and students to compare, sort, and rank 60 opinions on simulation design in how they would prioritize their recommendations for simulation design, the investigator can gain insight into their thinking process. So doing reveals underlying assumptions, values, and beliefs about this teaching method.

The following section was prepared as a manuscript that addressed a methodological step conducted in Q-methodological studies not clearly elucidated in the literature. This step comprises the construction of a Q-sample from a concourse of opinion statements. Manuscript Three was submitted for review to *Research in Nursing and Health (RINAH)*. This is an appropriate journal to disseminate this information since this journal publishes papers on research methods and techniques beyond what is generally available in the literature. Although the first manuscript to this journal was not accepted, the journal editor encouraged a revised manuscript be resubmitted after addressing the comments from the reviewers. Since the initial submission, Dr. Steven Brown as a world-renowned expert in Q-methodology reviewed the manuscript. Manuscript Three, as in this dissertation, has since incorporated the suggestions from the reviewers from *RINAH* and the suggestions offered by Dr. Brown.

The information in Manuscript Three was presented at a poster session during the 29$^{th}$ Annual Conference of the International Society for the Scientific Study of Subjectivity (ISSSS) in Amsterdam on September 5, 2013.

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**Section 3.2 - Manuscript Three "Q-Sample construction: A critical step for a Q-methodological study"**

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This article was a component of the doctoral dissertation by Jane B. Paige titled *Simulation design characteristics: Perspectives held by nurse educators and nursing students*. This study is in process with requirements for dissertation anticipated for completion fall 2013 for submission to the University of Wisconsin-Milwaukee.

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**Abstract**

Q-sample construction is a critical step in Q-methodological studies. Prior to conducting Q-methodological studies, investigators start with a population of opinion statements on a particular topic of interest, from which a sample is drawn. These sampled statements are known as the Q-sample. Although literature exists on methodological processes to conduct Q-methodological studies, limited guidance exists on the practical steps to reduce the population of statements to a Q-sample. The steps to construct a Q-sample are illustrated in a study exploring perspectives nurse educators and nursing students hold about simulation design. Experts in simulation and Q-methodology evaluated the Q-sample for readability, clarity, and representativeness of opinions contained in the concourse. The Q-sample was trialed with participants and feedback resulted in statement refinement. Investigators, especially those undertaking Q-method studies for the first time, may find the practical considerations for Q-sample construction offered in this paper beneficial.

*Keywords*: Q-methodology, simulation based learning, Q-sample construction

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**Q-Sample construction: A critical step for a Q-methodological study**

Q-methodology is a research approach designed to study subjectivity (Stephenson, 1953). Subjectivity, in Q-methodological terms, regards a person or group of people's point-of-view and exists when people communicate their thinking, thoughts, beliefs, and values about a particular phenomenon of interest (Stephenson, 1978a). Since subjectivity reflects values and beliefs, it becomes a complex phenomenon to explore. Yet understanding subjectivity offers valuable insight into human behavior (Stephenson, 1978a).

In order to explore subjectivity using a Q-methodological approach, investigators must start with a collection of opinion statements on a particular phenomenon of interest. This collection of opinion statements is called the concourse (Stephenson, 1978a) and it is from the concourse, that a sample of statements is selected for investigation. The sampled statements are known as a Q-sample (Brown, 1980). Although literature exists on the methodological process to conduct Q-studies, including the seminal works of Stephenson (1953) and Brown (1980), with more recent publications by Watts and Stenner (2012), McKeown and Thomas (2013), and specific to nursing research Dennis (1986), Akhtar-Danesh, Baumann, and Cordingley (2008), and Thompson and Baker (2008), little has been published detailing the techniques to construct a Q-sample from a concourse. Since the Q-sample is the unit of analysis, the goal in Q-sample construction is to locate a representative subset of statements that employs Brunswik's (1955) concept of representative design. In this paper, the practical steps to construct a Q-sample from a concourse of opinion statements are illustrated using a study exemplar. Investigators, especially those undertaking Q-method studies for the first time, may find the practical

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considerations for Q-sample construction offered in this paper beneficial. An overview of Q-methodology with a brief explanation of the study exemplar frame the discussion.

**Q-Methodology**

In brief, Q-methodology investigates subjectivity (Stephenson, 1953) by exploring how participants rank-order opinion statements about a particular phenomenon of interest into a distribution (- to +) grid. The particular arrangement each participant rank-orders the opinion statements undergoes correlation with all other participant's rank-ordering of statements. Through use of by-person factor analysis (factoring people rather than factoring traits), participants are grouped together by the way they think similarly about the phenomenon of interest. Once by-person factor analysis is completed, the investigator interprets the resulting factors to gain an understanding of different or shared viewpoints or attitudes.

The purpose of the study exemplified in this paper was to describe and compare perspectives about operationalizing simulation design characteristics as held by nurse educators and nursing students in simulation activities. To offer readers context for this study, simulation is conceptualized as "a dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement, and integrates the complexities of practical and theoretical learning with opportunity for repetition, feedback, evaluation, and reflection" (Bland et al., 2010 p. 5). Simulation has seen exponential growth across nursing programs (Ironside & Jeffries, 2010; Nehring & Lashley, 2010). Yet, during the period of growth in knowledge about simulation pedagogy, educators need time to reflect on this innovative and technology driven teaching strategy and how it fits into current teaching

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perspectives. Moreover, since students commonly evaluate teaching methods, it is important to understand from what perspective they base their evaluative comments (Brookfield, 2006). As opposed to rating individual items as in a questionnaire or survey, in Q-methodological studies, items (opinion statements) become interactive as participants rank and order statements to reveal personal choice, feelings, and underlying beliefs (Brown, 1980).

In the exemplar, the National League for Nursing – Jeffries Simulation Framework (NLN-JSF) (Jeffries, 2012) provided theoretical guidance by identifying the relevant interaction of the teacher, student, educational practices with five simulation design characteristics consisting of objectives, student support, problem-solving, fidelity, and debriefing. These eight conceptual components guided the construction of the Q-sample.

## Constructing a Q-Sample

### Step One - Populate the Concourse

Prior to constructing a Q-Sample, investigators start with a concourse, otherwise known as the population, comprised of opinion statements about the phenomenon of interest. Typically, investigators gather opinion statements that are derived from ordinary conversations, commentary, interviews, or the literature and include statements of opinion rather than statements of fact (Brown, 1980; Stephenson, 1978a). These types of day-to-day and ordinary conversations offer a vehicle to gain insight into human behavior (Stephenson, 1978a).

In the study exemplar two data sources, simulation literature and interviews of nurse educators contributed to populating the concourse that continued until saturation of

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opinions occurred. The International Association for Clinical Simulation and Learning (INACSL), as one data source, is an international organization that aims to promote research and disseminate evidence based educational practice standards for clinical simulation methodologies and learning environments (INACSL, 2011). Accessing nurse educators from this organization optimized the ability to gather a concourse that represented the diversity of viewpoints on how to design and conduct simulation activities. In order to find diverse views, a purposeful sampling frame located nurse educators across a range of categories that included level of educational preparation, type of training or orientation on simulation, years involved in simulation activities, whether simulations included collaboration with other disciplines, enrollment size of nursing program and/or healthcare institution, and region. Thirty-five members of the INACSL organization completed open-ended questionnaires (9 members in-person and 26 members electronically) between June 2011 and September 2011. Commentary was sought from nurse educators on the particulars of how, when, where, who, or what are methods/ways simulation design characteristics are put into action.

Simulation literature was the second data source. Databases searched included ERIC, MEDLINE, Academic Search Complete, and CINAHL with key word simulation, simulation design characteristics, features, and elements limited to the years 2006-2011. Particular attention directed at qualitative studies located quotes that were suitable as an opinion statement. Together, these two data sources populated a concourse of 392 statements on simulation design.

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**Step Two – Select a Preliminary Q-Sample**

Generally, a concourse of opinion statements can contain hundreds of opinion statements. Since this number of statements is too unwieldy for participants to sort and rank-order, a representative subset of opinion statements is sampled from the concourse. Certain Q-methodologist (McKeown & Thomas, 2013; Watts & Stenner, 2012) explain Q-sample construction using an inductive (unstructured) or deductive (structured) approach. In an inductive approach, the investigator selects statements when no preexisting theory exists related to the phenomenon of interest. In such a case, selection of statements is based on themes that emerge from the opinion statements. When a deductive approach is chosen, the investigator selects statements based on theoretical considerations. In such a case, the selection of statements is systematic and structured based on relevant concepts derived from a theory or framework.

In the exemplar, the NLN-JSF provided guidance for both the gathering of the concourse of statements and the sampling of statements from the concourse and reflected a deductive approach for Q-sample construction. A 3-by-5 factorial design (student, teacher, educational practices) times the five simulation design characteristics (objectives, student support, problem-solving, fidelity, and debriefing) produced 15 possible combinations for opinion statements (Table 1). For example, aa (opinion statement combining student and objectives), ab (opinion statement combining student and problem solving), and so forth. Once the 3-by-5 factorial design was defined, the process of reducing the concourse to a manageable number of statements was undertaken. In order to elicit different points-of-view, Brown (1980) recommends having 40-60 opinion statements for participants to rank-order. Considering the 3-by-5 factorial design

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and the desire for 60 statements, it was planned to select four statements per each of the 15 cells.

To expedite the Q-sample selection process, a large (four-by-five foot) poster board, partitioned into 15 cells, provided the visual tool to display the 392 opinion statements. Each of the 392 opinion statements, color-coded according to the eight concepts (teacher, student, educational practice, objectives, student support, fidelity, problem-solving, and debriefing), was individually printed on a 'post-it' note and placed into the partitioned poster board cell that best matched the view represented in opinion statement. Printing each statement on a 'sticky post-it' note made it possible to move statements around and group (stick) similar opinion statements together. One of the authors (JBP) evaluated the statements for duplication and selected one statement that best represented the view the opinion reflected. It is important when constructing a Q-sample to avoid selecting statements mere opposites of each other. As an illustration, the concourse in this exemplar contained opinion statements that viewed grading of simulations as both acceptable and not acceptable. As such, it was appropriate to retain only one of the statements since future participants have the opportunity to rank-order the statement into either side of the sorting grid.

Once the concourse was at 120 statements, evaluation of opinion statements for possible editing ensued. The process about how to edit an opinion statement yet retain the essence of the opinion as provided by the original source was a technique not easily located or detailed in the Q-literature base. Several recommendations on this process are offered by Stephenson (1953), Brown (1980), Akhtar-Danesh (2008), and Watts and Stenner (2012) and listed in Table 2. However, even as these recommendations exist,

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questions remain on statement composition. For example, investigators have to decide on an acceptable length to a statement. Keeping in mind there would be 60 statements to rank-order, having multiple statements of excessive length could become burdensome, time consuming and problematic for future participants.

The edited 120-statement concourse eventually achieved reduction to the desired 60 statement Q-sample. Even though the aim was to select four statements from each of the 15 cells that represented the most diverse opinions in the concourse, in two cells it was difficult to choose less than five diverse statements thus all retained. In two other cells, three statements were sufficient to capture the diversity of opinions. This resulted in a slight imbalance in four of the 15 cells; however, this was considered acceptable as it permitted the Q-sample to be most representative of the opinions contained in the concourse. According to Stephenson (1953), "apportioning of statements into the cells of a design" does not mean it is "correct" (p. 76) to any particular theory. Rather, the factorial design serves as a guide.

**Step Three - Evaluate Q-Sample with Experts**

Following the preliminary selection of the Q-sample, it is appropriate to consult experts to evaluate how closely the selected opinion statements for the Q-sample represent the concourse (Akhtar-Danesh et al., 2008). In the exemplar, the preliminary 60 statement Q-sample, along with the concourse (as reduced to 120 statements) were sent to two experts in simulation and one expert in Q-method. The selection of domain experts in simulation provided expertise regarding simulation design, while the Q-method expert was able to offer advice in Q-sample statement construction. Each expert offered a different form of evaluation of the Q-sample.

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Domain experts in simulation reviewed the Q-sample statements for readability as would be read by nurse educators and as would be read by nursing students. Experts also rated whether the four statements per each of the 15 cells illustrated the most diverse (heterogeneous) range in opinions from the concourse. It was important to clarify with domain experts that they were not to evaluate the accuracy of the content contain in the statement, but rather evaluate the readability of the statement irrespective of its accuracy or meaning. It was necessary to reinforce this point to domain experts as they identified statements at odds with how they thought. Unique to this exemplar, was the use of a content validity index (CVI) to assess agreement between simulation domain experts regarding three questions (Table 3) that rated readability, clarity of statement, and diversity in view. An acceptable CVI rating was set at 0.80 or above. Results of the CVI for the 60 statements included CVI of 1.00 for 43 statements, CVI of 0.83 for 10 statements, and CVI of 0.66 for seven statements.

An open-ended question asked domain experts if they were aware of any other opinions on simulation design not reflected in the concourse of statements. One simulation domain expert suggested the topic of videotaping debriefings. Although the concourse contained several opinions on videotaping, these opinion statements were in relation to videotaping the simulation and not videotaping the debriefing. Since the concourse of statements may not be all-inclusive as there is always something more people can say about a topic (Simons, 2013), the authors concluded the Q-sample reflected a comprehensive range of opinions on designing simulations and decided not to add an additional statement.

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A Q-method expert also reviewed the preliminary Q-sample and offered additional changes in wording of statements. These suggestions addressed aspects about Q-sample construction different from those aspects provided by simulation experts. For example, the Q-method expert recommended removal of additional sentences in an opinion statement that added a supportive argument. It is up to the sorter to impose his/her argument for that opinion statement in the context of comparing to all the other statements. In addition, the Q-method expert suggested minor changes in wording of statements to reflect similar action worded statements.

Based on the results of CVI, along with feedback from simulation domain and Q-method experts, investigators (one novice and one experienced) reviewed the seven statements with a CVI of less than 0.80 and edited six for wording while replacing one with another statement from the concourse. Minor word edits were made to 25 additional statements (even with a CVI greater than 0.80) and 28 statements were left unchanged. Examples of editing process appear in Table 4 (Part A) based on simulation expert input and (Part B) based on Q-method expert input.

**Step Four - Trial Q-Sample and Rank-Ordering Process with Participants**

In addition to obtaining expert review, it was beneficial to trial the Q-sample and rank-ordering process with potential participants. When participants rank-order statements in Q-methodological studies, it is important they are clear on what the investigator is asking them to do. In the exemplar, this was especially important to test since future participants will be administered the Q-sample without the investigator present. Furthermore, considering the future Q-study plans to ask nursing students to rank

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order statements that were provided by nurse educators, it was necessary to test the clarity of the statements as would be read by nursing students.

A convenience sample of four nurse educators and four nursing students evaluated the Q-sample and the directions for the sorting process as they conducted a trial rank-ordering of the statements into a distribution grid. Phone interviews conducted with participants following the trial rank-ordering elicited feedback on 14 statements, all provided by the nursing educators, while the nursing students had no particular comments. Feedback offered by nurse educators included: a) more than one idea in four statements, b) depends on the situation in six statements, c) uncertain in meaning of three statements, and d) one educator considered one statement too long. Of the 14 statements, only one statement received comments by more than one nurse educator.

Based on feedback received concerning the 14 statements, four statements were refined to limit each statement to one idea, eight refined to offer greater clarity, and two statements were left unchanged. For example, one nurse educator commented on the following statement, "students should be left to figure out problems on their own in a simulation." She stated she was uncertain it this statement pertained to the debriefing or during the simulation. Considering this feedback, this statement was refined to, "students should be left to figure out problems on their own during the actual simulation." Two of the four nurse educators commented that their decision to rank statements "depended on the situation" for six of the statements. Based on these comments, the investigators returned to the raw data contained in the open-ended questionnaires to gain insight in whether rewording of these six statements would offer greater clarity to the situation at hand. Five statements were subsequently refined with examples of refinements made to

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statements depicted in Table 4 (Part C). The final 60 statement Q-Sample organized by the 15 matrix design is indexed in Appendix B.

**Discussion**

The process to select a representative sample (Q-sample) from the concourse of opinion statements, employing Brunswick's (1955) concept of representative design, is an important goal in Q-methodological studies (Brown, 1980; McKeown & Thomas, 2013). In other words, if the same sampling design process was repeated to select a different set of statements from the same concourse, conceivably similar factors would result (Brown, 1980; Stephenson, 1953). In the exemplar used in this paper, the construction of the Q-sample entailed an iterative process that spanned three months. Based on the experience of authors, the particular techniques detailing how to select statements from the concourse and the acceptable degree by which to edit statements were unclear in the literature. To help prospective investigators employing a Q-method research approach, the following are practical considerations for Q-sample construction that may be beneficial to other researchers. Limitations in Q-sample construction particular to the exemplified study offer addition information.

First, when evaluating a concourse of opinion statements for comprehensiveness and diversity, it is useful to organize raw data using some tool that allows visualization of the statements captured within the concourse. Hundreds of opinion statements exist that may need deliberation. In the exemplar, 'post-it' notes displayed on a large poster board helped organize this process. Such a strategy provided a gestalt view of the entire concourse as decisions on statement selection for the Q-sample construction occurred.

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Second, since minimal detail exists in the literature on how to select and edit Q-sample statement composition, the guidelines in Table 2 can serve as a helpful and collective resource to other researchers. The degree to edit statements should keep these points in mind. Retention of statements that contain language-in-use (ordinary conversations) is expected and actually desired in a Q-sample. In addition, statement length and congruency to the sorting question participants rank and order statements by become important considerations.

Third, it is important to avoid a Q-sample structure that is “biased” towards a particular viewpoint (Watts & Stenner, 2012, p. 58). Such a structure would be unbalanced and restrict a future participant’s opportunity to express his/her views through the rank-ordering process. For example, in the exemplar it was also important to select opinions even if they were incongruent with emerging best practices in simulation design. These opinions exist, are held by nurse educators, and influence how simulations are designed.

Fourth, consulting experts in both simulation and Q-method was valuable as each offered different advice on statement construction. Even with revisions suggested by the experts, there remained statements that still needed refinement, thus trialing the Q-sample with potential participants proved additionally beneficial.

Limitations in the construction of the Q-sample illustrated in the exemplar need acknowledging. First, the NLN-JSF initially published in 2005, that served as a guide for gathering the concourse and as the factorial design for the Q-sample, underwent revision in 2012. In the revised framework, the concept of student was renamed as participant and the concept of teacher was renamed facilitator. The change in this terminology occurred

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after the concourse was gathered and the Q-Sample constructed, but before the actual Q-study was conducted in 2013. Potentially, this may have influenced participants' response as they rank-ordered any opinion statements pertaining to the teacher/facilitator and/or student/participant.

## Conclusions

As the unit of analysis, the Q-Sample is the *heart* of any Q-Study. Considering this statement, researchers cannot minimize the process to construct a representative sample from the diversity of opinions about the phenomenon of interest. Doing so provides future Q-study participants the opportunity to express their point-of-view with a representative mix of opinions. The value of accessing experts for Q-sample construction cannot be overstated. Since the details about how to select a Q-sample from a concourse along with how to edit the Q-sample statements is an area not well elucidated in the literature, authors offer investigators using Q-method an example that depicts these steps. Based on the exemplar, investigators considering Q-method as a research approach should allot sufficient time to construct a Q-sample for their Q-study.

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Table 1

*Factorial Design of Q-Sample (statements)*

| | | NLN-JSF Sphere Two: Five Simulation Design Characteristics | | | | |
|---|---|---|---|---|---|---|
| | | ***Objectives*** | ***Problem Solving*** | ***Fidelity*** | ***Debriefing*** | ***Student Support*** |
| **NLN-JSF Sphere One** | ***Student*** | 4 (actual 5) statements | 4 statements | 4 (actual 3) statements | 4 statements | 4 statements |
| | ***Teacher*** | 4 statements | 4 statements | 4 statements | 4 (actual 3) statements | 4 statements |
| | ***Educational Practices*** | 4 statements | 4 statements | 4 statements | 4 (actual 5) statements | 4 statements |

*Note.* National League of Nursing-Jeffries Simulation Framework (NLN-JSF)
*Note*. Q-Sample $N$ = (3) x (5) matrix x (4 Repetitions) = 60 opinion statements

Table 2

*Guidelines for Selecting and Editing Q-sample Statements*

1. Avoid selecting statements too difficult to understand, mere opposites of another statement, or ones that could be "picked out for special regard on extraneous or incidental grounds" (Stephenson, 1953, p. 76).
2. Edit grammar to offer clarity in wording of statements and reduce ambiguity of meaning. However, avoid removal of any emotional response evoked by the statement (Akhtar-Danesh et al., 2008).
3. Retain statements that invite a range of emotional reactions. The intent following completion of a Q-sort, is for participants to feel they were given ample opportunity to articulate their viewpoints (Watts & Stenner, 2012).
4. Avoid the urge to correct illogical properties of a statement (Brown, 1980).
5. Avoid double-barreled statements containing two or more proposition (Watts & Stenner, 2012). For example, 'simulation is fun but anxiety provoking' or double negative statement such as 'I do not find simulations enjoyable.'
6. Avoid statements with two opinions as this can make it difficult for the sorter if he/she agrees with one part but not the other (Watts & Stenner, 2012).

Table 3

*Questions for Domain Experts in Q-sample Development*

| | |
|---|---|
| 1. The statement is clear and unambiguous as would be read by a nurse educator. | 1 2 3 4 |
| 2. The statement is clear and unambiguous as would be read by a nursing student. | 1 2 3 4 |
| 3. The statement illustrates heterogeneity from other statements in the factorial design based on the NLN-JSF. | 1 2 3 4 |
| 4. Are there other statements expressed in the literature or SBL discussions you would offer that are not represented in the concourse of statements? | Open-ended |

*Note*. 1 = not at all, 2 = somewhat, 3 = mostly, 4 =completely

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Table 4

*Examples of Edited Q-Sample statements*

| Part A: Original Statement | Edited statement based on input from simulation domain experts | Rationale for editing |
|---|---|---|
| *Utilize a 'ticket to enter' to get the students prepared to take care of the simulated patient. Students who work though modules are better prepared for the simulation.* | *Assign students pre-simulation modules to help students be more prepared to take care of the simulated patient.* | By editing the wording from 'ticket to enter' to 'pre-simulation modules' the statement was clearer but retained original point-of-view. |
| *Do not use the word 'pretend.' During pre-briefing instruct students if they are going to do something, then do it i.e. give medications, wash hands, etc.* | *Do not use the word 'pretend' during simulations. Instead, instruct students to carry out actions i.e. washing hands, administering medication.* | Grammatical rewording offered clearer sentence structure. |
| Part B: Original Statement | Edited statement based on input from Q-methodologist | Rationale for editing |
| *Prior to the first simulation, students should observe a simulation and then have hands-on orientation with the manikin. This allows time to express fears and anxieties relating to the simulation experience.* | *Prior to the first simulation, students should observe a simulation and then have hands-on orientation with the manikin.* | Removal of the second sentence that added a supportive argument. This permits the sorter to assign his/her meaning to why or why not this activity is necessary. |
| *Simulation can be used for one-on-one learning/evaluation for students who are struggling or possibly unsafe in clinical.* | *Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical.* | Rewording to have statement phased as an action. This is similar to other statements and promotes a clearer sorting process. |
| Part C: Original Statement | Edited statement based on input from trial with participants | Rationale for editing |
| *Limit objectives to 3 to 4 and keep them general so students are not informed of the specific focus of the simulation.* | *Design and keep objectives general so students are not informed of the specific focus of the simulation.* | Reduce to one idea |
| *End a simulation, for example, when the patient has been transferred to another unit, the patient has recovered, or the student team has reached consensus.* | *End a simulation when students are not actively providing care, for example when the patient has been transferred to another unit, the patient has recovered, or consensus reached by the team.* | Offer greater clarity to situation. Reviewed original statement in raw data to gain insight for rewording statement. |

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## Section 3.3 Feasibility Study

Following the construction of the Q-sample, a feasibility study was undertaken to evaluate the Q-sort process, recruitment strategy, and calculate individual Q-sort test-retest reliabilities to gain a sense of the stability of individual points-of-view.

Composite factor reliability refers to the stability of perspectives over time (Brown, 1980). From a technical standpoint, computation of composite factor reliabilities depends on the reliability of individual test-retest correlations (same person, two different times, under same conditions with same Q-sample) (Stephenson, 1978b) and increases as more people load on a factor. Brown (1980), Fairweather (1981), and Frank (1956) have reported 0.80 or higher individual correlation coefficients when conducting individual test-retest procedures, however more recent individual test-retest assessment have not been located in the literature. Since, by default, a 0.80 individual test-retest coefficient is programmed into Q-software programs, for example, PQMethod (Peter Schmolck, 2012), a more current individual test-retest may be beneficial, thus an individual test-retest of Q-sorting procedures was designed into the feasibility study.

**Participant Selection and Recruitment**

Given that a sample size for feasibility purposes is generally 10 percent of the intended sample (Hertzog, 2008), eight participants (four nursing students and four nurse educators) were considered sufficient for the feasibility study. Participants for the feasibility study were selected who would be representative of the participants (P-Set) to be accessed for the planned *Q* study. The feasibility of accessing two national organizations: the National Student Nurse Association (NSNA) to recruit nursing students; and the International Association for Clinical Simulation and Learning

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(INACSL) to recruit nurse educators was also assessed. Participants were eligible if they had participated in one or more simulations. Additionally, an inclusion criterion for nurse educators was having attended at least one formal training experience on simulation.

Following Institutional Review Broad (IRB) approval (Appendix D), placement of a recruitment memo in the NSNA weekly newsletter in September 2012 resulted in 48 replies of interest. The first four nursing students who replied were enrolled in the feasibility study and the others retained for the planned *Q* study. Similarly, a recruitment memo posted on the INACSL list-serve in August 2012 recruited four nurse educators. All four nurse educators recruited completed the feasibility study while two of the four nursing students completed the study. Since one nursing student completed only the first Q-sort while another nursing student did not return any Q-sorts an additional recruitment strategy was employed to recruit the remaining two nursing students from the Student Nurse Association (SNA) at dissertator's university of employment following amendment to IRB.

**Study Packet**

The study packet contained four items: (a) *Q-sample* of 60 opinion statements each written on a four by six cm card randomly numbered on backside from one to 60, (b) *Conditions of Instructions of Card Sort*, (c) three by two foot *Card Sort Grid* (Figure 3.1) large enough to accommodate placement of the 60 cards, and (d) *Tabulation Sheet* for demographics that included a small card sort grid for recording of card numbers.

The consistency by which participants follow directions for the card sorting process (Q-sort) has implications for reliability. Therefore, to evaluate clarity of

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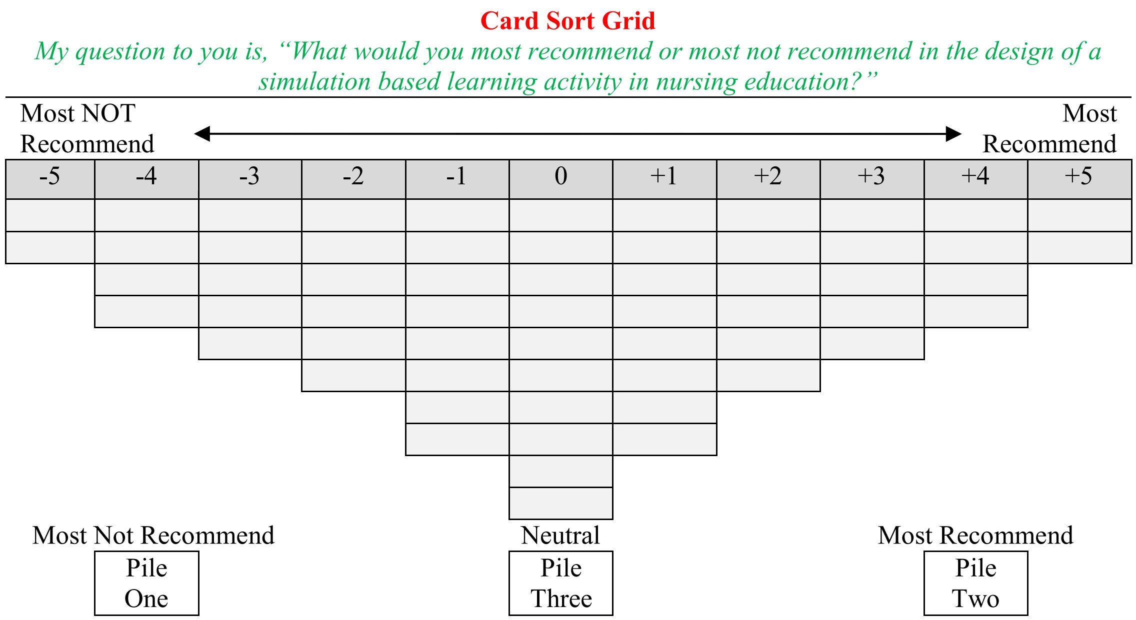
directions prior to administering the Q-sorts, a 14-year-old read the directions and reported them clear and understandable.

Figure 3.1

*Card Sort Grid*




**Procedure**

Participants (nurse educators and nursing students) received the four study items, consent letter, and an incentive (coffee gift card) via postal service. As directed in the *Condition of Instructions*, participants found a quiet location to optimize their attention to Q-sorting process. To offer participants a consistent point of reference, participants were provided the following definition of a simulation based learning activity - "a dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement, and integrates the complexities of practical and theoretical learning with opportunity for repetition, feedback, evaluation, and reflection" (Bland et al., 2010, p. 5).

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Following directions in the *Condition of Instructions*, participants read all opinion statements to get a general impression of the type and range of opinions. Then, to simplify the sorting process, participants sorted the 60 statements, following the direction of this question, "what would you *most recommend* or *most not recommend* in the design of a simulation based learning activity in nursing education," into three piles; *most recommend, most not recommend,* and *neutral*. Next, participants took the cards from the *most not recommend* pile and selected the two cards they would *most not recommend* and placed them under the -5. This was repeated for the *most recommend* pile with placement of two cards under the +5. Participants repeated this process, going back and forth between recommend and not recommend piles. This continuous switching between most recommend and most not recommend forced the participants to visualize as well as reconsider their views (Brown, 1980; Dennis, 1986; McKeown & Thomas, 2013). Finally, participants sorted the remaining cards into the remaining open spots on the grid. Following completion of the Q-sort, participants mailed the *Tabulation Sheet* to the investigator in a pre-paid envelop.

Two weeks later, participants received a second identical set of study items to complete a second Q-sort. Lastly, following return of the *Tabulation Sheet*, the investigator conducted a post-sort phone interview with seven of the eight participants (one of the eight participants did not reply to the interview request) asking about instruction clarity, time to complete Q-sort, and whether an electronic card sort option would increase or decrease attention or intent in completing this activity.

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## Results of Feasibility Study

**Conditions for Instructions.** Participants reported the *Conditions of Instructions for Card Sort* clear and understandable. They reported use of a separate colored *Tabulation Sheet* with card sort grid to record card numbers "very helpful." One participant suggested underlining card numbers to distinguish ones that could be read differently depending on how the card was positioned, for example 01 and 10.

**Q-Sort Process.** The time to complete card sort ranged from 30-60 minutes. Since programs are available to complete the card sorting process electronically and their use was being explored, but were uncertain about participants' attention and engagement in the sorting process, participants were questioned on this option. Participants consistently reported that an electronic process would be more difficult. One participant stated, "I liked to see all statements at one time, think about them, and move them around."

**Reliability of statements.** Individual test-retest reliability was evaluated by asking participants to repeat an identical card sort two weeks after the first card sort. However, the time between first and second card sort ranged from two to nine weeks as not all participants completed and returned second card sort within the requested time interval. An individual reliability coefficient between first and second sorts was calculated with the average test-retest reliability based on eight pairs of Q-sorts 0.72 (Table 3.3).

## Revisions to the Q-Sorting Process

Incidentally, it was upon data entry into the PQMethod software program that it was noted the positive and negative poles were opposite the poles as designed in the *Card*

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*Sort Grid*. This meant data from the *Card Sort Grid* needed reading from right to left instead of left to right as it was entered in PQMethod software. In order to reduce possible error during data entry, the *Card Sort Grid* was revised to have the -5 on the left and +5 on the right. No changes were made to the *Condition of Instruction for Card Sort.*

Table 3.3

*Correlation of Q-Sort (test-retest)*

| Participant | $r_{ab}$ | *Time between sorts* |
|---|---|---|
| Nurse Educator 1 | .87 | 3 weeks |
| Nurse Educator 2 | .87 | 4 weeks |
| Nurse Educator 3 | .78 | 3 weeks |
| Nurse Educator 4 | .62 | 3 weeks |
| Nursing Student 1 | .51 | 4 weeks |
| Nursing Student 2 | .43 | 9 weeks |
| Nursing Student 3 | .98 | 2 weeks |
| Nursing Student 4 | .72 | 5 weeks |
| *Mean* | .72 | |

*Note.* $a = 1^{st}$ *sort;* $b = 2^{nd}$ *sort*

Based on results from this feasibility study, the following actions for the Q-study were implemented. First, the positive and negative direction of the *Card Sort Grid* was reversed. Selected Q-sample card numbers (01, 06, 08, 09, 10, 18, and 60) were underlined.

Second, accessing INACSL to recruit nurse educators and NSNA to recruit nursing students was an effective recruitment strategy. However, based on the 75% return rate and up to a two month response time, it was necessary to over recruit by at least 25% and extend the data collection period from two to four months. The time of administration of Q-Sorts in relation to the academic school year was an important consideration. For example, all four nurse educators who received the study packet in August 2012 (prior to start of semester) completed the study, while two out of the four nursing students who received the study packet in September 2012 (after start of

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semester) completed the study. Consequently, it was decided to start data collection prior to the start of an academic semester in hope of increasing response rate.

Third, given the 0.72 average for individual test-retest reliability coefficient (lower than the 0.80 conservative estimate), the investigator questioned whether opinion statements on simulation design change as one participates in more simulation experiences. This question was investigated in research question four. Upon review of the individual test-retest correlations, one sort returned nine weeks after the first sort had a correlation of 0.42 (Table 3.3). Other possibilities were considered that may have contributed to this lower test-retest correlation, for example the possibility participants might not have invested as much thought and time in their second sorting process compared to the first, or whether participants may have interpreted the statements differently from first sort to second sort. Considering the 0.72 average for individual test-retest reliability coefficient from the feasibility study, the investigator consulted an expert in Q-methodologist. His consult yielded the following response. Even though factor reliability helps reveal statements that deserve closer attention (distinguishing statements); these statements are only one piece of data used for factor interpretation. To compensate for a lower test-retest coefficient, the investigator can raise the level of significance for accepting distinguishing statements (i.e. $p < .01$ instead of $p < .05$). Appropriateness of this action was confirmed with Q-methodologist (Dr. Steven Brown, personal communication, September 7, 2013). As such, the test-retest 0.72 coefficient average from eight pairs of Q-sorts updates dated literature on individual reliability test/retest, but did not compromise the ability to interpret factors as they emerge in the Q-study.

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## Section 3.4 Q-Method Research Design

The purpose of this study was to explore and compare perspectives about simulation design as held by nurse educators and nursing students. This section details the Q-method research design. Phase III was the actual Q-study and involved the administration of the Q-sorts, factor analysis, and interpretation of resulting factors. The following details more explicitly the Q-Study design from what would be possible in manuscripts reporting study results. The research design for Phase III is presented in Figure 3.2.

### Protection of Human Subjects

Participants were informed of study purpose, risk/benefits, and voluntary participation via a consent letter (Appendix C). Institutional Review Broad approval (IRB) from University of Wisconsin – Milwaukee was obtained and amended (Appendix D).

### Inclusion and Exclusion Criteria

The inclusion and exclusion criteria for study participants are listed in Table 3.4. Even though the MSN is the minimal educational level for educating student nurses, nursing programs do use BSN prepared nurses in simulation activities. Their opinions are important and relevant as they are part of the educational process.

### Selection of P (People)-Set

Consistent with *Q* principles (Brown, 1980; McKeown & Thomas, 2013), the P-sets for this study were purposely selected. Considering the inclusion and exclusion criteria, two P-Sets, one comprised of educators and one comprised of students, were selected guided by a 3-by-3 matrix design (Table 3.5).

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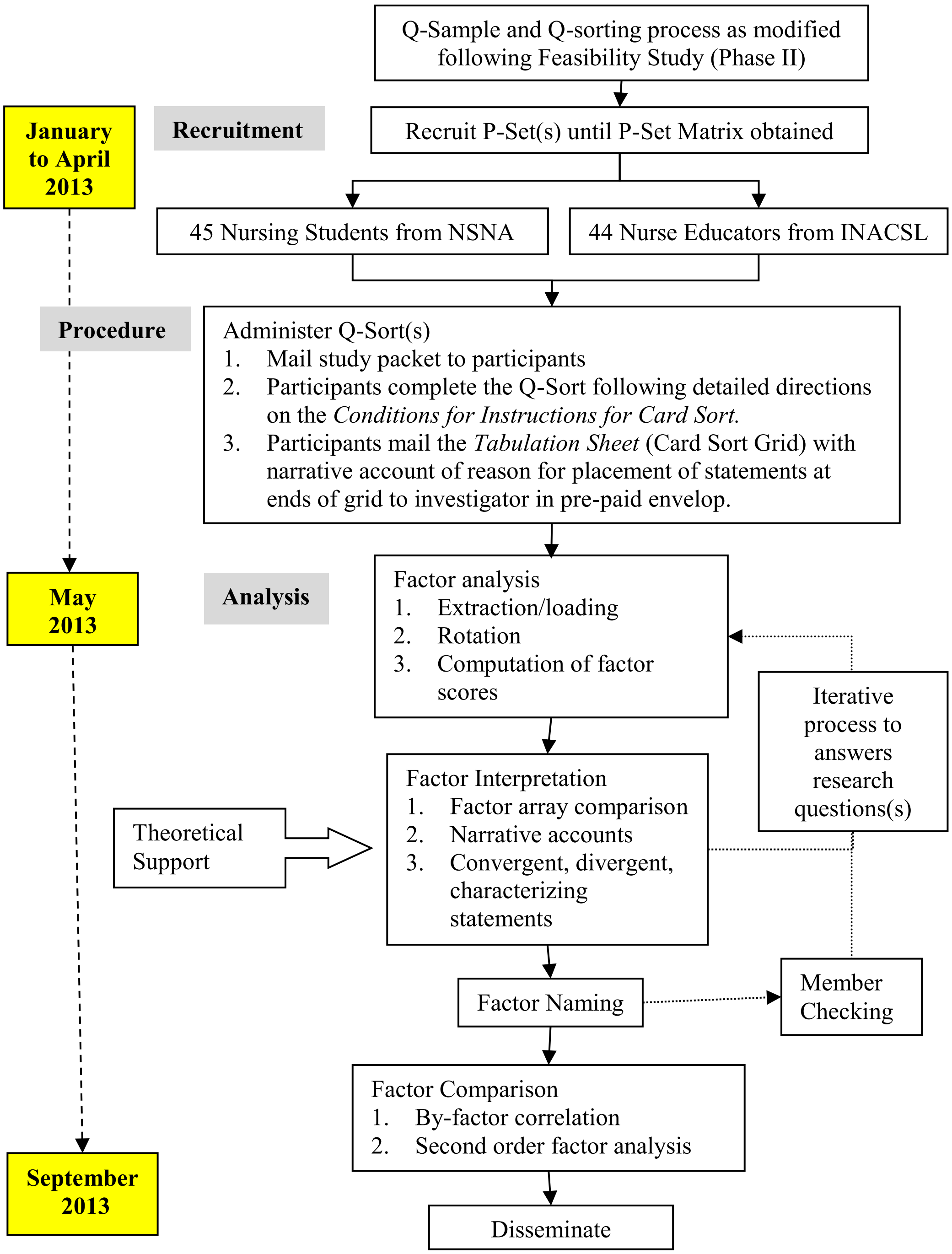
Figure 3.2

*Flowchart for Q-Study Research Design – Phase III*




*Note*. NSNA – National Student Nurse Association.
INACSL – International Association for Clinical Simulation and Learning

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Table 3.4

*Phase III Study Participants Inclusion and Exclusion Criteria*

| **Nurse Educator** | **Nursing Student** |
|---|---|
| *Inclusion Criteria* | |
| a. Participated in one or more simulations | a. Participated in one or more simulations |
| b. Conduct simulation activities with undergraduate associate, diploma, or bachelor's nursing students | b. Currently enrolled in an associate, diploma, or bachelor's degree nursing program |
| c. Hold a BSN or higher level of education and functions as a nurse educator (teacher) in an academic program or is a nursing lab coordinator working with simulation activities | |
| d. Had at least one formal training experience on simulation based learning | |
| *Exclusion Criteria* | |
| a. No experience in simulation<br>b. Non-nursing personal | a. Had not participated in a simulation educational experience |

Table 3.5

*P-Set Matrix Design for Nurse Educators and Nursing Students*

| Main Effects | Dimensions |
|---|---|
| ***Nurse Educators*** | |
| A. Nurse Educator's years of experience with SBL | a. Less than 2 years<br>b. 2 to 5 years<br>c. Greater than 5 years |
| B. Size of Program | a. <100 students<br>b. 100-250 students<br>c. >250 students |
| ***Nursing Students*** | |
| A. Nursing student's number of SBL experiences | a. 2 or less SBL<br>b. 3 to 5 SBL<br>c. Greater than 5 SBL |
| B. Size of Program | a. <100 students<br>b. 100-250 students<br>c. >250 students |

*Note*. P-Set = (Main effects) x (Replications)
(A) x (B) x (Replications)
(3) x (3) x (5) = 45 people i.e. (aa, ab, ac, ba, bb, bc, ca, cb, cc)

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As evident in the P-set matrix design (Table 3.5), there were two main effects, each with three dimensions. The enrollment size of nursing program and experience with simulation activities were considered relevant for recruitment since resources for conducting SBL activities may vary based on program enrollment and thus potentially influence perspectives. Experience level with SBL may also influence perspectives towards simulation design. Based on this 3-by-3 matrix design, there were nine possible combinations of experience and program size dimensions for participant recruitment. Each of these nine combinations was repeated five times, which yielded a P-set of 45 nurse educators and a P-Set of 45 nursing students. This P-set number was consistent with Brown's (1980) recommendation for 40 to 60 participants for a Q-study.

**Participant Recruitment**

**Nurse educators.** Recruitment of the nurse educator P-set occurred through accessing members of the International Association for Clinical Simulation and Learning (INACSL) organization and continued until each P-set combination and size was obtained. A recruitment memo posted twice (January and February 2013) on the INACSL list-serve recruited participants aiming to achieve the matrix P-Set of 45 nurse educators. In some Q-studies, the investigator has been included in the P-Set, provided the investigator met the same inclusion criteria (Brown, 1993). Including the investigator in the P-Set allows the investigator to determine which, if any, factor (perspective) he/she holds. This becomes helpful during factor interpretation as it facilitates the investigator's ability to bracket out bias (Polit & Beck, 2012). Considering this point, the investigator was included as a participant of the Q-sort (Dr. Steven Brown, personal communication,

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January 23, 2012). A five-dollar coffee gift card was provided as a study incentive. Recruitment memos and recruitment questionnaires are indexed in Appendix E.

**Nursing students.** Recruitment of nursing students started in Phase II and continued into Phase III until each P-Set combination and size was obtained. The National Student Nurse Association (NSNA), inclusive of a fee for accessing members, served as the recruitment vehicle. Recruitment memos in the NSNA newsletters in September 2012 and again in March 2013 recruited nursing students. A five-dollar coffee gift card was provided as a study incentive. Recruitment memos and recruitment questionnaires are indexed in Appendix E.

**Study Packet**

Following the incorporation of necessary revisions based on the feasibility study, four items comprised the study packet (Appendix F).

1. *Q-sample* of 60 opinion statements each written on a four by six cm card randomly numbered on backside from one to 60.
2. *Conditions of Instructions of Card Sort.*
3. Three-by-two foot *Card Sort Grid* large enough to accommodate placement of the 60 cards.
4. *Tabulation Sheet* for gathering demographic information, Q-sort arrangement (miniaturized small card sort grid), and written explanation why statements were placed at the ends of the grid. Demographic data included age, gender, type of nursing program, region, and experience with simulations for both nurse educators and students. For nurse educators, demographic data included educators' level of education, type of training for SBL, and whether educators conduct interdisciplinary

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simulations. These data served to describe P-Sets and demographics of each factor (perspective).

**Procedure**

The following procedures comprised the administration of the Q-sorts. As participants were recruited (January 2013 and continuing until April 2013), they received via postal service, incentive, a consent letter, and the four study packet items. Participants completed the Q-sort following the detailed directions outlined within the *Conditions for Instructions of Card Sort*. Following completion of the Q-sort, participants mailed the completed *Tabulation Sheet* to the investigator in the pre-paid envelop. Following data analysis and determination of the model Q-sort for each perspective, the investigator asked (email exchange in June 2013) the participant(s) who best matched the model Q-sort(s) to comment on investigator's interpretation.

**Data Analysis**

Typically in *Q*, data analysis of Q-sorts applies both qualitative and quantitative techniques. The quantitative (statistical) techniques for *Q* involve the sequential application of correlations, factor extraction, factor rotation, and computation of factor arrays (McKeown & Thomas, 2013). Four basic types of data are generated and include; (a) factor loadings, (b) rank-ordered list of Q-sample statements with z-scores, (c) factor scores (arrays), and (c) list of statements that distinguish each factor from other factors and list of consensus statements that represent agreement among all the factors (Brown, 1980; McKeown & Thomas, 2013; Newman & Ramlo, 2010). The qualitative techniques apply a constant comparative process where the resulting factor arrays are set side-by-side and compared for differences and similarities (Brown, 1980). Interpretation of

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participants' written explanations for placement of opinion statements toward the polar ends contribute interpretative value and add to study credibility.

In this study, selection of the best factor solution was guided by the following criteria; (a) ability to explain as much of the variance in the correlation matrix as possible considering Watts and Stenner's (2012) recommendation for 35 to 40% or above as a "sound solution" (p. 105), (b) minimize the number of confounding (sorts loading on more than one factor) and non-significant sorts (sorts not loading on any one factor), and (c) avoidance of significantly correlated factors. The selection of extraction and rotation methods were made wtih these criteria in mind. In this study, the PQMethod 2.33 (Peter Schmolck, 2012) was the free software program selected for factor computation.

**Correlation.** Each Q-sort represents a participant and the way he/she thinks about recommendations for simulation design. A 45-by-45 correlation matrix comprised of 45 Q-sorts completed by nursing students and another 44-by-44 correlation matrix comprised of the 44 Q-sorts completed by nurse educators were individually calculated. These matrixes correlated each participants' unique 60 statement rank-ordered Q-sort to each other participants' unique 60 statement rank-ordered Q-sort using the following formula $r_{xy} = 1 - \frac{\sum d^2}{2Ns^2}$ where $d^2$ = squared difference in ranking score of statement in two Q-sorts, $N$ = number of statements, $s^2$ = variance of forced distribution. The extent of the mathematical calculations that is undertaken in this by-person correlation becomes evident in Figure 3.3. However, in *Q,* little attention is given directly to the correlation matrix (Brown, 1980), which is only used as a transitional phase between the raw data and factor interpretation.

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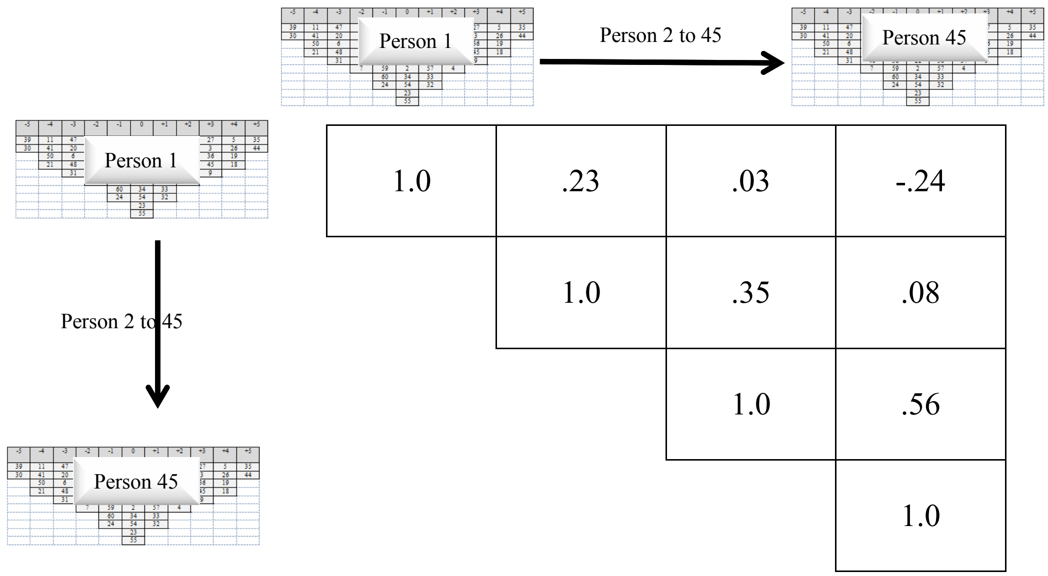
Figure 3.3

*By-Person Correlation Matrix Example*




**Factor extraction.** The correlation matrixes (nursing student and nurse educator) were then separately subjected to by-person factor analysis with the intent of identifying the number of natural groupings of Q-sorts (people). In *Q*, two factor extraction methods are available, centroid and principal component analysis (PCA). The centroid method, an older factor extraction method, is preferred by traditional Q-methodologists, as it is more permissive and allots for theoretical rather than mathematical decision-making (Brown, 1980; Newman & Ramlo, 2010; Stephenson, 1953). The PCA method provides a single, mathematically best solution in which the variance of loading is maximized (Watts & Stenner, 2012). As noted prior, the selection of extraction method depended on the ability to reach best factor solution based on pre-determined criteria. In this study, the best factor solution was obtained with PCA extraction.

The number of factors to extract is traditionally determined by eigenvalues greater than one (Brown, 1980) or whether there are two or more significant loadings on a factor

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(Brown, 1980, p. 222). However, in *Q*, the number of factors to extract using only statistical considerations (eigenvalue criteria) could lead to inclusion of faulty factors that are theoretically unimportant or exclude factors that may be highly important (Brown, 1980). Therefore, in this study, the number of factors to extract was based on Brown's recommendation to extract more factors than needed, since once factor rotation is performed, insignificant factors can be discarded.

Factor loadings are correlation coefficients and comprise the statistical means for grouping of people (McKeown & Thomas, 2013). When people load together on the same factor, it is because their Q-sorts significantly correlate and they share a common point-of-view. Conversely, when there are negative loadings on a factor, people have a reversal of that point-of-view (McKeown & Thomas, 2013). Q-sorts represent people and, if a person loads significantly on more than one factor, that means this person shares more than one perspective (Watts & Stenner, 2005). Similarly, a person may not load on any particular factor, which means this person does not have a shared point-of-view. These are residual types of people, and even though they still have a point-of-view, retaining people who load on more than one factor or who do not load on any factor obscures factor clarity. Typically in *Q* and as applied in this study, these people were excluded from computation of the composite Q-sort and subsequent factor interpretation. In this study, a 0.01 significance level determined factor loading. For a factor to be significant at the 0.01 level, it had to exceed 2.58 times the standard error (SE). The SE is calculated by $1/\sqrt{N}$ where *N* is the number of statements (Brown, 1980). Since this study had a Q-sample 60 statements, the standard error SE was $1/\sqrt{60}$ or 0.129. This

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means factor loadings for a 60 Q-sample were significant if a factor loaded at greater than +/- 0.33 [2.58 times 0.129] (99% confidence interval).

**Factor rotation.** Rotation examines factors (perspectives) from different angles and changes how people are grouped together. In *Q*, two factor rotation methods are available, judgmental (hand rotation) and varimax (McKeown & Thomas, 2013; Watts & Stenner, 2012). Judgmental rotation permits the researcher to apply abductive logic to follow hunches based on what he/she knows about the participants (Brown, 1980), structural features of the data (Akhtar-Danesh et al., 2008), and/or some *a priori* theoretical understanding (Brown, 1980). Conversely, varimax rotation rotates factors based on statistical criteria accounting for the maximum of study variance (Watts & Stenner, 2012). Similar to extraction, the selection of rotation method depended on the ability to reach the best factor solution. In this study, the best factor solution was obtained using varimax rotation for the nursing student perspectives, while for nurse educator's perspectives, the best solution was found using an unrotated solution.

**Factor interpretation.** Generally in *Q*, there is no set strategy for interpreting a factor structure; rather it depends on the purpose of the study (Brown, 1980). In this study, several techniques (Table 3.6) were applied during factor interpretation to answer the research questions. Factor interpretation then proceeded using factor z scores that had been converted to factor array scores. A factor array is essentially the reconfiguration of the resulting factor displayed as a Q-sort (Watts & Stenner, 2012). This new reconfigured (conceptualized best-fit or composite) Q-sort characterizes a person who would load 100 percent on that factor (Akhtar-Danesh et al., 2008). This composite Q-sort permitted easier display (helpful to those not familiar with *Q*) and facilitated factor interpretation.

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Table 3.6

*Analysis Method to Answer Research Questions*

| | Data | |
|---|---|---|
| Research Question | Quantitative | Qualitative |
| 1. What are nurse educators' perspectives towards operationalizing simulation design characteristics within simulation based learning educational interventions? | ▪ Factor Loadings<br>▪ Rotated Factor Loadings<br>▪ Factor Scores for each factor (z scores) and factor array (converted to grid scores)<br>▪ Distinguishing statements for each factor (converted to grid scores)<br>▪ Consensus statements (converted to grid scores) | ▪ Characterizing statements<br>▪ Post-sort narrative explanation of placement of cards at polar ends<br>▪ Factor naming<br>▪ Member checking with composite Q-sort |
| 2. What are nursing students' perspectives towards simulation design characteristics as operationalized by nurse educators? | ▪ Factor Loadings<br>▪ Rotated Factor Loadings<br>▪ Factor Scores for each factor (z scores) and factor array (converted to grid scores)<br>▪ Distinguishing statements for each factor (converted to grid scores)<br>▪ Consensus statements (converted to grid scores) | ▪ Characterizing statements<br>▪ Post-sort narrative explanation of placement of cards at polar ends<br>▪ Factor naming<br>▪ Member checking with composite Q-sort |
| 3. How do perspectives towards simulation design characteristics vary between nurse educators and nursing students? | ▪ Correlation coefficients between factor arrays of nurse educators and nursing student.<br>▪ Second order factor analysis | ▪ Visual inspection of factor arrays between nurse educators and nursing students |
| 4. How do perspectives about simulation design characteristics within SBL educational interventions vary based on experience with SBL for nurse educators and number of SBL experiences for nursing students? | ▪ Frequency distribution of SBL experience and number of SBL experiences across factors. | ▪ Visual inspection of factor arrays between nurse educators and nursing students |

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Taking into account that there were participants loading on the same factor more strongly than others, calculation of the factor array scores were weighted. The weight (w) was based on the participants' factor loading (*f*) and calculated as $w = f/1-f^2$). Using these weighted scores, each statement was recreated within its grid position (in this study -5 to +5) thus configuring the composite Q-sort.

Following the guidance of Watts and Stenner (2012), a systematic process (referred to as crib sheets by Watts and Stenner) was used to facilitate, organize, and visually inspect the data captured within each factor array (constant comparative). Crib sheets were used to identify statements in each factor that were ranked higher and ranked lower than all the other factors. According to Watts and Stenner, use of crib sheets help ensure nothing obvious in factor interpretation is missed or overlooked as the researcher is forced to engage with every statement in each factor array.

Factor interpretation also required examination of salient statements that deserved special attention known as distinguishing, characterizing, and consensus statements. Distinguishing (divergent) statement(s) reflect where participants placed/ranked a statement that is in a statistically significant different position compared to how participants in another factor placed the same statement. Conversely, consensus (convergent) statements are statements that all participants placed in a statistically significant similar position and consensus statements represent what all people think similarly on. A statement was considered characterizing if it was positioned in the outer two columns (-5, +5) of the composite Q-sort for each factor. However, these characterizing, distinguishing, and consensus statements are not the "be-all and end-all" (Watts & Stenner, 2012, p. 149) of factor interpretation. Even as these statements helped

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identify salient features of each factor, they were supplemented by data as organized by use of crib sheets. Additionally, post-sort explanations by the participants of their thoughts and reasons for placement of statements at polar ends provided further qualitative insight into the interpretative process.

After factor interpretation, member checking was completed (Watts & Stenner, 2012). In this step, the investigator returned the factor interpretation to one or more of the participants who best matched the composite Q-sort for each factor (nurse educator and nursing student who voluntarily agreed and provided contact email on Tabulation Sheet) and asked them to comment on the degree to which the interpretation matched what he/she thought. Member checks were requested of 14 nursing students with one student responding (7% return). Member checks were requested of five nurse educators and four educators responded (80% return). Questions asked of participants included: to what degree to you agree with investigators interpretation (1 [disagree], 2 [somewhat disagree], 3 [neutral], 4 [agree], 5 [strongly agree]); what do you consider most representative of your point-of-view and why; and what do you consider least representative of your point-of-view and why? However, caution must be used when exercising member checks as part of factor interpretation. Brown (2012) comments, "there is no guarantee a participant will recognized him/herself once a mirror is held up to them." For example - a person loads on a factor at 0.60 meaning 36% ($.60^2$) in common with the factor and if that person's test-retest estimate is around 0.80, then this means that person's specificity is 0.80 – 0.36 = .44 or 44% in common for that factor. Therefore, member checking was considered helpful rather than confirmative.

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**Comparing perspectives.** Nurse educators and nursing students were administered the same Q-sample. However, Q-sorts from each nurse educator and nursing student P-sets were factor analyzed separately to gain an understanding of perspectives collectively held by educators and collectively held by students. The resulting factors (between educators and students) were then compared via three methods: inter-factor correlations, second order factor analysis, and visual inspection (constant comparative) of the factor arrays (composite Q-sorts). The following describes each method. Inter-factor correlations between nurse educators and nursing students factors shows how a group of nurse educators correlates to each of the groups of nursing students in their rank-ordering of the statements. A significance of 0.01 was set for this correlation. Again, using the SE as $1/\sqrt{60}$ or 0.129, this meant inter-factor correlations were significant if factors correlated at greater than +/- 0.33 [2.58 times 0.129] (99% confidence interval) (Brown, 1980). Second-order factor analysis was also conducted and involved taking the composite Q-sort from each factor (nurse educators and nursing students) and conducting a second factor analysis with these reconfigured composite Q-sorts (McKeown & Thomas, 2013). In other words, each of the first-order factor solutions was considered as one composite Q-sort that then underwent a second round of correlation, factor extraction and rotation calculation. Visual inspection (constant comparative) analysis involved the comparison of the rank ordering of statements across each of the second-order factor arrays.

## Limitations

Study limitations need acknowledgment with an explanation of the measures the investigator used to attend to these limitations. First, in Q-methodology, a reported

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limitation is the extensive directions participants are asked to follow for completing the Q-sort (McKeown & Thomas, 2013). While this is a reported limitation, this study used a feasibility study to refine and revise this process.

Second, Q-methodology is sometimes criticized for its small, non-random selection of people to complete the Q-sorts (Akhtar-Danesh et al., 2008). This criticism may stem from misunderstanding of the purpose of Q-methodology that some reviewers, unfamiliar with the purpose of Q-methodology, report as a limitation. The purpose of Q-methodology is to locate different perspectives rather than the proportion of people who have that perspective (Brown, 1980). External validity, as in generalizability or transferability of findings, has never been the purpose of this method (Brown, 1980; McKeown & Thomas, 2013). Nevertheless, in this study, the selection of the P-Set was purposeful considering the possible relevance of participants' experience with SBL and size of nursing program as characteristics that could influence opinions about simulation design. Recruiting participants considering these two characteristics (experience with SBL and program size), was an added step included in this study not always done with P-set recruitments (Brown, 1980; McKeown & Thomas, 2013). While there is no guarantee participants recruited for this *Q* study will locate all existing perspectives about operationalizing simulation design characteristics, the perspectives it does discover do exist (Brown, 1980).

Thirdly, a limitation particular to the design of this study was having participants complete the Q-sorting process without the investigator being present. Typically, the investigator observes participants during the sorting process and interviews the participant afterwards as to why he/she placed the statements in certain areas in the grid

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paying particular attention to statements the participant took more time to sort (Brown, 1980). Since in this study, participants were recruited from across the country, being present as an investigator was not feasible. Despite this limitation, participants were requested to write an explanation on why they placed the two statements at either end of the grid.

Finally, a fourth possible limitation particular to this study was having nursing students sort opinion statements that were gathered from nurse educators. Typically in *Q*, participants who are asked to complete the sorting process are characteristically similar to the participants who provided the opinion statements for the Q-sample. In order words, participants who are asked to sort opinion statements need to have some familiarity with the topic of interest (Brown, 1980; Watts & Stenner, 2012). However, in this study it was important to understand nursing students' perspectives about the actions nurse educators take during simulation design. To control for this limitation, the Q-sample was tested with nursing students to evaluate statements clarity as would be read by nursing students prior to undertaking the actual Q-study.

## Chapter Summary

This chapter was divided into four sections. In Section 3.1, an overview of Q-Methodology and its selection as an appropriate research approach was provided. Section 3.2 was prepared as a manuscript and reported the construction of the Q-Sample from the concourse of opinion statements as a critical step prior to conducting a Q-study. In Section 3.3, the feasibility study of the Q-sample and the Q-sorting process were reported. Section 3.4 concluded this chapter by detailing the Q-Method research design.

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# CHAPTER 4.0 RESULTS

## Chapter Introduction

The purpose of this study was to describe and compare nurse educators' and nursing students' perspectives about operationalizing design characteristics within simulation based learning educational interventions in nursing education. Two manuscripts (Sections 4.1 and 4.2) report study results to research questions one and two. The results to research questions three and four are reported in Sections 4.3 and 4.4 respectively.

The following two sections (Section 4.1 and 4.2) were prepared as manuscripts to report study findings on the perspectives nurse educators and nursing student hold about simulation design. The journal(s) selected for possible publication of these manuscripts is yet to be determined. However, the desire is to locate a journal in which both manuscripts would be considered for publication. Since manuscript limitations typically precludes the ability to publish the entirety of results, Appendices G and H report comprehensive factor descriptions and factor array tables compared to the condensed versions used for manuscript preparation. This investigator additionally intends to develop a manuscript for possible publication that would report the results to research question three (Section 4.3) in which perspectives as held by nurse educators were compared to those perspectives held by nursing students.

The results reported in the sections 4.1, 4.2, and 4.3 were presented as a paper presentation at the 29$^{th}$ Annual Conference of the International Society for the Scientific Study of Subjectivity (ISSSS) in Amsterdam on September 5, 2013.

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**Section 4.1 - Manuscript Four "Design of simulations: Perspectives held by nurse educators"**

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This article was a component of the doctoral dissertation by Jane B. Paige titled *Simulation design characteristics: Perspectives held by nurse educators and nursing students*. Reported in this article are the results of nurse educator perspectives about simulation design. A second complimentary article reports the results of nursing students perspectives about simulation design as operationalized by nurse educators.

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Abstract

Despite the growing body of research into simulation based learning (SBL), limited investigation exists regarding beliefs that underpin SBL pedagogy. Even though key simulation design characteristics exist, the particular methods nurse educators use to operationalize simulation design are unknown. Reported in this study are nurse educators' perspectives about operationalizing simulation design characteristics. Employing a Q-methodological approach, 44 nurse educators rank-ordered 60 opinion statements, theoretically structured from the National League for Nursing-Jeffries Simulation Framework, into a quasi-normal distribution grid. Factor analysis revealed nurse educators share an overriding *Facilitate the Discovery* perspective about simulation design. Two secondary bipolar factors revealed that even though educators share a common perspective, there exist aspects of simulation design held in opposition. Results suggest ongoing and sustained educational development along with time for nurse educators to reflect on and clarify their perspective about simulation design is essential. Further educational research on how simulation design differs based on a formative or a summative purpose is necessary.


*Keywords*: simulation, teaching perspectives, Q-methodology, epistemological beliefs

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**Design of Simulations: Perspectives Held by Nurse Educators**

Simulation based learning (SBL) is a pedagogical method poised to innovate nursing educational approaches (Ironside & Jeffries, 2010; Parker & Myrick, 2012). Yet, despite a growing body of research on SBL, there is limited investigation about the underlying assumptions, principles, and beliefs that underpin SBL pedagogy (Schiavenato, 2009; Walton et al., 2011). Considering that educators can hold varying beliefs towards teaching and learning, while acknowledging best practices for simulation design continue to emerge, it is to be expected a certain degree of subjectivity exists as educators operationalize simulation design. Subjectivity reflects a point-of-view or perspective derived from a set of beliefs and intentions giving direction and justification to action (Pratt, 1998). Subsequently, in order to meet new ideas in simulation design, educators must understand their own perspective(s), be able to explain their perspective(s) to others, and see beyond their perspective to those of other educators.

Currently, the number of different perspectives nurse educators use to design simulations is unknown. Gaining an awareness of these perspectives (individual and shared) is a means to enhance instructional delivery, while informing the educational development of nurse educators in SBL. Educators readily share their points-of-view about designing simulation both formally (in literature and conference presentations) (Deckers, 2011; Goosen, 2001) and informally (ordinary conversations and list-serve postings). These types of conversations portray the subjectivity surrounding simulation design and become a vehicle for exploration.

As part of a larger study that described and compared nurse educators' and nursing students' perspectives about operationalizing design characteristics, this article

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reports on nurse educators' perspectives about simulation design. Reported elsewhere are the five perspectives about simulation design as held by nursing students and the comparison of nurse educator perspectives to those held by nursing students. This article reports on the research question, "What are nurse educators' perspectives about operationalizing simulation design characteristics within SBL educational interventions?"

**Background**

SBL is a teaching - learning strategy " involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement, and integrates the complexities of practical and theoretical learning with opportunity for repetition, feedback, evaluation, and reflection" (Bland et al., 2010, p. 5). Assimilation of SBL as a teaching/learning strategy into healthcare education has increased exponentially around the world (Dieckmann, 2009; Nehring & Lashley, 2010). Yet, as educators acquire knowledge about SBL with its associated new technologies, what cannot be overlooked is how SBL teaching/learning strategies fit into current teaching perspective(s). Even as SBL touts a student-centered approach and educators may agree with this philosophy, deep-rooted assumptions more commonly associated with a teacher-centered approach, exist and need to be uncovered and possibly challenged.

In the case of SBL, without adequate time for reflection on why we teach the way we do, nurse educators can potentially design and conduct simulations that are not ideal (Akhtar-Danesh et al., 2009; Clapper, 2010; Clapper, 2011; Howard et al., 2009; Miller & Bull, 2013). If poorly designed SBL activities take place, the learner can leave with a false sense of learning or what Clapper (2010) calls a "confident incompetent" (p. e8).

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For various reasons, not all simulation design options (equipment availability, space limitation, educator comfort and knowledge level, student group numbers, context or purpose of simulation, etc.) are always available, feasible, or recommended. Consequently, educators are forced to decide between one choice over another and a SBL activity may turn into a significantly different type of learning activity based on individual educators' personal choices.

Even as reports from systematic reviews indicate a preference for teaching and learning with SBL exists (Howard et al., 2009; Laschinger et al., 2008), fewer studies explore the reasons why educators think this way (Rowbotham, 2010). To get at this thinking involves a deeper probe into underlying assumptions and beliefs. Akhtar-Danesh et al. (2009) have conducted such probing investigations and located four perspectives towards SBL held by nurse faculty; positive enthusiastics, supporters, traditionalist, and help seekers. What remains undiscovered is what constitutes different perspectives toward design of simulations and how these perspectives distinguish the different ways educators think about simulation design. Understanding perspectives becomes important, as there may exist viewpoints precluded or overshadowed by more obvious and extreme viewpoints. In addition, teaching perspectives may be obscured by one or two singular opinions. If either is the case, then not all voices are heard as best educational practices for simulation design are established.

**Theoretical framework**

The National League for Nursing-Jeffries Simulation Framework (NLN-JSF) (Jeffries & Rogers, 2012) is a theoretical framework comprised of five conceptual components (teacher, student, educational practices, simulation design characteristics,

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and student outcomes) that provide direction to educators as they plan, conduct, and evaluate simulation activities (Figure 1). In this study, the NLN-JSF provided theoretical guidance for the gathering of opinion statements on simulation design considering the relevant interaction of teacher, student, and educational practices upon the five simulation design characteristics (objectives, student support, problem solving, fidelity, and debriefing). It was from this interaction that perspectives were investigated.

## Method

### Q-Methodology

Investigators employ a Q-methodological research approach to explore the subjectivity inherent in perspectives (Stephenson, 1953). In a rigorous and systematic process, Q-methodology applies both qualitative and quantitative techniques and contains unique terminology that needs some explanation (Brown, 1980; McKeown & Thomas, 2013). In Q-studies, investigators start with a large collection of opinion statements about a particular topic of interest. This population of opinion statements is known as the concourse and from this population a sample (the Q-sample) is drawn that becomes the unit of analysis. Typically a Q-sample of 40-60 statements is sufficient in number to draw out points-of-view (Brown, 1980). Participants are purposefully selected who may hold differing points-of-view and are referred to as the P-Set. Participants are asked to rank order the opinion statements into a quasi-normal distribution grid following a particular set of directions provided by the investigator. This rank-ordering process is called Q-sorting and the unique arrangement of opinion statements in the grid by each participant is called a Q-sort (Brown, 1980; McKeown & Thomas, 2013). The Q-sorts then undergo correlation and factor analysis. The resulting factors represent the way groups of people

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think about a topic, thus Q-method is known as a by-person factor analysis. Each factor is reconfigured into a composite Q-sort that models that group of participants' collective arrangements of the statements. Factors are subsequently interpreted to reveal how people think and share views about the particular topic of interest (Brown, 1980; McKeown & Thomas, 2013).

**Concourse and Q-Sample**

A concourse of 392 opinion statements about simulation design, derived from interviews of 35 nurse educators across the United States and Canada and from review of simulation literature, populated the concourse. Considering the NLN-JSF, a 3-by-5 factorial design (student, teacher, and educational practices times the five simulation design characteristics of objectives, student support, problem solving, fidelity, and debriefing) provided the structure for construction of the Q-sample from the concourse (Paige & Morin, 2013). Four opinion statements were selected for each of the 15 cells resulting in a Q-sample of 60 statements. A feasibility study was undertaken to evaluate the Q-Sample prior to conducting the Q-study.

**Participant Selection (P-Set)**

In this study, the experience level of nurse educators and enrollment size of nursing programs could be factors that may influence educators' opinions on how to design simulations. Thus, participant (P-set) selection sought recruitment of nurse educators across a range of experience levels and size of nursing program. A 3-by-3 matrix (9-cell) P-set (Table 1) provided the sampling frame to recruit 45 nurse educators. Inclusion and exclusion criteria for nurse educators appear in Table 2.

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**Nurse Educator Recruitment**

Following Institutional Review Board (IRB) approval, JBP recruited nurse educators from the International Association for Clinical Simulation and Learning (INACSL) having over 15,000 members globally (INACSL, 2013). Recruitment memos posted January and February 2013 on the INACSL list-serve resulted in 60 replies of interest. Considering the sampling frame, JBP mailed study packets to 55 responders and received 40 in return (72% return rate). Since respondents were lacking from nursing programs of less than 100 students and with less than two years of experience with simulation, a second recruitment strategy was used to access members of the Administrators of Nursing Education of Wisconsin (ANEW) organization. Following IRB amendment, JBP posted a recruitment memo on the ANEW list-serve in March 2013 resulting in 10 replies of interest. Study packets were mailed to all 10 and six were returned (60% return rate). These two recruitment strategies resulted in the return of 46 Q-sorts. However, two nurse educators did not complete Q-sorts in a manner suitable for data entry. The final P-Set comprised 44 nurse educators with demographic descriptors displayed in Table 3. As evident in Table 1, recruitment results for the P-set matrix was unbalanced with one to eight nurse educators per cell. However, according to Brown (1980), it is unnecessary to achieve a completely balanced P-Set since using a sampling frame provides a guide but does not guarantee the location of diverse points-of-view.

**Procedure**

An incentive (coffee gift card), consent letter, and the following four study items were mailed to all participants: a) *Q-sample* of 60 opinion statements each written on a small card randomly numbered on backside from one to 60, b) *Conditions of Instructions*

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*of Card Sort*, c) three-by-two foot *Card Sort Grid* large enough to accommodate placement of the 60 cards, and d) *Tabulation Sheet* for recording demographics and miniature card sort grid for recording of card numbers. Nurse educators rank-ordered (Q-sorted) the 60 statement Q-Sample according to the question, "What would you most recommend (+5) or most not recommend (-5) in the design of a simulation based learning activity in nursing education" into a quasi-normal, 11 column, distribution grid (Figure 2). Following the Q-sorting activity, nurse educators returned the completed *Tabulation Sheet* with demographic information, card sort arrangement, and their explanation for placement of statements at polar ends (-5 and +5) of grid.

**Analysis**

By-person factor analysis was conducted through sequential application of correlation, factor extraction, and computation of factor array using PQMethod 2.33 (Peter Schmolck, 2012). Post-sort written explanations by the participants on their thoughts and reasons for placement of statements at polar ends as well member checking provided further qualitative insight for interpretative process (Gallagher & Porock, July/August 2010). Nurse educators with the five highest loadings were asked, in an email exchange, to rate the degree (1 disagree, 2 somewhat disagree, 3 neutral, 4 agree, 5 strongly agree) to which they agreed with factor interpretation.

## Results

**Nurse Educator Perspectives about Simulation Design**

Using principal component analysis (PCA) (Watts & Stenner, 2012) as the extraction method without rotation (rotation distributed common variance across factors resulting in highly correlated factors) revealed an overriding consensual perspective

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about operationalizing simulation design (Factor A - *Facilitate the Discovery*) that explained 29% of variance in the correlation matrix. Two bipolar, secondary factors (Factors B and C) were also revealed. The presence of these secondary bipolar factors meant that even though nurse educators largely share a common perspective about simulation design (Factor A - *Facilitate the Discovery*), there exist opposing views about specific aspects of simulation design as revealed in the polar ends (-5 and +5) of Factors B and C. Twenty-seven nurse educators loaded solely on Factor A - *Facilitate the Discovery*, while 15 additional educators loaded on Factor A while also loading on either secondary bipolar Factors B or C (Table 4). The following presents the interpretation of Factor A - *Facilitate the Discovery* followed by a discussion focused on the polarity in views about simulation design as revealed in Factors B and C. Since Factors B and C are confounded (overlap) with Factor A, they are not distinct factors (perspectives) and were left unnamed. Q-Sample statements (item number, array score) and quotes (*italics)* from nurse educators explaining their placement of statements at the polar ends support factor interpretation.

**Factor A *"Facilitate the Discovery."*** To enhance factor clarity, only those participants loading solely (purely) on Factor A were used to calculate composite factor array and its interpretation (Watts & Stenner, 2012). Factor A - *Facilitate the Discovery* (Table 5) revealed nurse educators feel most strongly about getting at students' thinking processes (#6, +5). This is accomplished primarily during the debriefing where students do most of the talking but are redirected if conclusions are erroneous (#40, +5) *"sometimes, what the student did was right but their reasoning is wrong."* Furthermore, video recording the simulation to view portions in the debrief (#51, -5), or have students

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view independently is considered *"valuable as students often are unaware of what they say, how they say it, and their body language."* Student thinking develops by allowing enough time to process information, not cue too soon (#22, +4), and let students troubleshoot equipment independently (#58, -4) as *"skills are often best revealed to students by what they try to do but don't or can't and they learn to resource."* Educators recommend stopping a simulation (#57, -5) if it is clear "*serious incorrect things are being done which could cause harm to the patient."* In planning simulations, it is important to schedule following theoretical content (#29, +4) and discuss scenario confidentiality (#43, +4). It is appropriate to offer specific scenario objectives to help students prepare (#17, -3) since *"we shouldn't be worried that students will be over-prepared and fly through the simulation."* Creating reality is important and is in the detail of assuring technology is functional, educators know how to use, and it has been pilot tested (#35, +4; #11, +3) because *"poor preparation leads to suboptimal simulation outcomes…and students can be ruined by bad simulations."* Member checking with nurse educators indicated they strongly agreed (2 educators) to agreed (2 educators) with investigator's interpretation of Factor A – *Facilitate the Discovery*.

**Secondary Bipolar Factors B and C.** Examination of secondary bipolar factors B and C, each accounting for 5% of variance in the correlation matrix, revealed specific aspects of simulation design held in opposition by nurse educators. This became evident when a particular statement in one factor was ranked on both sides (-/+ 4 or -/+5) of the grid. Focusing attention on the statements ranked at both ends of Factor B or Factor C identified opposing views about simulation design. These opposing views concern how to

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assign roles, the degree in providing student support, and whether to stop or repeat a simulation.

***Role assignments.*** Nurse educators holding a secondary, bipolar Factor C perspective held opposite views on how to use roles characters in simulations, while secondary, bipolar Factor B revealed nurse educators held opposite views on whether students should play family role characters. Both Factors B and C revealed nurse educators were in disagreement on how to assign simulation roles to the weaker student. The characterizing (ranked -/+4 or-/+5) statements (identified by item number) in Factors B and C include:

| Item # | Statement | Factor B | Factor C |
|---|---|---|---|
| #15 | Assign students to play family role characters. This allows students a better understanding of the experience of family members. | -/+ 4 | |
| #55 | It is best if role playing characters are not well known to the students. | | -/+ 4 |
| #54 | Consider mixing students from different levels in the program. This allows senior students to practice delegation and junior students to see how smart they will be/should be closer to graduation. | | -/+ 4 |
| #8 | Place "weaker" students in roles that force them to perform. Doing so allows nurse educators to better evaluate these students. | -/+ 5 | -/+ 4 |

***Offering student support.*** The opposition in views as to what extent students should be offered support during the simulation was revealed in secondary, bipolar Factors B and C. For example, statement #9 on whether the nurse educator should be in in the simulation room was ranked at both ends of the grid (+5) most recommend and (-5) most not recommended. The characterizing (ranked -/+4 or-/+5) statements (identified by item number) in Factors B and C include:

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| Item # | Statement | Factor B | Factor C |
|---|---|---|---|
| #16 | Review simulation objectives verbally with students. This allows time for nurse educators to stress the purpose of the simulation, and how meeting these objectives will facilitate learning | -/+ 4 | |
| #41 | If students are going to make an error during a simulation, first give them cues to change their minds. But, if they say, "I am good" or "let's go do this", let students make the error and help them discover the error or omission in debriefing. | -/+ 4 | -/+ 4 |
| #49 | Offer students preplanned information or cues during the simulation. To accomplish this, it is necessary for nurse educators to predict what additional cues students will need to progress in the scenario. | -/+ 4 | |
| #20 | Students should be left to figure out problems on their own during the actual running of the simulation. | -/+ 5 | |
| #9 | Nurse educators should not be present in the room during a simulation, as students tend to rely on the educator to get through the scenario. | -/+ 4 | -/+ 5 |

Written comments explaining statement placement provide insight into nurse educators' thinking, for example, "*nurse educators should be present…so they can observe firsthand how students interact and provide cues to assist the student to think through a problem or situation."* In an opposing view, *"…the educator should not be in the room…it is not realistic…causes students to interact with the educator instead of the patient….and novice educators find it nearly impossible to not instruct."* The statements #41, #49, and #20 were ranked as most recommend (+4/5) and most not recommend (-4/5) by nurse educators, it is apparent educators differ on how much and at what point cueing should be provided in the simulation to help student figure things out.

***Stopping or repeating simulations.*** Similarly, the bipolar ranking of statements #37 and #57 regarding stopping and or repeating a simulation revealed differing views

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about how far to let students fumble before having to stop a simulation. Review of written explanations offered by nurse educators revealed the differing views educators have about how to balance letting mistakes happen but not create a feeling defeat. For example, one nurse educator commented *"they need to make mistakes but not to the point of not learning."* Another educator alluded to how the debriefing can contribute to whether students leave feeling defeated, *"if a student leave the sim experience feeling defeated, then something wasn't done well, most likely the debriefing."* The characterizing (ranked -/+4 or-/+5) statements (identified by item number) in Factors B and C include:

| Item # | Statement | Factor B | Factor C |
|---|---|---|---|
| #37 | Since students can feel so dejected if they did not perform well, it is helpful to repeat the same simulation. | | -/+ 5 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | -/+ 4 | |

**Discussion of Perspectives**

In this study, 44 purposely selected nurse educators rank-ordered 60 opinion statements on simulation design to reveal how they prioritized their recommendations for simulation design. Findings indicate nurse educators collectively approach simulation design with a shared understanding that aims to facilitate students' own discovery of nursing knowledge. The overriding perspective held by nursing educators labeled *Facilitate the Discovery* is consistent with reports in the literature for simulation design. For example, nurse educators should aim to facilitate students' clinical judgment (Bambini et al., 2009; Lasater, 2007a) and appropriately select levels of fidelity (Weaver, 2011). Simulation, when used as a formative learning activity takes into account the

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developmental nature of the learning process. In this study, this is reflected when nurse educators used the phrase, "*mistakes are puzzles to be solved*" meaning students learn from their mistakes. This perspective also is congruent with the emerging standards of best practice (INACSL Board of Directors, 2013). For example, in INACSL Standard IV and V it is the role of the facilitator (nurse educator) to orient the student to simulation ground rules that encompass a psychologically safe and noncompetitive environment, communication of simulation objectives, and explore students' decisions and actions during debrief. These are similar to statements nurse educators recommend.

Explanation for the existence of an overriding consensus factor nurse educators hold for simulation design may reflect the possibility that nurse educators are tapping into the same resources as they become educated on SBL. Two national simulation organizations, INACSL and the Society for Simulation in Healthcare (SSH), as well as their associated journals, conferences, webinars, and white papers are available for healthcare educators. Demographics for gender, age, level of education, type of training, and program type described characteristics of the nurse educators. Of interest was the percent of training attributed to simulation manufacturers (76%) and training conducted person-to-person (86%) as opposed to structured educational inservice programs (38%).

However, rather than focusing energies on the common and shared *Facilitate the Discovery* perspective, it may be more beneficial to focus attention on the opposing design issues revealed in the two bipolar secondary factors. Evident from the bipolar secondary factors, specific quandaries in simulation design remain. These quandaries concern on how or if to assign students as role characters and the amount of student

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support to offer during the simulation including when and whether to stop/repeat a simulation.

Whether to assign students as role characters is dependent on how different role characters are scripted into the simulation. In other words, role characters can be used to add complexity to the simulation (family members, other healthcare providers) or role characters can be used as a vehicle to offer cueing or act as a resource. However, the choice on whether and how to assign students as role characters in simulations presents a quandary for nurse educators. As evident in Factor A *Facilitate the Discovery,* nurse educators recommend not assigning students to play non-nursing healthcare professional roles, however, as evident in secondary, bipolar Factors B and C, whether to assign students as family members was not as clear. Furthermore, having a nurse educator in the simulation room, whether as a role character, acting as a resource, or being an observer, is another design choice in which educators differed.

The quandary of allowing mistakes to happen but not create the feeling of defeat is an ongoing challenge for nurse educators. Nurse educators need to decide how far to let students struggle before offering support or stopping a simulation in process. Evident in the bipolar Factor B and Factor C, educators differ on these accounts. In part, findings revealed that nurse educators' concern about how students feel following simulation activities may be a factor in their decisions of when and how much to offer student support. Educators are particularly sensitive if student weaknesses are revealed, for example educators commented, "*exposing their weaknesses as 'beat[ing] up' on them."* or *"students should love simulation and not feel beat up."* Considering such comments, it may be pertinent to discuss and ask, does a concern in whether students like or feel good

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after a simulation influence educators' ability to provide meaningful and constructive feedback? Rudolph and colleagues (2013) recognize this concern over providing constructive feedback and suggest educators reexamine their assumptions about providing feedback. So, instead of thinking, "if I say critical things, students will feel bad and scared of simulation" a reframed way of thinking is "learners are resilient and they can tolerate direct feedback if shared in a respectful way" (Rudolph et al., 2013 p. 8). This type of reflection forces educators to consider and possibly reframe their underlying belief about providing feedback. In order words, feedback can be provided in a way that does not need to defeat the student.

However, learning how to deliver feedback in a respectful, transparent, and upfront way requires educator development and ongoing practice (Rudolph et al., 2013). In part, how nurse educators emotionally prepare nursing students for simulation activities could be a determining variable that influences whether students experience this feeling of defeat. One nurse educator, in this study, tells students upon entering the simulation to "*make some good mistakes so we have lots to talk about.*" Literature on how to conduct debriefing in a meaningful and respectful manner exists (Dreifuerst, 2010; Neill & Wotton, 2011; Rudolph et al., 2013; Simon et al., 2009) yet, minimal guidance exists about how to prepare students emotionally for simulation activities.

Student support is also subject to the emotional climate created by the learning activity (Clapper, 2010; Rowbotham, 2010). Even though this study did not have a Q-sample statement referring to a *'safe'* learning environment, educators in their comments used this phrase, thus it deserves some discussion. Upon review of the comments offered by educators regarding the 'safe' learning environment, it becomes apparent different

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connotations exist for this phase. In this study, as educators commented on the 'safe' learning environment, some were in reference to keeping the patient safe, for others it was in reference to graded simulations, for others it was the vulnerability students experienced around other students, while other educators considered a 'safe' environment as maintaining confidentiality in not discussing students' performance with other faculty. Ganley and Linnard-Palmer (2012) explored this phenomenon and offered some clarity by defining 'academic safety' as a supportive climate where there is freedom to learn and grow. Similarly, the INACSL standards of best practice define 'psychological safety' when participants can speak freely and share thoughts and opinions without the risk of retribution or embarrassment (INACSL Board of Directors, 2013).

When placed within the context of the NLN-JSF (Jeffries, 2012), the following are specific aspects of the five simulation design characteristics nurse educators sharing in the *Facilitate the Discovery* perspective most recommend. These aspects could contribute useful information for establishing assumptions and/or principles relevant to this framework as it is evaluated as a potential theory. As a design characteristic, *objectives* should be specific rather than general and reviewed with students prior to the simulation activity. Scheduling of simulation activities ideally should follow theoretical content. *Problem solving,* as a design characteristic, is enhanced when educators allow students enough time to think and process information during the simulation. *Fidelity,* as a design characteristic, is maintained if the technology is functional and educators are proficient in knowing how to operate and troubleshoot the technology. Incorporating use of videotaped simulations and letting students do the talking during *debriefing* is a useful

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strategy. However, *student support,* as a design characteristic, may be more appropriate subdivided into instructional support and emotional support.

## Implications for Educational Development

Ongoing educational development is essential for educators as they design, conduct, and evaluate SBL activities (Dillard et al., 2009; Issenberg et al., 2011; Jones & Hegge, 2008; McNeill et al., 2012; Stainton et al., 2010). In addition to learning the technological 'nuts and bolts' of simulation operation, there is need for educators to engage in reflective exercises that clarify one's perspective of teaching with SBL. This happens when one compares one's own views to those of others and examines reasons behind choices made. Being able to articulate ones' perspective influences the confidence and comfort educators have when employing instructional strategies such as SBL (Pratt et al., 2007).

## Limitations

Study limitations need acknowledgment. One limitation was that the investigator was not present during the administration of the Q-sort. As a common procedure in Q-methodology, the investigator interviews participants in-person as to why they placed statements in particular areas in the grid. Such interviews provide helpful insight for factor interpretation. Since this study recruited nurse educators from across the United States, the investigator did not have opportunity to complete in-person interviews. However, nurse educators did explain in writing why they placed statements at ends of the grid. The level of written explanation provided by nurse educators was generally very insightful; however, the explanations were limited to the +5 and -5 placements on the grid. Further explanations to placement of statements across the grid would have

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provided additional insight for factor interpretation. Second, since simulation is developing at a rapid rate and attitudes change as new things are learnt, this study provides a glimpse of perspectives that exist at this point in time. Even as this study identified one consensual perspective nurse educators hold about simulation design, undiscovered views about simulation design remain.

## Conclusion

Nurse educators benefit from critical reflection about teaching practices in terms of what we do (action), what we are trying accomplish (intentions), and why we think as we do (beliefs) (Pratt, 1998). Reflecting on our actions and intentions is a start, but what becomes more challenging is discovering our underlying epistemological beliefs behind teaching and learning. Beliefs reveal themselves when choices are forced, similar to the method used to discover perspectives in this study. Findings from this study indicate educators overall hold similar views about simulation design. However, the means and degree to offer student support before and during the simulation activity is unknown, under researched, and a topic ripe for investigation.

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Figure 1

*National League for Nursing-Jeffries Simulation Framework*

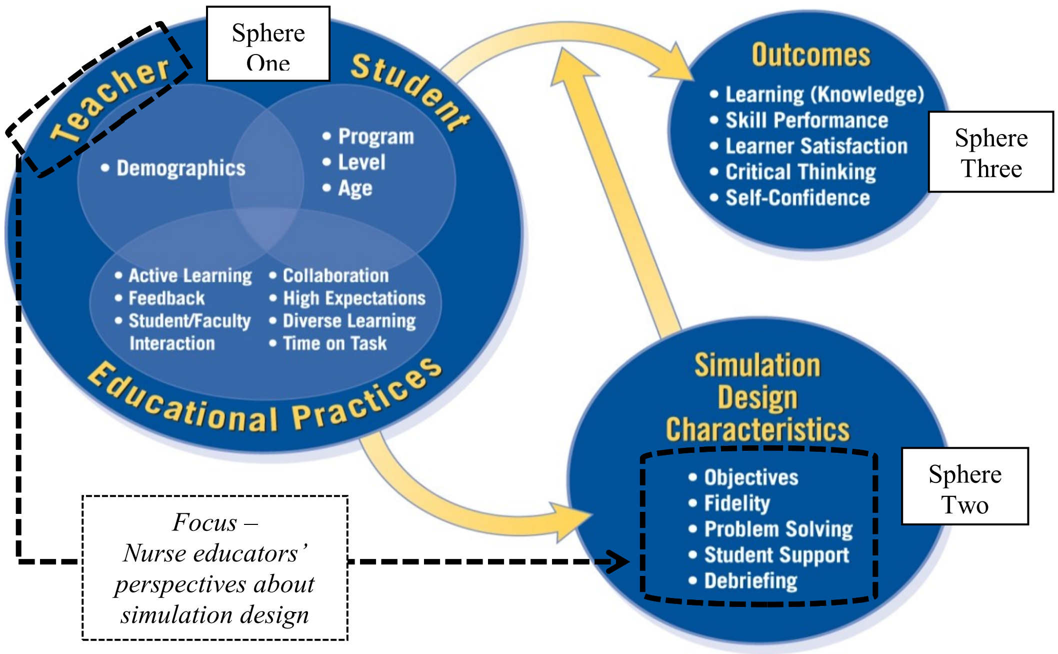


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Figure 2

*Card Sort Grid*

**Card Sort Grid**

*My question to you is, "What would you most recommend or most not recommend in the design of a simulation based learning activity in nursing education?"*

Most NOT Recommend ← → Most Recommend

| -5 | -4 | -3 | -2 | -1 | 0 | +1 | +2 | +3 | +4 | +5 |
|---|---|---|---|---|---|---|---|---|---|---|

Most Not Recommend — Pile One

Neutral — Pile Three

Most Recommend — Pile Two

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Table 1

*Nurse Educator P-Set Matrix and Recruitment Results*

| | | **Nurse Educator P-Set** Years of Experience with Simulation | | |
|---|---|---|---|---|
| | | < 2 yrs. | 2-5 yrs. | > 5 yrs. |
| Program | < 100 students | 4 | 4 | 1 |
| Enrollment | 100-250 students | 6 | 8 | 7 |
| Size | > 250 students | 3 | 6 | 5 |
| | | TOTAL P-Set 44 nurse educators | | |

*Note*. Desired P-Set = (3 x 3 matrix) times (5 replications) = 45 participants per P-Set

Table 2

*Inclusion and Exclusion Criteria for Nurse Educators*

*Inclusion Criteria*

1. Participated in one or more simulations
2. Conduct simulation activities with undergraduate associate, diploma, or bachelor's nursing students
3. Hold a BSN or higher level of education [a] and functions as a nurse educator (teacher) in an academic program or is a nursing lab coordinator working with simulation activities
4. Had at least one formal training experience on simulation based learning

*Exclusion Criteria*

1. No experience in simulation
2. Non-nursing personal

*Note*. [a] Even though the MSN is the minimal educational level for educating student nurses, nursing programs do use BSN prepared nurses in simulation activities. Their opinions are important and relevant as they are part of the educational process.

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Table 3

*Demographics of Nurse Educator P-Set*

| | No. (percent) | | No. (percent) |
|---|---|---|---|
| **Gender** | | **Collaborate with Other Disciplines** | |
| Female | 39 (89%) | Yes [a] | 17 (40%) |
| Male | 5 (11%) | No | 26 (60%) |
| **Age** (years) | | **Type of Training** [b] | |
| $\leq$ 25 | 0 (0%) | Conference | 35 (79%) |
| 26-30 | 2 (5%) | Inservice | 17 (38%) |
| 31-40 | 6 (13%) | Manufacturer | 32 (76%) |
| 41-50 | 11 (25%) | Person-to-person | 38 (86%) |
| 51-60 | 19 (43%) | Self-taught | 5 (11%) |
| > 60 | 6 (14%) | Certificates | 3 (6%) |
| **Level of Education** | | **Program - Type** | |
| BSN | 8 (19%) | ADN | 17 (38%) |
| MSN | 31 (72%) | Diploma | 2 (4%) |
| DNP | 1 (2%) | BSN | 26 (58%) |
| PhD | 3 (7%) | | |
| **Region** | | | |
| U.S. Northeast | 9 (20%) | | |
| U.S. Midwest | 20 (45%) | | |
| U.S. South | 6 (14%) | | |
| U.S. West | 7 (16%) | | |
| Other [c] | 2 (5%) | | |

*Note.* [a] Medicine, Social Work, Chaplain, Pharmacy, Radiology, PT, Paramedics
[b] More than one can apply. [c] Canada and South Africa.

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Table 4

*Nurse Educator - Factor Loadings*

| Sort No. and demographic code [d] | Factor Loadings [a,b] | | |
|---|---|---|---|
| | A | B [c] | C [c] |
| Educator 15 Ma45B1 | **(.73)** | -.05 | .28 |
| Educator 32 La35A2 | **(.71)** | -.16 | .19 |
| Educator 19 Mb60A2 | **(.70)** | -.08 | .06 |
| Educator 35 Lb35A2 | **(.68)** | .12 | .25 |
| Educator 34 Lb45A1 | **(.67)** | -.01 | -.14 |
| Educator 7 Sb60A2 | **(.67)** | .02 | -.01 |
| Educator 31 La35B2 | **(.64)** | -.06 | -.06 |
| Educator 14 Ma55B1 | **(.64)** | .09 | -.04 |
| Educator 43 Lc45B4 | **(.63)** | .19 | .11 |
| Educator 25 Mc55A2 | **(.62)** | .02 | .03 |
| Educator 10 Ma55B3 | **(.60)** | -.13 | -.28 |
| Educator 11 Ma55B4 | **(.60)** | -.14 | -.03 |
| Educator 24 Mc45B2 | **(.58)** | -.05 | .19 |
| Educator 21 Mb55B2 | **(.58)** | .13 | .18 |
| Educator 44 Lc45D2 | **(.56)** | -.05 | -.18 |
| Educator 40 Lc55A2 | **(.56)** | .05 | -.07 |
| Educator 13 Ma55B1 | **(.55)** | .07 | .12 |
| Educator 1 Sa55A2 | **(.53)** | -.29 | .09 |
| Educator 41 Lc55A2 | **(.51)** | .19 | -.20 |
| Educator 20 Mb35B2 | **(.46)** | .28 | .06 |
| Educator 28 Mc55B2 | **(.44)** | .13 | .12 |
| Educator 39 Lb45B2 | **(.42)** | -.22 | .00 |
| Educator 23 Mb60B2 | **(.40)** | .13 | -.21 |
| Educator 3 Sa55B1 | **(.40)** | -.19 | .01 |
| Educator 8 Sb45B | **(.39)** | -.22 | .15 |
| Educator 38 Lb45B2 | **(.37)** | .32 | -.08 |
| Educator 2 Sa55B3 | **(.35)** | -.14 | -.23 |
| Educator 36 Lb45A2 | .08 | **(.52)** | .32 |
| Educator 26 Mc60A2 | **.37** | **.55** | -.17 |
| Educator 27 Mc60B3 | **.55** | **.40** | -.18 |
| Educator 29 Mc35B2 | **.44** | **.44** | -.25 |
| Educator 4 Sa28B2 | **.59** | **-.44** | .02 |
| Educator 18 Mb55B2 | **.54** | **-.41** | .22 |
| Educator 37 Lb55A2 | **.52** | **-.40** | -.06 |
| Educator 5 Sb60B2 | **.49** | **-.38** | -.11 |
| Educator 6 Sb45A2 | **.51** | -.01 | **.47** |
| Educator 12 Ma55A2 | **.59** | .16 | **.44** |
| Educator 16 Mb28A2 | **.41** | .11 | **.43** |
| Educator 22 Mb45B2 | **.41** | .10 | **.35** |
| Educator 42 Lc55B1 | **.55** | -.20 | **-.44** |
| Educator 9 Sc45B2 | **.47** | .13 | **-.39** |
| Educator 17 Mb55B2 | **.65** | .13 | **-.37** |
| Educator 30 Mc55A1 | **.56** | .09 | **-.36** |
| Educator 33 La35B2 | .26 | .01 | -.17 |
| **Variance** | 29% | 5% | 5% |

*Note*. [a] Principal Component Analysis (PCA) extraction without rotation.
[b] Loadings > ±0.33 ($p < 0.01$) in boldface and pure factor loadings parenthesized.
[c] secondary bipolar factors.
[d] Demographic code: enrollment: S < 100, M = 100-250, L > 250 students; yrs. of sim experience: a < 2, b 2-5, c > 5; age median; Program: A=associate degree, D=diploma, B= bachelor's degree. Education 1=BSN, 2=MSN, 3=PhD, 4=DNP

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Table 5

***Factor Array for Perspective "Facilitate the Discovery" (Factor A)***

| . | **Item Number and Statement**<br>(+5 Most Recommend to -5 Most Not Recommend) | Factor Array Score |
|---|---|---|
| #6 | During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. | +5 |
| #40 | During debriefing, let students do most of the talking on how they came to conclusions. The nurse educator interferes only if conclusions are erroneous. | +5 |
| #29 | Schedule simulations following theoretical content in order for students to apply concepts learned in the classroom. | +4 |
| #43 | During student orientation, discuss confidentiality of scenario, or not telling other students what the scenario is about, as this could help or hinder the simulation experience for other students. | +4 |
| #22 | Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. | +4 |
| #35 | Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds should be as realistic as possible, equipment should be as true to what is used in real practice as possible. | +4 |
| #11 | Pilot test newly developed or adopted scenario with real participants to ensure no element has been forgotten, all resources are available, and it can run smoothly and realistically. | +3 |
| #17 | Design and keep objectives general so students are not informed of the specific focus of the simulation. | -3 |
| #58 | Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. | -4 |
| #19 | The more expert the learner, the more realistic the simulation needs to be. | -4 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | -5 |
| #51 | Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. | -5 |

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**Section 4.2 - Manuscript Five "Design of simulations: Perspectives held by nursing students"**

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This article was a component of the doctoral dissertation by Jane B. Paige titled *Simulation design characteristics: Perspectives held by nurse educators and nursing students*. Reported in this article are the results of nursing student perspectives about simulation design. A second complimentary article reports the results of nurse educator perspectives about simulation design as operationalized by nurse educators.

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**Abstract**

Simulation based learning (SBL) has been touted as a pedagogical method to more effectively prepare future nurses for complex and dynamic healthcare environments. Yet, an essential and sometime absent focus for educational research is exploring how new pedagogies are seen through the eyes of students. A core assumption behind skillful teaching is for educators to be constantly aware how students experience their learning and perceive educators' actions. In this study, a Q-methodological approach was employed to explore nursing student perspectives about simulation design as operationalized by nurse educators. Derived from 392 opinions on simulation design gathered from nurse educators and theoretically structured based on the National League for Nursing-Jeffries Simulation Framework, a 60-statement Q-sample was rank-ordered into a quasi-normal distribution grid by 45 nursing students recruited from the National Student Nurse Association. Factor analysis revealed nursing students hold five distinct and uniquely personal perspectives labeled *Let Me Show You, Stand By Me, The Agony of Defeat, Let Me Think it Through,* and *I'm Engaging and So Should You*. Assuring students have clear understanding of simulation purpose and requiring pre-simulation assignments are strategies to help students effectively prepare for SBL activities.


*Keywords*: simulation, Q-methodology, nursing students

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**Design of Simulations: Perspective Held by Nursing Students**

Findings reported in the Carnegie Foundation for the Advancement of Teaching study (Benner et al., 2010) indicate nursing education programs are currently deficient in preparing future nurses. Consequently, new pedagogies such as simulation based learning (SBL) are being developed to more effectively prepare nurses for a complex and dynamic healthcare environment (Ironside & Jeffries, 2010; Kardong-Edgren, 2010a; Nehring, 2008; Parker & Myrick, 2012). Yet, even as educational research on SBL is occurring (Cant & Cooper, 2009; Lapkin et al., 2010; Laschinger et al., 2008) investigators researching SBL struggle to keep pace as SBL is integrated into nursing curricula (Schiavenato, 2009; Walton et al., 2011). An essential and sometime absent focus for educational research is exploring how new pedagogies are seen through the eyes of students (Lecouteur & Helfabbro, 2001; Pratt, 1998). Brookfield (2006) attests a core assumption behind skillful teaching is for educators to be constantly aware how students experience their learning and perceive educators' actions.

A point-of-view, also known as a perspective, is a complex phenomenon to explore as it reflects personal feelings, values and beliefs (Brown, 1980; Pratt, 1998). However, investigating the subjectivity inherent in a perspective can offer valuable insight behind human behavior (Brown, 1980; Stephenson, 1953). As part of a larger study that described and compared nurse educators' and nursing students' perspectives about operationalizing design characteristics, this article reports on nursing students' perspectives about simulation design. Reported elsewhere are the perspectives about simulation design as held by nurse educators and how nursing students' perspectives compare to those as held by nurse educators. This article reports on the research question;

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"What are nursing students' perspectives about simulation design characteristics within SBL educational interventions as operationalized by nurse educators?

**Background**

Bland and colleagues (2010) conceptualize simulation as "a dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement, and integrates the complexities of practical and theoretical learning with opportunity for repetition, feedback, evaluation, and reflection" (p. 5). Typically, SBL activities comprise a pre-brief, the simulation activity itself, and a debriefing (Harder, 2010). Furthermore, simulation activities require an appropriate selection of mode of delivery (standardized patient, manikin, hybrid, task trainer, or virtual simulation) and level of realism (Decker et al., 2008). The expected benefit of SBL is the ability to foster clinical judgment (Ironside & Jeffries, 2010; Lasater, 2007b) and develop students' "sense of salience" (Benner et al., 2010, p. 14) about what is most urgent in each clinical situation. However, as SBL has been incorporated into nursing programs, it becomes apparent not all SBL activities are equally effective nor are their simulation design characteristics of equal importance (Kneebone, 2005; Waxman, 2010).

Even though a number of investigators have reported key simulation design categories, a few being repetitive practice, debriefing, range of difficulty level, defined learning outcomes, realism, and student support (Issenberg et al., 2005; Jeffries, 2012; McGaghie et al., 2006), these are broad, conceptually based categories. In order to operationalize the design of simulation activities, educators need to make choices. What

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remains unknown are how students view the choices nurse educators use to operationalize design characteristics.

Educators should not assume that students perceive the SBL activity in the manner it was intended (Dieckmann et al., 2007). In one example, Dieckmann (2009) observed students interacting with a patient simulator aiming to please the instructor rather than treating the patient condition. This type of student action can lead to missed learning opportunities.

Even as instruments are available for students to evaluate simulation activities (Jeffries & Rodgers, 2007a), it is unknown from what point-of-view or perspective students use when offering evaluative comments. Since students are commonly asked to evaluate teaching strategies it is crucial to know from what perspective they base their evaluations. If educators misinterpret or misunderstand what students mean in their evaluative scores and comments, then subsequent revision of teaching practices can be based on faulty information. Covey's (1989) claim to first seek understanding of others before being understood, as well as Brookfield's (2006) assertion that one of the hardest things for educators to do is imagine the fear that happens when learning something new, warrants the need for educators to gain an understanding of students' perspectives. Examining nursing students perspectives, as recipients of SBL, is a means to enhance instructional delivery and offer direction for educational development programs on SBL as a pedagogical method.

**Theoretical framework**

The National League for Nursing-Jeffries Simulation Framework (NLN-JSF) is a comprehensive framework developed to provide theoretical direction as educators plan,

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conduct, and evaluate simulation activities (Jeffries, 2012). Visually (Figure 1) the NLN-JSF consists of five conceptual components across three spheres. These conceptual components include (1) teacher, (2) student, and (3) educational practices within the first sphere, (4) simulation design characteristics in the second sphere, and (5) expected student outcomes the third sphere. The NLN-JSF provided guidance for this study by identifying the relevant interaction of teacher, student, and educational practices with the five simulation design characteristics (objectives, student support, problem solving, fidelity, and debriefing). It was from this interaction that perspectives were investigated.

## Method

### Q-Methodology

Investigators employ a Q-methodological research approach to explore and reveal the subjectivity inherent in perspectives (Brown, 1980). Q-methodology combines qualitative and quantitative techniques and has unique terminology and particular methodological processes (Watts & Stenner, 2012). In brief, Q-method begins with a collection of opinion statements known as the concourse gathered from interviews of people and the literature on a particular topic of interest (Brown, 1980; Stephenson, 1953). Since the concourse can potentially contain hundreds of opinion statements, which would be too unwieldy to investigate, it becomes necessary to reduce the concourse to a workable subset, called the Q-sample. The investigator then selects a sample of statements from the concourse, typically 40-60 statements (Brown, 1980; Watts & Stenner, 2012) are sufficient, with the aim to retain the essence of opinions contained in the concourse.

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Participants, called the P-Set, are then recruited to sort and rank the Q-sample statements into a quasi-normal distribution grid with a “most-to-most” labeling of the polar ends (- to +). As participants compare statements to each and every other statement (Q-sorting), they are forced to consider and reconsider which statements they feel most strongly about. Statements placed in the middle of the grid take on an absence of salience while statements placed away from the middle gain greater salience (Brown, 1980).

Participants are purposely recruited who may hold particular viewpoints based on *a priori* grounds (Brown 1980 p. 184). Typically, 40-60 participants are sufficient to elicit existing points-of-view (Brown, 1980). The particular arrangement of the opinion statements made by each participant is called a Q-sort. All Q-sorts then undergo by-person factor analytic procedures. In Q-method, people are correlated by the way they think about a topic and then factor analysis groups those people who think similarly, thus Q-method is considered a by-person factor analysis. Interpretation of the resulting factors subsequently reveals how participants share similar or different ways of thinking (Brown, 1980).

**Concourse and Q-Sample**

Since nurse educators design and conduct simulation activities, it is their opinions that become the unit of analysis. In this study, 392 opinion statements about simulation design, derived from interviews of 35 nurse educators across the United States and Canada and from review of simulation literature, populated the concourse. A 3-by-5 factorial design (three concepts in sphere one times the five simulation design characteristics in sphere two of the NLN-JSF) provided the structure for the selection of the Q-sample (Paige & Morin, 2013). Four opinion statements were selected for each of

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the 15 cells resulting in a Q-sample of 60 statements. Prior to conducting the Q-study, a feasibility study tested the Q-Sorting process and recruitment strategies.

**Participant Selection (P-Set)**

In this study, nursing students' experience with simulation and enrollment size of their nursing program were possible influential factors in nursing students' perspectives about simulations design. Thus, in order to locate variation in possible opinions, a 3-by-3 (9-cell) P-set matrix provided the sampling frame to recruit 45 nursing students (Table 1). Nursing students were included if they participated in one or more simulations and were currently enrolled in an associate, diploma, or bachelor's degree nursing program.

**Nursing Student Recruitment**

The National Student Nurse Association (NSNA) with over 60,000 members within the United States (NSNA, 2012) provided the vehicle for accessing nursing students. Following Institutional Review Board (IRB) approval, recruitment memos posted in the NSNA weekly newsletter, one in September 2012 (48 replies of interest) and a second in March 2013 (47 replies of interest) recruited students. Considering the aim to recruit five participants per each of the nine-cell P-set matrix, JBP mailed study packets to 58 responders and received 32 in return (55% return rate). Since nursing student respondents were still lacking from P-set matrix categories, a second recruitment strategy was used to access students in attendance at the February 2013 Wisconsin Student Nurse Association (WSNA) Conference. This added thirteen nursing students who completed the Q-sort in person. These two recruitment strategies resulted in a P-Set of 45 nursing students. As evident in Table 1, participant recruitment for each of the nine cells ranged from two to six nursing students. However, even as five participants per each

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of the nine matrix cells were desired, according to Brown (1980), it is unnecessary to achieve a completely balanced P-Set matrix since the matrix only provides a guide for the investigator to locate diverse views. Demographics descriptors of the P-Set appear in Table 2.

**Procedure**

Nursing students received by mail (posted service) an incentive (coffee gift card), consent letter, and the following four study items: a) *Q-sample* of 60 opinion statements each written on a four by six cm card randomly numbered on backside from one to 60, b) *Conditions of Instructions of Card Sort*, c) three by two foot *Card Sort Grid* (Figure 2) large enough to accommodate placement of the 60 cards, and d) *Tabulation Sheet* for demographics that included a miniature card sort grid for recording of card numbers. Following directions in the *Condition of Instructions*, nursing students first read all opinion statements to get a general impression of the type and range of opinions. Then, under the direction of this question, "what would you *most recommend* or *most not recommend* in the design of a simulation based learning activity in nursing education," students rough sorted the statements into three piles; *most recommend, most not recommend,* and *neutral*. Next, students took the cards from the *most not recommend* pile and selected the two cards they would *most not recommend* and placed them under the -5. This was repeated for the *most recommend* pile with placement of two cards under the +5. Students repeated this process, going back and forth between recommend and not recommend piles and sorted the remaining cards into the open spots on the grid. Following completion of the Q-sorting activity, nursing students returned the *Tabulation Sheet* with demographic information, card sort arrangement, and narrative explanation of

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placement of statements at (-5 and +5) polar ends. The time to complete the Q-sort ranged from 30 to 45 minutes whether Q-sort was mailed to participants or whether the Q-sort was completed at WSNA conference.

**Analysis**

The quantitative (statistical) techniques involved the sequential application of correlations, factor extraction, factor rotation, and computation of factor arrays (McKeown & Thomas, 2013). The qualitative techniques applied a constant comparative process where the resulting factor arrays (ranking score ranging from -5 to +5) were set side-by-side and compared for differences and similarities (Brown, 1980). Interpretation of participants' written explanation for placement of opinion statements at the polar ends (-5 and +5) contributed interpretative value and added study credibility (Gallagher & Porock, July/ August 2010).

In this study, a principal component (PCA) extraction method with varimax rotation (Watts & Stenner, 2012) resulted in the best factor solution that explained maximal amount variance in the correlation matrix, minimized the number of confounding and non-significant sorts, and avoided significant inter-factor correlations. A free software program, PQMethod 2.33 (Peter Schmolck, 2012) specifically created for Q-methodology, facilitated the statistical calculations. A 0.01 significance level determined factor loading. During factor interpretation, the weighted factor array scores (a reconfigured composite Q-sort) for each factor and the salient (distinguishing, characterizing, and consensus) statements aid factor interpretation (Brown, 1980). Distinguishing statement(s) are those ranked in a statistically significant different position compared to all other factors, consensus statements are those ranked in a statistically

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significant similar position, while characterizing statements are those positioned in the polar ends. Following the guidance of Watts and Stenner (2012), review of statements ranked higher and lower within each factor array helped ensure nothing obvious in factor interpretation was overlooked. Together these procedures facilitated a *gestalt* approach to interpreting the perspective captured in the composite Q-sort for each factor. Post-sort explanations recorded by the participants on their placement of statements at polar ends as well member checking with the person best matched to each factor provided further qualitative insight into the interpretative process (Gallagher & Porock, July/ August 2010).

**Results**

Inspection of results revealed five distinct factors (perspectives) held by nursing students (*Let Me Show You, Stand By Me, The Agony of Defeat, Let Me Think it Through, and I'm Engaging and So Should You*) that explained 42% of variance in the 45-by-45 correlation matrix. Twenty-seven of the 45 nursing students loaded solely on one factor, 15 students loaded (confounded) on two factors, while three students did not load on any factor (Table 3). Non-significant inter-factor correlations ($p > .01$) indicate each factor represents a distinct perspective. In order to avoid obscuring factor clarity, Q-sorts (people) that were confounded on more than one factor were excluded from computation of the composite factor array and subsequent factor interpretation (Watts & Stenner, 2012). Factor descriptions follow exemplified with Q-Sample statements (statement number, array score), support with student quotes (*italics)*, and factor array tables that display and compare ranking of statements across factors. A complete factor array table is provided as an Appendix H.

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**Factor 1 "*Let Me Show You*" Perspective**

Four nursing students loaded solely on Factor 1 (12 additional students were confounded on Factor 1 with another factor). Factor 1 explained 11% of the total variance in the correlation matrix (Table 4). Students holding this perspective want to figure things out on their own (#20, +4), receive minimal assistance and cueing (#22, +4; #32, +1), and let the simulation happen as it happens (#57, +3). These students want to talk during the debriefing to figure out what they know (#40, +4). They prefer verbal debriefing rather than written (#50, -5), most likely related to their comfort talking. They are least concerned, compared to other perspectives, that learning objectives are not specific (#17, 0) or that cues are scripted and consistent between students (#47, -4). They expect all students to prepare for all simulation roles (#13, +5). They are not interested in playing non-nursing roles (#25, +5) since they *"want as much nursing experience as possible*." They also see no benefit in mixing students across different levels within the nursing program (#54, -5) because *"each level is learning something different."*

**Factor 2 "*Stand By Me*" Perspective**

Eleven nursing students loaded solely on Factor 2 (5 additional students were confounded on Factor 2 with another factor). Factor 2 explained 10% of the variance in the correlation matrix (Table 5). Students holding this perspective want structure to and guidance in their learning that occurs before, during, and after the simulation. Students want an orientation and opportunity to practice with the manikins (#23, +4). They desire specific learning objectives (#17, -5) and find it helpful when verbally reviewed (#16, +3) to understand *"why are we doing this?"* If they are uncertain what to expect, mistrust may happen, *"positive reinforcement of being prepared is better than being set up to*

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*fail."* Students recommend simulations follow theoretical content (#29, +4) as *"it reinforces concepts and helps them sink in."* They are least interested in role-playing non-nursing roles (#25, +5; #15, -4) as this *"reduces the reality"* of the simulation and could "*confuse the student"* if the role is not well *"scripted."* These students clearly prefer interacting with actual patients in the clinical setting rather than simulated patients (#56, -4) in part because, *"two less hours spent in a clinical-like experience (simulation) is cheating the student out of learning time they paid for."* Students appreciate working *"together as it calms anxiety*" and they are okay with the educator or clinical instructor being present in the simulation room (#9, -4). This way, educators can offer direction on use of equipment and guidance in figuring out the situation *"which if left to solve on own, objectives of sim takes a back seat"* (#20, -5; #58,+3). They consider it acceptable to stop a simulation to correct mistakes and misassumptions when they happen (#57, -2). During the debrief, students count on the educator to ask questions (#6, +5) to get at their thinking process since they prefer not to do all the talking (#40, -2).

**Factor 3 "*The Agony of Defeat*" Perspective**

Five nursing students loaded solely on Factor 3 (4 additional students were confounded on Factor 3 with another factor). Factor 3 explained 8% of the variance in the correlation matrix (Table 6). Students holding this perspective are most concerned about how they feel following the simulation experience, *"it is very important that everyone feels like a 'super' nurse when they leave."* Students want to leave the simulation feeling good about them self as opposed to feeling defeated (#60, +5). In part, this feeling of defeat relates to whether grading of simulations occurs (#30, +5; #34, -5; #47, +1). Instead, students recommend points be allocated for *"showing up prepared and*

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*participating"* or as *"a pass or fail"* assessment. Compared to other perspectives, students are least likely to value pre-simulation assignments (#42, -2) or review learning objectives (#16, -2), perhaps since they can rely on each other to get through the simulation (#10, +4). These students do not recommend singling out weaker students (#8, -5) as *"it puts too much pressure on them and could be embarrassing*." It is okay to stop a simulation to offer guidance (#57, -4). Students consider use of humor important (#39, +4) and value the opportunity to role-play non-nursing characters (#25, -4). Students also view simulation an acceptable replacement for clinical (#56, +1) contrary to other perspectives not recommending this replacement.

**Factor 4 *"Let me Think it Through"* Perspective**

Three nursing students loaded solely on Factor 4 (7 additional students were confounded on Factor 4 with another factor). Factor 4 explained 7% of the variance in the correlation matrix (Table 7). Student holding this perspective see greater value from simulation if educators are properly trained in simulation technology (#38, +5; #4, +3) and understand how to use and work it (#46, +4; #18, +3),*"information technologist* [is needed and it]…*doesn't help us learn when the main piece of equipment (manikin) is broken and no one can fix it."* Students may see a connection between educators' level of training and teaching expertise with their feelings of defeat (#60, +5) or being singled-out if struggling (#31, -5). For example, a preference exists in not being interrupted to provide assistance with equipment (#58, -4) or redirected by cueing (#41, -5; #49, -3) as it throws off one's train of thought, *"I don't like it when my thoughts are stopped, it makes me feel stupid and makes me more nervous."* Students prefer not stopping a simulation (#57, +3) or having others think aloud (#7; -3) as it could interfere with

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independent thought as in *"students need to learn on their own without someone else putting the idea in their head."* Diverging from other perspectives, these students recommend written in addition to verbal debriefings (#50, +4), are less interested in being questioned during debriefing (#6, +1), and are more inclined to view videotaping unnecessary (#51, 0). These students have no qualms with playing role characters (#45, -4; #15, +3), while making things up (#33, -2) and pretending (#14, -3) during a simulation is acceptable.

**Factor 5 *"I'm Engaging and so Should You"* Perspective**

Four nursing students loaded solely on Factor 5 (2 additional students were confounded on Factor 5 with another factor). Factor 5 explained 6% of the variance in the correlation matrix (Table 8). Even though all perspectives recommend creating a realistic simulation, students holding this perspective have the strongest feelings about realism. They see reality created in the detail and functioning of the equipment (#35, +5), as well as how seriously educators (#36, +4, #39, -4) and students take the simulations (#21, +4). Focusing on the lack of realism is unnecessary (#24, -5) and use of the word 'pretend' is not acceptable (#14, +5). Permitting patients to die (#1, +4), having persistent cues to know where they are in a simulation (#59, +2), and not limiting simulations to less than 30 minutes (#48, -2), are design characteristics that enhance reality. Contrary to other student perspectives, students holding this perspective feel they as well as their peers are responsible for their own learning in simulations. For example, students consider it acceptable to use simulation for one-on-one learning (#31, +3), allow grading of simulations (#30, -4; #34, +2), and deliver consequences if students do not take simulation seriously (#21, +4). Students sharing this perspectives recommend viewing

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video recordings of the simulations (#51, -5), having pre-simulation assignments (#42, +3), and are indifferent in whether 'weaker' students are placed in roles that force them to perform (#8, 0) *"weak student need help! Simulation is a wake-up call for them."* Least recommended is allowing dependency of students on others (#10, -3), as in "*students who do not deal with the situation as quickly"* should not have the *"same chance to draw conclusions themselves."* Of all perspectives, those sharing this view are least concerned about students feeling defeated following a simulation (#60, -1). In this study, member checking with each of the five student factors occurred. However, only one student holding the Factor 5 *I'm Engaging and So Should You* perspective replied and agreed with factor interpretation.

**Discussion of Perspectives**

Findings from this study indicate nursing students hold five distinct perspectives about simulation design. There are several possible reasons for these findings, some of which are consistent with reports in the literature, while others reasons have not yet been identified.

Inspection of findings revealed participation in simulation activities evokes different emotional responses from students. Anxiety is a common emotional response with some of the particular circumstances contributing to anxiety revealed in the perspectives. Students holding the *Stand By Me* and *The Agony of Defeat* perspectives indicate anxiety increases if educators are not able to offer assistance or if they feel singled out as a weaker student. These findings are comparable to other studies that have explored student anxiety during simulation activities (Nielsen & Harder, 2013). Cordeau (2010) found perceived anxiety happens when students do not know what to expect,

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when they are being video-recorded, and over their fear of failure. Videotaping has been reported as a contributor to student anxiety (Elfrink, Nininger, Rohig, & Lee, 2009; Ganley & Linnard-Palmer, 2012; Nielsen & Harder, 2013) however, the five perspectives revealed in this study indicate students had no qualms in being videotaped.

A feeling of defeat is an emotional response that exists in *The Agony of Defeat* perspective. Acknowledging the existence of this perspective is vital, but more important is gaining an understanding of what contributes to this defeated feeling. Exploring the explanations students provide for their placement of opinion statement #60 "take into consideration, students should not feel defeated when leaving the simulation lab" at the polar ends provides helpful insight into the differing accounts for this feeling. In the perspective, *The Agony of Defeat*, students indicate they want to feel good about them self and feel bad and inadequate if they do not perform up to expectations. Conceivably this feeling of defeat relates to the very visible identification of learning gaps. During simulations, students witness each other's performances and floundering as opposed to other learning activities where seeing another student's performance is not as obvious. Parker and Myrick (2012) labeled this type of situation as "performing in the fishbowl" (p. 368). A finding that deserves further investigation is the discovery that students holding *The Agony of Defeat* perspective are least likely to recommend use of pre-simulation assignments or review learning objectives. This finding calls into question whether student preparation or lack thereof influences the degree students experience a feeling of defeat.

Simulations activities can be designed as a learning activity (formative assessment) or as an evaluation activity (summative or high-stakes). In nursing education,

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both of these purposes for simulation activities are used (Meakim et al., 2013). It is possible that the student perspectives as revealed in this study occurred based on whether students were thinking of simulation either as a learning activity or as an evaluative activity. Students' ranking of statements may have differed based on which purpose they were thinking.

Students who held *The Agony of Defeat* perspective, in part, associate their defeated feeling to the grading of simulations. However, it is unclear what defines a grade. Even though the topic of grading simulations is discussed in the literature (Cordeau, 2010; Sportsman et al., 2011) it is unclear whether this grading is in reference to a team or individual grade, or whether the grade is based on points for performance, for showing up prepared, or for participation. The student perspectives, as revealed in this study, may reflect this variation in grading practice. Noteworthy, is the finding that the *I'm Engaging and So Should You* perspective consider grading of simulations acceptable and the feeling of defeat takes on little salience for them. Rather, the students holding an *I'm Engaging and So Should You* perspective express frustration with their peers and are more likely to recommend consequences for students who do not take simulation seriously. The *I'm Engaging and So Should You* group of students view dependency on other students, as a 'wake-up call' and feel educators should impose necessary consequences.

Yet, the *Let Me Think it Through* perspective has not yet been reported in the SBL literature. These students need extra time to work things out in their minds and can get off track if their train-of-thought is interpreted. It is conceivable students holding this perspective may have additional difficulty recovering from an interruption in thought.

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What remains unknown is whether there are characteristics that place students more at risk for this interruption in thought. Various studies have investigated task interruptions (Altmann, Trafton, & Hambrick, 2013; Brumby, Cox, Back, & Gould, 2013) including the interruptions of nurses as they work in healthcare environments (Grundgeiger, Sanderson, MacDougall, & Venkatesh, 2010). It may be helpful to explore whether there are particular tendencies students and future nurses have that may affect their ability to maintain their train-of-thought or recover from an interruption in their thought process. Students holding the *Let Me Think it Through* perspective may benefit from a written debrief assignment that can provide this opportunity. This was actually recommended (+4) as an option by students holding this perspective. Most likely students holding the *Let Me Think it Through* perspective has been an unspoken view across educational strategies (not just with SBL).

Upon inspection of the five perspectives, a finding not found reported in the literature is the diversity in how students view stopping a simulation. For example, students holding the *Let Me Think it Through* perspective, consider stopping a simulation could interfere with their train-of-thought. On the other hand, students holding *The Agony of Defeat* and *Stand By Me* perspectives expect simulations to be stopped if they were doing something wrong. At the same time, students holding the *Let Me Show You* perspective want the opportunity to figure things out on their own, receive minimal assistance and cueing from educators, and prefer to not stop simulations. There was also the *I'm Engaging and so Should You* perspective where students take offense when other students are unprepared and prefer to not stop a simulation to offer them help. The reasons for this diversity in preferences in whether to stop or not stop a simulation likely

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relates to each students' unique needs such as learning style, different level of academic ability, level of student preparation, comfort with simulation, to name a few.

Whether to assign students as a simulation role character differed across perspectives. Students holding a *Let Me Show You* or *Stand by Me* perspective do not want to be assigned non-nursing roles, but for different reasons. The *Let Me Show You* students would rather focus on nursing, while the *Stand By Me* students see playing non-nursing roles confusing especially if they are unclear on what the role entails. Conversely, students holding *The Agony of Defeat* or *Let Me Think it Through* perspectives have no qualms playing other role characters, perhaps the opportunity to play other roles removes them from the spotlight. According to Harder et. al (2013) role confusion happens when students play non-nursing roles and when educators made haphazard and inconsistent role assignments.

Employing a Q-methodological approach, Baxter and colleagues (2009) located four perspectives towards simulations as held by nursing students; *reflectors, reality skeptics, comfort seekers,* and *technology savvies*. Baxter investigated perspectives towards simulation from a broad overview, whereas in this study design of simulations was the focus. However, similarities in findings exist. According to Baxter (2009), students holding a *comfort seekers* perspective, value simulation experiences that provide comfort and are not stressful. This *comfort seeker* factor is similar to The *Agony of Defeat* perspective in the current study. The t*echnology savvies* factor discovered by Baxter, represent students who want to engage in simulations. This factor is similar to the *I'm Engaging and so Should You* perspective.

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**Perspectives within the Context of NLN-JSF**

The NLN-JSF (Jeffries, 2012) conceptualizes five simulation design characteristic educators need to consider as they design and conduct simulation activities. *Objectives*, as one design characteristic, should be clear, concise, realistic, and correspond to students' level of knowledge and experience (Jeffries, 2012). However, the degree of specificity a learning objective should contain remains unknown (Groom et al., 2013). Three of the five perspectives in this study recommend specifically written objectives while two perspectives are indifferent as to whether objectives are specific or general.

*Student support*, as a design characteristic, occurs when assistance is provided to students but does not interfere with their independent thought (Jeffries, 2012). Allowing time for students to problem solve and make decisions is congruent with the perspectives revealed in this study. However, in the NLN-JSF, student support connotes an instructional approach initially derived from use cues (Jeffries, 2012), while the perspectives in this study reveal the importance of an emotional component to support. Findings from this study suggest it may be necessary to reexamine student support not only from an instructional approach but also to include an emotional approach.

Findings from this study revealed *fidelity* is an important design characteristic and happens if equipment is functional and educators are proficient in its operation. Therefore, in addition to creating reality, it is equally important educators know how to maintain it by being properly educated in how to effectively use and troubleshoot the technology.

*Problem solving*, as a design characteristic, happens when opportunities are designed into a simulation that engage students in tasks that increase knowledge, skills,

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and challenge beliefs (Jeffries, 2012). Yet, student perspectives in this study differed on their recommendation for this design characteristic. Some students wanted to problem solve independently with minimal educator or peer assistance, while other students depended on others to help them along in their thinking.

Finally, *debriefing* as a design characteristic occurred when the educator facilitated students' reexamination of the clinical encounter in order to foster clinical reasoning and judgment (Jeffries, 2012). This characteristic was important across perspectives as students wanted educators to get at their thinking process. Yet, the level of student participation expected during debriefing varied across perspectives. Conceivably, this is due to the varying level of students comfort with their knowledge as well as the time individual students need to process information. Across perspectives, students in this study found value in viewing of videos of the simulation activity.

**Implications for Educational Practice**

Brookfield (2006) claims educators need constant awareness how students experience learning and perceive educators' actions. However, given students may not be always honest, upfront, or comfortable expressing their views, getting inside their heads can be a challenge (Brookfield, 2006). Hence, the value of Q-method as a research approach to reveal the subjectivity inherent in perspectives (Brown, 1980). Based on the perspectives that emerged from this study, it became apparent students experience simulation in a very personal and diverse way.

Considering the findings from this study, the following recommendations focus on strategies to facilitate student preparation for simulation activities. Assuring students have a clear understanding of the simulation purpose and the requirement that students

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complete pre-simulation assignments are two important activities educators should consider as they design simulation activities.

First, nursing students need to have a clear understanding of the purpose of the SBL activity. Just because students are provided with learning objectives does not mean students understand the purpose of the simulation. The purpose of the simulation activity must be transparent and clearly understood by all educators involved (Robinson & Dearmon, 2013). If this does not occur, students may see incongruences between educators involved in the simulation activity, which can potentially create mistrust in the teacher-student relationship. In this study, students used phrases such as, "*being set up to fail*," "*trying to trick me*," "*sink or swim*" in their narrative accounts. These phrases indicate students may mistrust educators' intent behind the simulation activity. Even if students review the learning objectives that provide direction to the activity, they also need to be clear on whether the simulation is a formative, summative, or high-stakes evaluation (Sando et al., 2013). In formative assessments, students are still learning the material and simulations help students make connections between theory and practice. Mistakes are going to happen and students need reassurance this is okay. On the other hand, summative or high-stakes evaluations evaluate whether students meet pre-established criteria. In these types of high-stakes simulation (which may result in student failure), it is conceivable students feel they are "*being set up to fail*." In order to control for this feeling, it is important students are clear on criteria and the instruments used to make these determinations are valid and reliable (Sando, Meakim, Gloe, Decker, & Borum, 2013). Furthermore, educators need processes to reaffirm students understand the purpose of simulations.

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Second, requiring students to complete pre-simulation assignments that review knowledge and skills for the particular simulation activity can help allay anxiety and promote achievement of the objectives of the simulation (Blazeck & Zewe, 2013; Elfrink et al., 2009; Nielsen & Harder, 2013). Even if students claim this unnecessary and extra work, in retrospect, and as revealed by four of the five perspectives in this study, students find pre-simulation activities beneficial.

**Limitations**

Several limitations to this study need acknowledgement. First, a common procedure in Q-methodology is to interview participants after completion of the Q-sort as to why they placed statements in particular areas in the grid. Understanding participants' thinking for statement placement provides helpful insight for factor interpretation. Since this study recruited nursing students from across the United States, the investigator did not have opportunity to interview participants (students) in-person. However, participants did provide written explanation why they placed the statements at +5 and -5.

A second, possible limitation was having nursing students sort opinion statements that were gathered from nurse educators. Typically in Q-studies, participants completing the sorting process are characteristically similar to the participants providing the opinion statements. In order words, participants who sort the opinion statements need to have some familiarity with the topic of interest (Brown, 1980; Watts & Stenner, 2012). However, in this study it was important to understand nursing students' perspectives about the actions nurse educators take during simulation design. To control for this limitation, a feasibility study tested the opinion statements (Q-sample) with nursing students prior to undertaking the actual Q-study.

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Thirdly, as students participate in simulation activities, their attitudes towards simulation may change. Therefore, this study provides a "snapshot" in time of what perspectives nursing students hold about simulation design. It is also necessary to acknowledge there were no male nursing students who participated in this study. It is possible male students hold some differing points-of-view that were missed. As such, there is no guarantee that this one Q-study located all existing perspectives (Brown, 1980), yet the five perspectives it did discover are real and do exist. Even though these five perspectives accounted for 42% of the study's variance, undiscovered views on simulation design remain.

**Summary**

In this study, 45 purposely selected nursing students rank-ordered 60 opinion statements theoretically drawn from a concourse of 392 opinions gathered from nurse educators about simulation design. As opposed to surveys that measure opinions against pre-determined criteria (Woods, 2011), participants in this Q-methodological study ranked and ordered opinion statement in an interactive process and in so doing revealed their personal choice, feelings, beliefs. It was through this sorting and ranking process the diversity in nursing students' views about simulation design were revealed. In light of the findings revealed in this study, implications for student preparation for simulation activities were offered.

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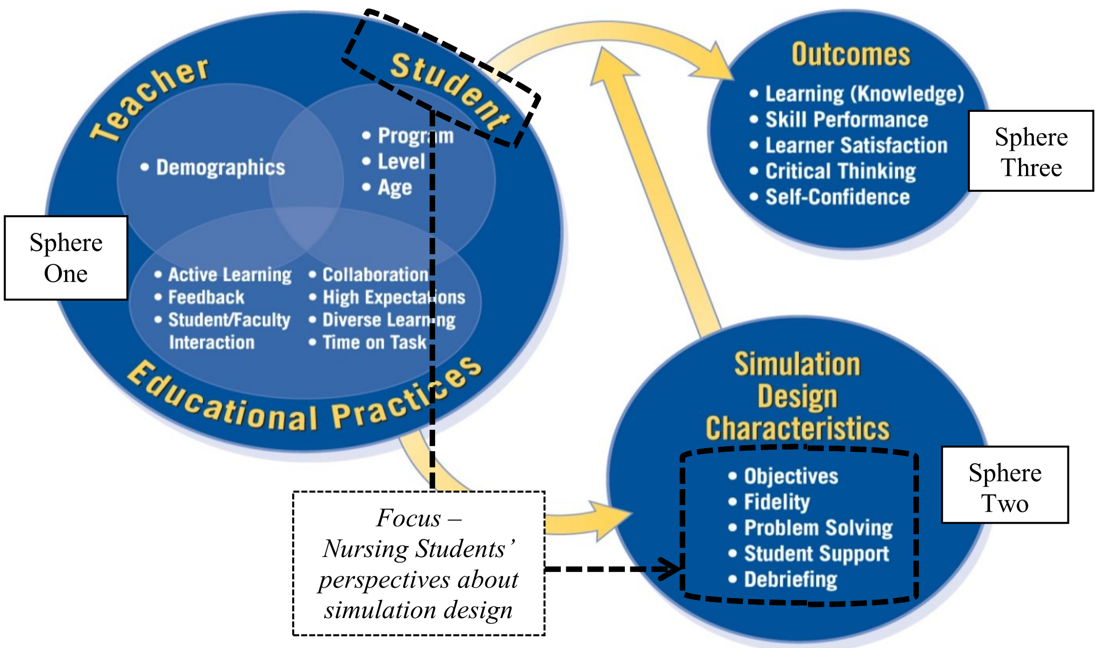
Figure 1

*National League for Nursing-Jeffries Simulation Framework*




Permission for use granted from the National League for Nursing New York, NY
Jeffries, P. & Rodgers K. (2007). Theoretical framework for simulation design. In P. Jeffries (Ed.) Simulation in nursing education: From conceptualization to evaluation (pp. 21-33). New York: National League for Nursing

Figure 2

*Card Sort Grid*

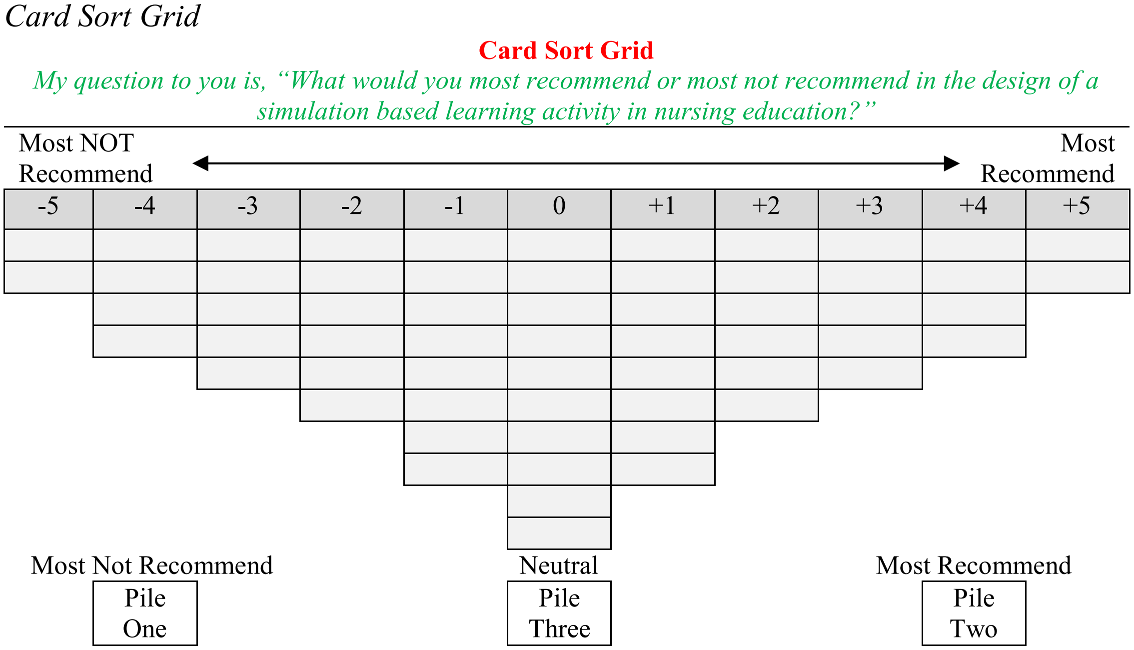



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Table 1

*Nursing Student P-Set Matrix and Recruitment Results*

| | | Nursing Student P-Set<br>Number of Simulation (sim) Experiences<br>< 3 sim | 3-5 sim | > 5 sim |
|---|---|---|---|---|
| Program | < 100 students | 6 | 5 | 5 |
| Enrollment | 100-250 students | 6 | 6 | 4 |
| Size | > 250 students | 2 | 5 | 6 |
| | | TOTAL P-Set 45 nursing students | | |

*Note*. Desired P-Set = (3 x 3 matrix) times (5 replications) = 45 participants per P-Set.
Cells display actual number of participants per matrix category.

Table 2

*Demographics of Nursing Student P-Set*

| | No. (percent) |
|---|---|
| **Gender** | |
| Female | 45 (100%) |
| Male | 0 (0%) |
| **Age** (years) | |
| ≤ 20 | 5 (11%) |
| 21-25 | 15 (33%) |
| 26-30 | 10 (22%) |
| 31-40 | 7 (16%) |
| 41-50 | 6 (3%) |
| > 50 | 2 (5%) |
| **Program - Type** | |
| ADN | 15 (33%) |
| Diploma | 1 (3%) |
| BSN | 29 (64%) |
| **Region** | |
| U.S. Northeast | 3 (7%) |
| U.S. Midwest | 23 (51%) |
| U.S. South | 6 (13%) |
| U.S. West | 13 (29%) |

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Table 3

*Nursing Student - Factor Loadings*

| Sort No. and Demographic code[c] | Factor Loadings[a,b] 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Student 3 Sa35B[d] | **(.71)** | -.01 | .18 | .00 | .20 |
| Student 7 Sb28A | **(.64)** | .17 | .05 | -.02 | .12 |
| Student 41 Lc28B | **(.49)** | .22 | -.17 | .25 | .22 |
| Student 12 Sc35A | **(.44)** | .10 | .14 | .26 | -.32 |
| Student 35 Lb45A | .12 | **(.66)** | .01 | -.19 | .05 |
| Student 32 Ma45A | -.21 | **(.64)** | .11 | -.06 | -.04 |
| Student 2 Sa20B | .22 | **(.55)** | .02 | .32 | .08 |
| Student 19 Ma28B | .14 | **(.54)** | -.01 | -.03 | .10 |
| Student 6 Sb45B | -.05 | **(.52)** | .25 | .29 | .00 |
| Student 31 Mb23A | .17 | **(.52)** | .25 | .21 | .17 |
| Student 27 Mc23B[d] | .00 | **(.51)** | -.03 | .25 | -.07 |
| Student 28 Mc23B[d] | .11 | **(.46)** | .27 | .27 | .18 |
| Student 36 Lb28A | .31 | **(.45)** | .31 | .13 | .30 |
| Student 21 Mb23B | .24 | **(.44)** | .27 | .02 | .31 |
| Student 1 Sa35A | .25 | **(.40)** | .02 | .32 | .05 |
| Student 40 Lc23B | .06 | -.01 | **(.82)** | -.08 | -.03 |
| Student 14 Sc28B[d] | -.02 | .11 | **(.67)** | .30 | .25 |
| Student 38 Lb23B[d] | .22 | -.03 | **(.55)** | .13 | .-22 |
| Student 15 Sc38A | .15 | -.06 | **(.47)** | .06 | .12 |
| Student 30 Sa28B | -.07 | .30 | **(.42)** | .07 | -.03 |
| Student 45 Lc23B | .08 | .18 | .11 | **(.70)** | -.20 |
| Student 24 Mb23B[d] | .02 | -.19 | .10 | **(.59)** | .22 |
| Student 43 Lc45A | .06 | .06 | .10 | **(.46)** | .16 |
| Student 39 Lb20B | .05 | .00 | .03 | .08 | **(.64)** |
| Student 34 La28B | .29 | -.03 | -.05 | .17 | **(.61)** |
| Student 10 Sb23B[d] | .01 | .16 | .20 | .03 | **(.42)** |
| Student 37 Lb28B[d] | -.07 | .11 | .00 | .04 | **(.42)** |
| Student 5 Sa35A | **.42** | .13 | **.33** | .28 | .00 |
| Student 9 Sb50B | **.44** | -.11 | -.26 | -.10 | **.38** |
| Student 11 Sc23B | **.40** | .23 | **.35** | .14 | .00 |
| Student 13 Sc50B | **.51** | -.10 | .27 | **.35** | .10 |
| Student 18 Ma20A | **.58** | .07 | .27 | **.34** | -.07 |
| Student 22 Mb23B[d] | **.47** | .00 | .20 | **.36** | .19 |
| Student 23 Mb23B[d] | **.63** | .08 | -.04 | **.37** | -.05 |
| Student 25 Mb20B[d] | **.40** | .02 | **.42** | -.08 | -.05 |
| Student 26 Mc28A | **.46** | **.40** | .11 | -.11 | -.20 |
| Student 29 Mc20B[d] | **.47** | **.46** | .01 | -.16 | -.12 |
| Student 33 La45A | **.41** | **.40** | .30 | -.14 | .14 |
| Student 42 Lc35B | **.43** | .32 | .14 | **.45** | .12 |
| Student 17 Ma23A | .09 | **.46** | .19 | **.39** | .07 |
| Student 20 Ma38A | .25 | **.42** | -.04 | .23 | **.41** |
| Student 8 Sb23B | .01 | .32 | **.36** | **.42** | .24 |
| Student 16 Ma23D | .26 | .23 | .32 | -.10 | .22 |
| Student 4 Sa45B[d] | .12 | .14 | -.14 | .32 | -.02 |
| Student 44 Lc28B | .00 | .25 | -.03 | .18 | -.24 |
| **Variance** | 11% | 10% | 8% | 7% | 6% |

*Note*. [a]Principal Component Analysis (PCA) extraction with varimax rotation. [b]Loadings > ±0.33 ($p$< 0.01) in boldface and pure factor loadings parenthesized. [c]Demographic code: program enrollment: S < 100, M = 100-250, L > 250 students; number of sim experiences: a < 3, b 3-5, c > 5; age median; type of program: A=associate degree, D=diploma, B= bachelor's degree. [d]students completing Q-sort at WNSA conference.

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Table 4

**Factor Array for Perspective "*Let Me Show You*" (Factor 1)**

| | Number and Statement (5 Most Recommend to -5 Most Not Recommend) | Factor Array Scores 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| #13 | Assign student roles randomly at the start of the simulation. This way students need to be prepared for all roles and not just their assigned role. | **5*** | 2 | 2 | 1 | 0 |
| #25 | Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role. | **5** | 5 | -4 | -1 | 0 |
| #40 | During debriefing, let students do most of the talking on how they came to conclusions. The nurse educator interferes only if conclusions are erroneous. | **4*** | -2 | 0 | 2 | 1 |
| #20 | Students should be left to figure out problems on their own during the actual running of the simulation. | **4*** | -5 | -3 | -2 | 1 |
| #22 | Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. | **4** | 3 | 2 | 1 | 3 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | **3** | -2 | -4 | 3 | 2 |
| #17 | Design and keep objectives general so students are not informed of the specific focus of the simulation. | **0** | -5 | -3 | 0 | -4 |
| #47 | Script and deliver cues in the same way for each simulation, including number of times offered, how, and when. | **-4** | -3 | 1 | -4 | -2 |
| #50 | Use both verbal and written debriefing for simulations where students need time to consider and think through events such as end-of-life simulations. Comments by students a week later are much richer and thoughtful than during the immediate debrief. | **-5*** | -3 | 1 | 4 | 0 |
| #54 | Consider mixing students from different levels in the program. This allows senior students to practice delegation and junior students to see how smart they will be/should be closer to graduation | **-5*** | 0 | 2 | -1 | 2 |

*Note*. Characterizing statement +5 or -5. Distinguishing statement (*$p < .01$). Higher/Lower ranking of statements compared to other factors.

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Table 5

**Factor Array for Perspective "*Stand By Me*" (Factor 2)**

| Number and Statement (5 Most Recommend to -5 Most Not Recommend) | | Factor Array Scores 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| #6 | During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. | 3 | **5** | 2 | 1 | 4 |
| #25 | Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role. | 5 | **5** | -4 | -1 | 0 |
| #29 | Schedule simulations following theoretical content in order for students to apply concepts learned in the classroom. | 2 | **4** | 2 | 2 | 2 |
| #23 | Prior to the first simulation, have students observe a simulation and then allow hands-on orientation with the manikin. | 2 | **4** | 0 | 2 | -1 |
| #58 | Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. | -1 | **3*** | -1 | -4 | -3 |
| #16 | Review simulation objectives verbally with students. This allows time for nurse educators to stress the purpose of the simulation, and how meeting these objectives will facilitate learning. | 1 | **3** | -2 | -1 | -1 |
| #27 | If a simulation runs perfectly and the students quickly complete it, nurse educators can ad lib some different complexity into the simulation. | -1 | **2*** | 0 | -2 | -2 |
| #7 | Ask students to "think aloud" during the simulation. This helps other students, who do not deal with the situation as quickly, hear what other students are thinking. | -2 | **2*** | -1 | -3 | -2 |
| #40 | During debriefing, let students do most of the talking on how they came to conclusions. The nurse educator interferes only if conclusions are erroneous. | 4 | **-2*** | 0 | 2 | 1 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | 3 | **-2*** | -4 | 3 | 2 |
| #15 | Assign students to play family role characters. This allows students a better understanding of the experience of family members. | 0 | **-4*** | 0 | 3 | 1 |
| #9 | Nurse educators should not be present in the room during a simulation, as students tend to rely on the educator to get through the scenario. | 3 | **-4** | 0 | -3 | 1 |
| #56 | It is acceptable to use four hours simulation time to replace 6 hours of clinical experience. | -3 | **-4** | 1 | -3 | -3 |
| #17 | Design and keep objectives general so students are not informed of the specific focus of the simulation. | 0 | **-5*** | -3 | 0 | -4 |
| #20 | Students should be left to figure out problems on their own during the actual running of the simulation. | 4 | **-5*** | -3 | -2 | 1 |

*Note*. Characterizing statement + or -5. Distinguishing statement (*$p < .01$).
Higher/Lower ranked statement compared to other factors.

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Table 6

**Factor Array for Perspective *"The Agony of Defeat"* (Factor 3)**

| Number and Statement (5 Most Recommend to -5 Most Not Recommend) | | Factor Array Scores 1 | 2 | **3** | 4 | 5 |
|---|---|---|---|---|---|---|
| #30 | Do not grade simulations. There are too many variables that cannot be controlled to make it fair for all students | 2 | 0 | **5*** | 2 | -4 |
| #60 | Take into consideration, students should not feel defeated when leaving the simulation lab. | 1 | 3 | **5** | 5 | -1 |
| #10 | Run simulations with 2-3 students to promote the 'one whole brain' concept. Between the 3 of them, they should be able to remember enough to get through the simulation. | 2 | 1 | **4*** | -1 | -3 |
| #39 | Use of humor is important in simulations. | -1 | -2 | **4*** | -2 | -4 |
| #47 | Script and deliver cues in the same way for each simulation, including number of times offered, how, and when. | -4 | -3 | **1*** | -4 | -2 |
| #56 | It is acceptable to use four hours simulation time to replace 6 hours of clinical experience. | -3 | -4 | **1*** | -3 | -3 |
| #16 | Review simulation objectives verbally with students. This allows time for nurse educators to stress the purpose of the simulation, and how meeting these objectives will facilitate learning | 1 | 3 | **-2** | -1 | -1 |
| #42 | Assign students pre-simulation assignments to help students be more prepared to take care of the simulated patient. | 0 | 2 | **-2*** | 2 | 3 |
| #4 | Ideally, three key positions are needed for simulation programs. A subject matter expert (educator with expertise in topic content), an instructional designer (person with expertise in teaching techniques), and an information technology specialist (person with technological expertise). | -2 | -1 | **-3** | 3 | 0 |
| #46 | Nurse educators who use simulation should be master's prepared, as most clinical instructors are required to be. | 0 | 1 | **-4** | 4 | -4 |
| #25 | Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role. | 5 | 5 | **-4*** | -1 | 0 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | 3 | -2 | **-4*** | 3 | 2 |
| #34 | When grading a simulation, record the number of cues given and factor this in when determining student's grade. | -4 | -4 | **-5** | -1 | 2 |
| #8 | Place "weaker" students in roles that force them to perform. Doing so allows nurse educators to better evaluate these students. | -4 | -2 | **-5** | -4 | 0 |

*Note*. Characterizing statement + or -5. Distinguishing statement (*$p$ < .01).
Higher/Lower ranked statement compared to other factors

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Table 7

**Factor Array for Perspective "*Let Me Think it Through*" (Factor 4)**

| | **Number and Statement** (5 Most Recommend to -5 Most Not Recommend) | Factor Array Scores 1 | 2 | 3 | **4** | 5 |
|---|---|---|---|---|---|---|
| #38 | When running a simulation, use only nurse educators who are very familiar and proficient with operating the simulator and have sufficient content knowledge about the scenario. | 1 | 4 | -2 | **5** | 1 |
| #60 | Take into consideration, students should not feel defeated when leaving the simulation lab. | 1 | 3 | 5 | **5** | -1 |
| #46 | Nurse educators who use simulation should be master's prepared, as most clinical instructors are required to be. | 0 | 1 | -4 | **4*** | -4 |
| #50 | Use both verbal and written debriefing for simulations where students need time to consider and think through events such as end-of-life simulations. Comments by students a week later are much richer and thoughtful than during the immediate debrief. | -5 | -3 | 1 | **4*** | 0 |
| #4 | Ideally, three key positions are needed for simulation programs. A subject matter expert (educator with expertise in topic content), an instructional designer (person with expertise in teaching techniques), and an information technology specialist (person with technological expertise). | -2 | -1 | -3 | **3*** | 0 |
| #15 | Assign students to play family role characters. This allows students a better understanding of the experience of family members. | 0 | -4 | 0 | **3** | 1 |
| #18 | Only assign nurse educators to teach with simulation who have education in current best simulation practices, understanding of the utility of simulation, its limits and functionality, and the amount of preparatory time needed to do it well. | -1 | 3 | -1 | **3** | 0 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | 3 | -2 | -4 | **3** | 2 |
| #51 | Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. | -4 | -3 | -4 | **0** | -5 |
| #6 | During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. | 3 | 5 | 2 | **1** | 4 |
| #33 | Prior to a simulation, caution students to not make things up (assessment data/findings) or assume things (i.e. do not need to do something) if they do not have what they are looking for. | 1 | 0 | 1 | **-2** | 1 |
| #49 | Offer students preplanned information or cues during the simulation. To accomplish this, it is necessary for nurse educators to predict what additional cues students will need to progress in the scenario. | -2 | 1 | 0 | **-3** | 0 |
| #7 | Ask students to "think aloud" during the simulation. This helps other students, who do not deal with the situation as quickly, hear what other students are thinking. | -2 | 2 | -1 | **-3** | -2 |
| #14 | Do not use the word "pretend." During pre-briefing, tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. | 2 | 0 | 3 | **-3*** | 5 |
| #58 | Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. | -1 | 3 | -1 | **-4** | -3 |
| #45 | Avoid having students play role characters in a simulation, as they tend to want to help the other classmates instead of sticking to their role. | -2 | -2 | -2 | **-4** | -3 |
| #31 | Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical. | 3 | 1 | 1 | **-5*** | 3 |

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Table Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| #41 | If students are going to make an error during a simulation, first give them cues to change their minds. But, if they say, "I am good" or "let's go do this", let students make the error and help them discover the error or omission in debriefing. | -1 | 0 | 0 | **-5*** | -1 |

*Note*. Characterizing statement + or -5. Distinguishing statement (**p* < .01).
Higher/Lower ranked statement compared to other factors.

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Table 8

**Factor Array for Perspective *"I'm Engaging and So Should You"* (Factor 5)**

| Number and Statement (5 Most Recommend to -5 Most Not Recommend) | | Factor Array Scores 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| #14 | Do not use the word "pretend." During pre-briefing, tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. | 2 | 0 | 3 | -3 | **5*** |
| #35 | Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds should be as realistic as possible, equipment should be as true to what is used in real practice as possible. | 4 | 4 | 3 | 4 | **5** |
| #21 | There should be consequences for students if they do not take simulation seriously. | -3 | 0 | -2 | 1 | **4*** |
| #1 | Do not make students believe that all patients survive as this may portray a false impression of real patient care. | 0 | 0 | 1 | -1 | **4*** |
| #36 | Nurse educators need to treat the simulation room and patient like a real person since students take simulation as seriously as do the educators. | 3 | 2 | -2 | -1 | **4** |
| #31 | Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical. | 3 | 1 | 1 | -5 | **3** |
| #42 | Assign students pre-simulation assignments to help students be more prepared to take care of the simulated patient. | 0 | 2 | -2 | 2 | **3** |
| #59 | Students need to know where they are during a simulation, therefore use persistent visual signs and/or sensory sounds (e.g., white board marked "OR", "Burn Ward", "Bedroom", alarms sounding, etc.). | -1 | -1 | 0 | 1 | **2*** |
| #34 | When grading a simulation, record the number of cues given and factor this in when determining student's grade. | -4 | -4 | -5 | -1 | **2*** |
| #8 | Place "weaker" students in roles that force them to perform. Doing so allows nurse educators to better evaluate these students. | -4 | -2 | -5 | -4 | **0*** |
| #60 | Take into consideration, students should not feel defeated when leaving the simulation lab. | 1 | 3 | 5 | 5 | **-1*** |
| #48 | Simulations should be less than 30 minutes in length; otherwise, students lose interest and become overwhelmed. | 1 | 1 | 4 | 4 | **-2*** |
| #10 | Run simulations with 2-3 students to promote the 'one whole brain' concept. Between the 3 of them, they should be able to remember enough to get through the simulation. | 2 | 1 | 4 | -1 | **-3** |
| #39 | Use of humor is important in simulations. | -1 | -2 | 4 | -2 | **-4** |
| #30 | Do not grade simulations. There are too many variables that cannot be controlled to make it fair for all students | 2 | 0 | 5 | 2 | **-4*** |
| #24 | Be "real" about the lack of reality in a simulation. This is appreciated by students and they engage more fully than if this issue is not discussed. | -3 | -1 | 0 | 2 | **-5** |
| #51 | Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. | -4 | -3 | -4 | 0 | **-5** |

*Note*. Characterizing statement + or -5. Distinguishing statement (*$p < .01$).
Higher/Lower ranked statement compared to other factors.

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## Section 4.3 - Design of Simulations: Comparing Perspectives as Held by Nurse Educators and Nursing Students

In this section the results to research question three, “How do perspectives about operationalizing simulation design characteristics vary between nurse educators and nursing students?” are reported and discussed. To answer the question, Factor A *Facilitate the Discovery* (nurse educator perspective reported in Section 4.1) was compared to the five distinct factors as held by nursing students: Factor 1 *Let Me Show You,* Factor 2 *Stand By Me,* Factor 3 *The Agony of Defeat,* Factor 4 *Let Me Think it Through,* and Factor 5 *I’m Engaging and So Should You* (reported in Section 4.2). Comparison of factors (perspectives) between nurse educators and nursing students occurred via three methods: inter-factor correlations, second order factor analysis, and visual inspection of factor arrays (constant comparative).

### Results

#### Inter-Factor Correlations

Findings indicate similarities and differences in the views held by nurse educators and nursing students. First-order inter-factor correlations (6-by-6 matrix) revealed the nurse educator Factor A *Facility the Discovery* significantly correlated with four out of five nursing student factors (Table 4.1). The only student factor that did not correlate with nurse educators was student Factor 4 *Let Me Think it Through*.

#### Second-Order Factor Analysis

Upon conducting second-order factor analysis that involved taking the composite Q-sorts from each of the six first order factors (5 nursing student factors plus the 1 nurse

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educator factor) and subjecting them to a second-order factor analysis, factors W, X, Y and Z emerged (Table 4.1).

A PCA extraction method with varimax rotation located the best factor solution and explained 83% of the variance in the 6-by-6 correlation matrix. The following describes the second-order factors. Since the purpose of conducting this analysis was to compare perspectives between nurse educators and nursing students, the focus of the interpretation was directed at what were the particular aspects of simulation design nurse educators share or do not share in common with nursing students, rather than offering factor interpretations for W, X, Y, and Z.

Table 4.1

*First-Order Factor Correlation and Second-Order Factor Analysis*

| | First-Order Factor Correlations [b] | | | | | | Second-Order Factor Loadings [a b] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | A | W | X | Y | Z |
| 1 - *Let Me Show You* | ---- | **.41** | .22 | .19 | .30 | **.48** | **(.78)** | .25 | .08 | .05 |
| 2 – *Stand by Me* | | ---- | .21 | .20 | .21 | **.49** | **(.87)** | -.03 | .06 | .09 |
| 3 - *The Agony of Defeat* | | | ---- | .15 | .11 | **.38** | .13 | .03 | **(.97)** | .06 |
| 4 - *Let me Think it Through* | | | | ---- | .11 | .27 | .12 | .05 | .07 | **(.98)** |
| 5 - *I'm Engaging and so Should You* | | | | | ---- | **.42** | .16 | **(.96)** | .04 | .04 |
| A - *Facilitate the Discovery* | | | | | | ---- | **(.61)** | **(.41)** | **(.40)** | .17 |
| | | | | | Explained Variance | | 29% | 19% | 18% | 17% |

*Note*. [a] Principal Component Analysis (PCA) extraction with varimax 4 factors rotated
[b] Correlation and Loadings > ±0.33. Significant ($p < 0.01$) in boldface/parenthesized

**Factor W.** Factor W loaded with three first-order factors; student Factor 1 *Let Me Show You,* student Factor 2 *Stand By Me,* and nurse educator Factor A *Facilitate the Discovery* and explained 29% of variance in the 6-by-6 correlation matrix. Statement (identified by item number) and factor array score (-5 most not recommend to +5 most recommend) located aspects of simulation design that evoke the strongest response and include:

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| Item # | Statement | Array score |
|---|---|---|
| #6 | During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. | +5 |
| #25 | Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role. | +5 |
| #22 | Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. | +4 |
| #56 | It is acceptable to use four hours simulation time to replace 6 hours of clinical experience. | -4 |
| #51 | Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. | -5 |

Nurse educators and nursing students, who comprised Factor W, hold similar views regarding the need to get at why students made their decisions, not cue students too soon, avoid assignment of students to non-nursing roles, and use playback of video recordings during debriefing. These nurse educators and students also do not recommend replacement of actual clinical with simulation activities. The focus of this factor is directed at getting at students' thinking.

**Factor X.** Factor X loaded with two first-order factors; student Factor 5 *I'm Engaging and So Should You* and with nurse educator Factor A *Facilitate the Discovery* and explained 19% of variance in the 6-by-6 correlation matrix. Statement (identified by number) and factor array score (-5 most not recommend to +5 most recommend) located aspects of simulation design that evoked the strongest response and include:

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| Item # | Statement | Array score |
|---|---|---|
| #35 | Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds should be as realistic as possible, equipment should be as true to what is used in real practice as possible. | +5 |
| #14 | Do not use the word "pretend." During pre-briefing, tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. | +5 |
| #36 | Nurse educators need to treat the simulation room and patient like a real person since students take simulation as seriously as do the educators. | +4 |
| #21 | There should be consequences for students if they do not take simulation seriously. | +4 |
| #30 | Do not grade simulations.  There are too many variables that cannot be controlled to make it fair for all students. | -4 |
| #24 | Be "real" about the lack of reality in a simulation. This is appreciated by students and they engage more fully than if this issue is not discussed. | -5 |

Nurse educators and nursing students who comprised Factor X hold similar views regarding the need that everyone is engaged in the simulation activity and take the simulation seriously. It this does not happen, then consequences should be delivered. Spending too much time talking about how to engage in simulation reality is unnecessary. In other words, educators and students recognize this is a learning activity designed to represent reality and consider spending time to explain the simulated reality a waste of time. Nurse educators and students holding a Factor X consider grading of simulations an acceptable action, which distinguishes this group of nurse educators and nursing students from other educators and students.

**Factor Y.** Factor Y loaded with two first-order factors; student Factor 3 *The Agony of Defeat* and nurse educator Factor A *Facilitate the Discovery* and explained 18%

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of variance in the 6-by-6 correlation matrix. Statement (identified by number) and factor array score (-5 most not recommend to +5 most recommend) located aspects of simulation design that evoked the strongest response and include:

| Item # | Statement | Array Score |
|---|---|---|
| #60 | Take into consideration, students should not feel defeated when leaving the simulation lab. | +5 |
| #30 | Do not grade simulations.  There are too many variables that cannot be controlled to make it fair for all students. | +5 |
| #10 | Run simulations with 2-3 students to promote the 'one whole brain' concept. Between the 3 of them, they should be able to remember enough to get through the simulation. | +4 |
| #39 | Use of humor is important in simulations. | +4 |
| #8 | Place "weaker" students in roles that force them to perform. Doing so allows nurse educators to better evaluate these students. | -5 |

Nurse educators and nursing students who comprised Factor Y hold similar views that simulations should be ungraded in order to avoid students feeling defeated. Students are encouraged to think as one without singling out the weaker students. Use of humor during simulations is important and distinguishes how this group of nurse educators and nursing students view simulation differently from other educators and students.

**Factor Z.** Alternatively, Factor Z loaded solely with one first-order factor and essentially retained the same interpretation as nursing student Factor 4 *Let Me Think it Through* (see Section 4.2). Statement (identified by number) and factor array score (-5 most not recommend to +5 most recommend) located aspects of simulation design that evoked the strongest response and include:

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| Item # | Statement | Array Score |
|---|---|---|
| #46 | Nurse educators who use simulation should be master's prepared, as most clinical instructors are required to be. | +4 |
| #50 | Use both verbal and written debriefing for simulations where students need time to consider and think through events such as end-of-life simulations. Comments by students a week later are much richer and thoughtful than during the immediate debrief. | +4 |
| #31 | Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical. | -5 |
| #41 | If students are going to make an error during a simulation, first give them cues to change their minds. But, if they say, "I am good" or "let's go do this", let students make the error and help them discover the error or omission in debriefing. | -5 |

The discovery of Factor Z revealed the existence of a group of nursing students who hold different views about simulation design from any of the other nursing students or nurse educators. Even as nurse educators share some of the views of the other four groups of nursing students, nurse educators do not share views with students holding a *Let Me Think it Through* perspective. Statements that distinguish the students holding a Factor Z view from other factors include the recommendations that nurse educators hold a MSN level of education, use of written debriefing in addition to verbal debriefing, to not interrupt a simulation to provide cues, and to not use simulation for one-on-one learning.

**Visual Inspection of Factor Arrays**

Visual inspection of the second-order factor array tables and review of consensus statements revealed similarity in thinking across factors. Consensus statements are those statements that do not significantly distinguish any pair of factors (McKeown & Thomas, 2013). Consensus statements revealed design characteristics in which nurse educators and

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nursing students think similarly on (Table 4.2). The statements ranked towards the middle of the grid (-2 to 2) reveal design issues that are non-salient (not a 'big deal') for both educators and students across all second-order factors. The design issues reflected in these statements (#33, #53, #49) may not be as useful in identifying the issues that need further attention. Whereas the ranking of statements (#35, #22, #45) towards either of the polar ends across second-order factors identifies design issues that do hold salience (evoke a stronger response) and are issues that need attention.

Table 4.2

*Consensus Statements Among Factors W, X, Y, and Z*

| | Item Number and Statement | Second-order Factor Array Scores | | | |
|---|---|---|---|---|---|
| | (+5 Most Recommend to -5 Most Not Recommend) | **W** | **X** | **Y** | **Z** |
| #33 | Prior to a simulation, caution students to not make things up (assessment data/findings) or assume things (i.e. do not need to do something) if they do not have what they are looking for. | 0 | 1 | 1 | -2 |
| #53 | How students interpret realism in a simulation needs to be understood by nurse educators. | -1 | -1 | 1 | 0 |
| #49 | Offer students preplanned information or cues during the simulation. To accomplish this, it is necessary for nurse educators to predict what additional cues students will need to progress in the scenario. | 0 | 0 | 0 | -3 |
| #35 | Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds should be as realistic as possible, equipment should be as true to what is used in real practice as possible.* | 4 | 5 | 3 | 4 |
| #22 | Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. | 4 | 3 | 2 | 1 |
| #45 | Avoid having students play role characters in a simulation, as they tend to want to help the other classmates instead of sticking to their role.* | -3 | -3 | -2 | -4 |

*Note*. Statements non-significant at $p > .01$, *Statements non-significant at $p > .05$

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**Discussion**

Considering findings from these analytic methods (inter-factor correlations, second-order factor analysis, and visual inspection), nurse educators with a first-order Factor A *Facilitate the Discovery* perspective hold similar views with components of four of the five nursing student first-order factors, *Let Me Show You*, *Stand By Me*, *The Agony of Defeat*, and *I'm Engaging and So Should You*. There is also a group of students holding a first-order *Let Me Think it Through* perspective about simulation design that is not shared by nurse educators. Closer inspection of the distinguishing and characterizing statements in each of the second-order Factors W, X, and Y revealed the particular characteristics in simulation design that nurse educators and nursing students view similarly. In addition, second-order Factor Z revealed aspects about simulation design held by nursing students that nurse educators may not even have realized existed. The following discusses possible reasons for these findings.

Not surprisingly, Factor W revealed nurse educators want students to discover on their own how to manage patient situations. Likewise, nursing students holding a Factor W view also want to self-discover knowledge on patient management, but need guidance along the way. Factor W most likely is comprised of students who want to take responsibility for their own learning, ask for help when needed, and educators who support and facilitate the discovery of learning.

In Factor X, it is clear educators and students hold strong views about simulation realism including the need to take simulation activities seriously. If neither student nor educator takes simulation seriously, then consequences are in order. Interestingly, grading of simulations is a recommended action by those holding a Factor X view. It is

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possible those holding a Factor X view may be more engaged and invest more time and energy into the simulation activity and if others were not as engaged then consequences, such as a grade, would be appropriate.

There are also nurse educators and nursing students who view simulation more as a learning (formative) activity rather than an evaluative (summative) activity. This became evident in Factor Y when the issue of grading simulation evoked strong responses with a recommendation that simulations be ungraded. In Factor Y, the strongest views, by both educators and students, revolved around how students felt after they left the simulation activity. It is possible that Factor Y is comprised of nurse educators who sympathize with nursing students regarding their fear and anxiety associated with simulation activities.

Finally, Factor Z was a new discovery not yet reported in the literature and one that calls for further exploration. Factor Z essentially reflected the student perspective *Let Me Think it Through*. These students need more time to process information, think about their actions, and not be interrupted by hearing the thoughts of others. Of concern, was the finding that nurse educators do not share or possibly recognize Factor Z. Nurse educators may not be able to accommodate students with this type of view, possibly related to logistics and time constraints for conducting simulation activities. It may also be that nurse educators do not recognize the existence of students holding this view. It is conceivable students comprising this view are dealing with tendencies that make it more difficult for them to recover from an interruption in their train-of-thought. Considering this, educators may need to allot time to follow up with students following simulation activities.

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The ranking of one statement in Factor Z continues to be puzzling. Statement #31 reads, "use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical." Nursing students in Factor Z ranked this statement as most not recommend (-5). However, considering how students in this factor view interruptions as throwing them off track in their thinking, one would think, as an educator, that these students would value the opportunity for one-on-one learning. However, a potential reason for the ranking of statement #31 as not recommended could be this group of students prefers to not be identified as needing extra help or needing more time to process information. This calls the question whether this group of students is voicing their views or whether their voices are being heard.

Considering the consensus statement (#35) was ranked most recommended (+4 to +5) across all factors, it is suggested to be considered as a key principle for simulation design. The statement regards the importance in educators' ability to operate and troubleshoot simulation technology.

Summarizing the findings to research question three indicates that nurse educators as a collective whole share similar views with subgroups of students regarding particular aspects of simulation design as identified in second-order Factors W, X, and Y. However, inspection of Factor Z revealed a group of students that hold a view not shared by other educators or other students. The views held by Factor Z calls for further exploration in order to better understand the perspective *Let Me Think it Through*.

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## Section 4.4 Perspectives about Simulation Design in Relation to Simulation Experience

The fourth research question asked how do perspectives about simulation design characteristics within SBL educational interventions vary based on experience with SBL for nurse educators and number of SBL experiences for nursing students.0

### Nurse Educators

Nurse educators hold an overriding perspective regarding how to operationalize simulation design characteristics. Upon visual inspection of the 44-by-44 correlation matrix and the overriding consensus Factor A *Facilitate the Discovery*, nurse educators hold this perspective across experience levels with simulation (< 2 years, 2-5 years, and > than 5 years).

Visual inspection of the two bipolar secondary Factors B and C regarding the years of simulation experience provide the following results. For Factor B, the positive pole loaded with four nurse educators (3 educators with > 5 years of simulation experience and 1 educator with 2-5 years), while the negative pole of Factor B loaded with four nurse educators (3 educators with < 2-5 years of simulation experience and 1 with < 2 years). Considering these loadings and the statements that comprise the polar ends, nurse educators with more experience are more likely to let students progress on their own and figure things during a simulation. While nurse educators with less simulation experience are more likely to offer more help by providing cues, stopping a simulation, and having an educator in the simulation room.

For Factor C, the positive pole loaded with four nurse educators (3 educators having 2-5 years of simulation experience and 1 educator with < 2 years), while the

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negative pole of Factor C loaded with four nurse educators (3 educators with > 5 years of simulation experience and 1 educator with 2-5 years). Considering these loadings, nurse educators with more experience are more likely to not repeat or stop a simulation, feel it is unnecessary to increase realism as students gain experience, and avoid assisting students during the simulation. While nurse educators with less simulation experience are more likely to repeat or stop a simulation, encourage students to work and think together, and offer assistance in use of equipment.

As only eight nurse educators loaded on either secondary bipolar Factor B or C, caution is necessary before drawing any conclusions. Nevertheless, the findings are worth reporting as they offer ideas for further exploration.

**Nursing Students**

Upon visual inspection of the 45-by-45 correlation matrix and the five resulting factor arrays, there appears to be no noticeable association between number (< 3, 3-5, or > 5) of simulation experiences with any particular perspective students held or did not hold.

## Chapter Summary

This chapter provided study results to the four research questions asked in this study. The findings regarding research questions one and two were reported in two manuscripts (sections 4.1 and 4.2) prepared for publication. Findings to research questions three and four were reported in sections 4.3 and 4.4.

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# CHAPTER 5.0 SYNTHESIS OF STUDY

Nursing education is challenged to transform the educational processes to prepare new graduate nurses. Simulation based learning (SBL) is one pedagogical method that has emerged as an innovative approach to tackle this challenge (Benner et al., 2010; Jeffries, 2005). However, there are unanswered pedagogical questions regarding underlying assumptions, principles, language, and beliefs surrounding SBL as an educational intervention. Of particular interest for this study, were methods nurse educators use to operationalize simulation design characteristics and how these choices were viewed from the perspective of nursing students.

Generic simulation design and implementation processes are described in the literature (Issenberg et al., 2005; Jeffries, 2005). However, as educators become more deeply involved with SBL, it has become obvious more detail and direction is necessary to design SBL educational activities. The exponential growth of SBL has given way to facets of SBL that need to be deconstructed and investigated more specifically in order to advance evidence based educational practice and build SBL's role in the science of nursing education. Broad categories for simulation design have been determined, for example debriefing, range of difficulty level/complexity, defined learning outcomes, realism, and student support (Issenberg et al., 2005; Jeffries, 2012; McGaghie et al., 2006). However, in keeping with the "Rubik Cube" analogy introduced in Chapter 1.0, as educators make decisions on simulation design, one twist (choice in simulation design) here and one turn (another choice in simulation design) there may be a significant factor influencing the efficacy of a SBL educational activity. The focus of this study was directed at simulation design as one aspect of SBL with the intent to look deeper at

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perspectives educators use to figure out this "Rubik Cube" puzzle. Paired with this was the importance of exploring the student nurse perspective on what he/she would recommend to nurse educators about SBL design. This final chapter culminates with a synthesis of the five manuscripts and discusses the conclusions and implications this body of work offers for theoretical guidance, educational practice, educational policy, and future research (Figure 5.1).

## Synthesis of Manuscripts

### Problem - Lack of Clarity in Simulation Language and Pedagogical Understanding

Manuscript One, *Simulation Fidelity and Cueing: A Systematic Review of the Literature*, addressed a problem issue identified in Chapter 1.0 concerning the ambiguous and unclear use of terminology used in simulation design. Specifically, fidelity and cueing were terms frequently seen in the literature and commonly heard in ordinary conversations, but often it was difficult to discern their meaning. In this manuscript, conceptual definitions of fidelity and cueing were offered. Fidelity was defined as a multi-dimensional concept forming a matrix of physical, psychological and conceptual dimensions. Cueing was defined as comprising two types – reality cues that help the learner interpret or clarity simulated reality and conceptual cues that provide information to help the learner reach learning objectives. The mode of delivery for each type of cue is enacted via equipment, environment, or patient/role character. Dissemination of these definitions to educators employing SBL occurred in April 2013 when this manuscript became available as an advanced online publication in *Clinical Simulation in Nursing*. Within this manuscript, a visual representation of the fidelity matrix within the larger context of a simulation education intervention was offered.

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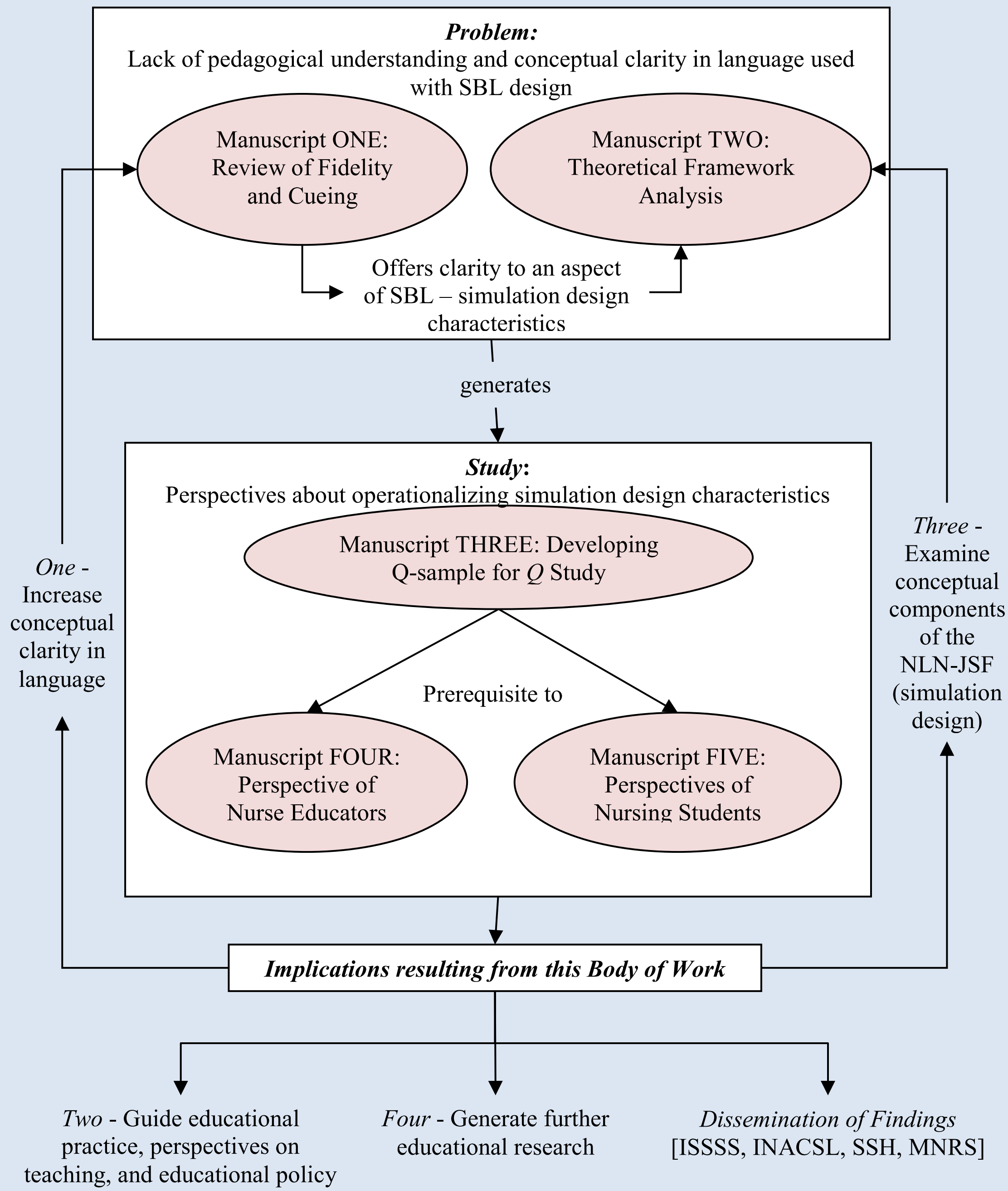
Figure 5.1

*Synthesis of Study*




*Note*: International Society for the Scientific Study of Subjectivity (ISSSS), International Association for Clinical Simulation and Learning (INACSL), Society for Simulation in Healthcare (SSH), Midwest Nursing Research Society (MNRS)

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The second problem identified in Chapter 1.0 was lack of pedagogical understanding of SBL. Use of theoretical frameworks, incorporation of educational and learning theories, and educators' personal reflection of the actions, intentions, and epistemological beliefs serve as guides to pedagogical understanding. In Manuscript Two, *Theoretical Frameworks for Simulation Based Learning in Healthcare Education: A Systematic Review,* five theoretical frameworks developed to guide SBL activities were reviewed. Analysis of these frameworks indicated conceptual clarity of was again lacking for fidelity, cueing, and student support. This review also concluded frameworks guiding simulation activities are not yet fully developed. One of the reviewed frameworks was the NLN-JSF that served as the theoretical guide for this study. Together, the two reviews of literature manuscripts on simulation fidelity, cueing, and theoretical simulation frameworks informed this investigator's expansion of sphere two of the NLN-JSF (Figure 1.2, page 15). Within this expanded visual, one can see how the investigator incorporated the fidelity matrix and conceptual definitions of fidelity and cueing as published in Manuscript One.

**Study - Investigating Perspectives about Simulation Design**

As educators acquire knowledge about new technologies (SBL in this study), time is needed to reflect on how these new teaching/learning strategies fit into current teaching perspectives(s). Attending to this issue is crucial since perspectives formulate our (educators') intentions and provide direction to our actions that are derived from epistemological beliefs. Equally important, pedagogical understanding of educational practices requires examination of student perspectives, thus the drive to uncover perspectives about operationalizing simulation design characteristics as held by nurse

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educators and nursing students. Perspectives are subjectively based on one's opinion or point-of-view (Watts & Stenner, 2012). Given the focus on exploring perspectives, Q-methodology was selected as a research approach that could investigate subjectivity in a systematic and rigorous process (Brown, 1980).

A prerequisite component to investigate subjectivity employing a Q-methodological approach is the construction and test of a Q-Sample (collection of opinion statements on the topic of interest). The processes to gather, select, edit, and test opinion statements for a Q-study is comprehensive and iterative. Manuscript Three, *Q-Sample Construction: A Critical Step for a Q-Methodological Study*, detailed the construction and test of the Q-Sample used in this study. Finally, Manuscripts Four and Five reported study findings to research questions one and two. Study conclusions and summary of answers to the four research questions follow.

**Study Conclusions**

Four research questions were asked in this study. The first research question asked what are nurse educators' perspectives about operationalizing simulation design characteristics within SBL educational interventions? Findings indicate nurse educators share an overriding perspective about operationalizing simulation design. This perspective has been labeled *Facilitate the Discovery* to reflect the key aspects of this view where educators facilitate students' thinking process by allowing them enough time to process information and subsequently discover their own learning. This is primarily accomplished during the debriefing where students do most of the talking but are redirected if conclusions are erroneous. Key aspects of this *Facilitate the Discovery* perspective were consistent with reports in the literature as well as the evolving standards

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of best educational practice for simulation as put forth by INACSL (INACSL Board of Directors, 2013). However, there remain aspects of simulation design that still need investigation, as opposing views exist as revealed in two secondary bipolar factors. These opposing views concerned whether to and how to assign students to role characters in simulation activities and the degree to offer support to students during simulation activities including when and if simulations should be stopped/repeated. The reasons behind these opposing views, as held by educators, may relate to educators' underlying personal beliefs regarding how to teach and how students learn.

The second research question asked what are nursing student perspectives about simulation design characteristics within SBL educational interventions as operationalized by nurse educators? Findings indicate nursing students hold five distinct and uniquely personal perspectives. These five perspectives were labeled *Let Me Show You, Stand by Me, The Agony of Defeat, Let Me Think it Through,* and *I'm Engaging and so Should You.* Given that the literature reports students need support and guidance during SBL activities (Parker & Myrick, 2012) while also suggesting anxiety is associated with SBL (Bremner, Aduddell, & Amason, 2008; Cordeau, 2010; Nielsen & Harder, 2013), it was no surprise to discover the *Stand by Me* and *The Agony of Defeat* perspectives. However, a perspective held by nursing students was discovered that has not yet been reported in the literature. It is possible this perspective, *Let Me Think it Through*, represents a group of students we as educators have overlooked. Bearing in mind simulations typically contain a group of students, it is likely any particular simulation may include students holding one or more of the student perspectives discovered in this study.

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The third research question asked how do perspectives about simulation design characteristics within SBL educational interventions vary between nurse educators and nursing students. Findings indicate nursing students view simulation from their own unique and personal experience (evident by five distinct factors), while nurse educators approach simulation design with the collective group of students in mind (evident by one overriding factor). These findings were consistent with other reports (Ganley & Linnard-Palmer, 2012) where it was found students focus more narrowly on their personal experience while nurse educators view the simulation experience from a broader perspective.

The fourth research question asked how do perspectives about simulation design characteristics vary based on experience with SBL for nurse educators and number of SBL experiences for nursing students. Findings from this study indicate each of the five nursing student perspectives is comprised of students who have varying numbers of simulation experiences. Similarly, the one overriding nurse educator perspective *Facilitate the Discovery* (42 of the 44 nurse educators) is comprised of nurse educators with varying years of experience with simulation. However, the secondary bipolar factors, which some nurse educators hold in addition to the overriding perspective, indicate experience with SBL use may vary for particular design choices. Additional exploration would be needed to draw further conclusions.

An analysis of the study conclusions produces several significant conclusions. First, nurse educators need to appreciate the diverse student views about SBL that encompasses a personal and emotional experience. Second, nurse educators should consider, as they conduct SBL activities, whether a group of students exists who need

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more time to process information, not be interrupted in their train-of-thought, and if this group of students exists, what are their particular instructional needs. Third, nurse educators need to collectively discuss and decide how far to let students struggle before offering support or stopping a simulation in process. Fourth, a recommendation is given that student support, as a NLN-JSF design characteristic, is reexamined not only from an instructional approach but also to include an emotional approach. Finally, program administrators need to plan for educational development of nurse educator employing SBL with ongoing practice that includes training in the operation of and troubleshooting of simulation technology, reflective exercises to clarify one's perspective of teaching with SBL, and how to deliver student feedback in a respectful, transparent, and upfront way.

## Implications Resulting from this Body of Work

As stipulated in Chapter 1.0, the purpose of this study was to explore perspectives nurse educators hold on simulation design and explore perspectives nursing students hold on simulation design as operationalized by nurse educators. Implications resulting from this body of work were directed at four areas: 1) offer greater clarity in how language is currently used in SBL design, 2) offer guidance in educational practice with SBL and associated educational policy, 3) critically examine certain conceptual components of the NLN-JSF as a new theoretical framework, and 4) identify topics for further educational research (Figure 5.1). A discussion returns to each of these four areas.

### Conceptual Clarity of Language in Simulation Design

A systematic review of the literature (Manuscript One) offered definitions for fidelity and cueing. Likewise, opinion statements about simulation design (Q-sample), as

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used in this study, provided exemplars of how terms such as fidelity, cueing, and student support were used in ordinary language. Together, these two activities can contribute information useful for conceptual development of these terms used in SBL. As stated in Chapter 1.0, conceptual clarity develops from a series of activities that identify exemplars and map out meanings of concepts (Waltz et al., 2010). The theoretical definitions for fidelity and cueing, offered in Manuscript One, now need to be reviewed and evaluated by others.

In addition, findings from this study indicate a lack of clarity exists regarding the concept of student support. This was revealed as educators and students thought of different things as they referred to student support. In order to enhance clarity on student support (concept in the NLN-JSF), it is first necessary to understand the perspectives people (nurse educators and nursing students) hold as they use this term. This study offers preliminary information on usage of this concept. For example, upon exploration of perspectives in this study, it was apparent student support manifests as either instructional support and/or emotional support. Further conceptual exploration of student support is necessary.

**Educational Practice and Policy**

It is apparent educators, students, and program administrators have a high interest in SBL evident by the escalated incorporation of SBL into nursing curricula (Nehring, 2008; Schlairet, 2011), the multitude of simulation conferences and webinars (INACSL, 2011; SSH, 2012), certification programs for simulation centers and simulation educators (Bryan Health College of Health Sciences, 2013; College of Nursing and Health Professions, University of Southern Indiana, 2010; SSH, 2012), and simulation research

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(Dieckmann et al., 2011). Considering this, one may ask what is so different about teaching and learning with simulation compared to other educational practices. Based on the findings revealed in this study, it is apparent SBL is different from other pedagogical methods in how it readily reveals to all educators and students present, an individual student's performance. Compared to other teaching and learning methods, such as cognitive tests, written assignments, and even clinical performance, individual student performance is more private and limited to the student and educator involved. During simulation activities, this is not the case. All those present in the simulation activity witness each other's performance and decision-making ability. Consequently, additional issues surface that nurse educators need to attend to and researchers need to investigate. For example, in this study, the issue of how to emotionally prepare students prior to simulation activities is an area educators need to address and research.

Because of this body of work regarding simulation design characteristics and the perspectives revealed about simulation design as held by nurse educators and nursing students for SBL activities, implications for educational practice, perspectives on teaching with SBL, and educational policy are identified. The following discusses these implications.

**Educational Practice.** Several implications for SBL educational practice were introduced in Manuscript Four (Section 4.1) and Manuscript Five (Section 4.2). These implications focused on use of pre-simulation assignments, confirming and reaffirming students are clear on the purpose of the simulation activity, and the need for educators to take time to reflect on their underlying epistemological beliefs. Further implications regarding role assignment, providing student support, understanding the diversity in

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student views, and creating realism resulted from this study. The following expounds on implications beyond what was discussed in the manuscripts.

***Pre-simulation preparation.*** How to prepare students for participating in SBL activities needs to be meaningful, well thought out, appropriate to students' level in the program, and inclusive of the emotional preparation students need for simulation activities. To date, best practices for pre-simulation activities include providing specific learning objectives regarding the scenario and the use of assignments that focus on content review (INACSL Board of Directors, 2013). In addition to these activities, it is important to spend time clarifying the purpose of each SBL activity with students. This should actually be the first thing discussed since SBL activities can be designed either as formative assessments or as summative or high stakes evaluations (Meakim et al., 2013). Students' understanding of the purpose of the simulation needs reaffirmation by the educator.

***Role assignment.*** Establishing an engaging learning environment prior to the start of a SBL activity means students understand their roles and the roles of the educators (Simon et al., 2009). The casting of role characters is important for the quality and subsequent psychological fidelity of the SBL activity (Sanko, Shekhter, Kyle, Di Benedetto, & Birnbach, 2013). In this study, it was clear nurse educators have some opposing views on how to and whom to assign role characters. If possible, nurse educators should avoid assigning students to play non-nursing healthcare providers or roles outside students' abilities. Although not ideal, non-nursing role assignments may be necessary in simulations in order to accommodate the number of students. If this would be the case, it is important educators provide clear directions and scripts to nursing

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students. Role character assignment for simulation activities is a topic area for educator development programs and an area for further educational research (Harder et al., 2013).

***Providing student support.*** Based on study findings, one quandary nurse educators face is how to offer constructive critique on students' performances when students clearly fall short of expectations. Educators do not want to harm students' confidence or their self-esteem, especially if they feel students are trying their best. Yet feedback needs to be provided otherwise students assume they are meeting expectations. In part, beliefs educators hold on how students receive feedback influences their comfort in providing feedback. Following the advice of Rudolph and colleagues (2013), educators should examine and possibly reframe their underlying assumptions. For example, if an educator views students to be resilient and capable, rather than fragile and defensive, educators may have greater confidence in their ability to provide meaningful feedback. Considering the perspectives revealed in this study, nurse educators could emotionally prep students for simulation activities by:

1. Informing students upfront that one of the purposes of formative simulation activities is to locate gaps in knowledge and/or misassumptions student may have. Purposely seeking and locating these gaps can then offer direction to educators and students where additional education and review is needed.
2. Informing students upfront that it is likely errors will happen, yet as educators, we believe in their ability to learn and adapt. Such statements may help reduce some of the anxiety students experience.

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3. Preparing students for the possible feelings that they may experience that occur before, during, and after simulation activities. Let students know that these feelings may differ between students.
4. Allotting time, following simulation activities, for students to meet individually with educators and discuss simulation events that remain unclear. This is especially important for students who were not able to completely process information in the simulation activity.

The emotional preparation students need prior to simulation activities is an area that needs further exploration. This need was evident as the concept of psychological safety surfaced in explanations offered by both nurse educators and nursing students.

***Understanding the diversity in students.*** Nurse educators are particularly challenged when a mix of student abilities and perspectives about simulation design are present in a group of students. Considering the existence of the five distinct nursing student perspectives, in any given simulation, there may be students who want to figure things out on their own, students who expect to be offered help, students who rely on other students, students who feel taken advantage of by other students, and students who need more time to figure things out but feel interruptions get them off track. Students participating in simulations may hold a *Let Me Show You*, *Stand By Me,* or *Let Me Think it Through* perspective, all wanting and expecting different levels of support from the educator and their peers. Finding the right balance can be a challenge for nurse educators. This diverse mix in student perspectives kindles a variety of choices nurse educators face. Based on this study, nurse educators have decisions to make. A few are:

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1. How to accommodate students who need more time to figure things out during a simulation.
2. How to decide when to stop a simulation knowing there are students who have varying views of this action.
3. What to tell students who feel taken advantage of by other students.
4. How to decide whether the educator or clinical instructor should be in the room with students and what this person's role entails.

The diversity in how simulation activities become unique and personal experiences for each student necessitates the need for educators to understand their particular group of students. In part, the diversity in student perspectives can be explained by students' unique needs and individual learning styles. Literature describes different learning styles from which students use while educators attempt to offer a variety of different types of teaching/learning activities to accommodate these different styles (Clapper, 2010; Knowles, 1980; Vygotsky, 1978). SBL has been touted as a pedagogy that can accommodate different learning styles. However, it became evident from findings in this study that perspectives contain an emotional element that may transcend the different learning styles. Ideas on how to evaluate the diversity in student perspectives include:

1. Poll nursing students on the type of perspective(s) they hold about simulation design. This can be accomplished using the five perspectives discovered in this study. Nursing students could be asked to individually self-identify how closely they think similarly or differently to each of perspectives. This information can then provide the educator a snapshot of his/her students who are scheduled for simulation activities.

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2. Administer the Q-sample of 60 opinion statements on simulation design developed from this research to the students in one's nursing program followed by factor analytic procedures. The resulting factors are then interpreted to discover the perspectives held by that particular nursing program's students.

***Creating and maintaining realism.*** Since all five nursing student perspectives and the one nurse educator perspective recommended creating and maintaining simulation reality, this becomes an important implication for simulation design. Creating realism happens if equipment is functional and educators are proficient in its operation. In addition, engaging or 'buying into' simulation realism may come easier as one gains experience with SBL. Walton, Chute, and Ball (2011) found students pass through phases where joking around and not taking roles seriously happens. Taking SBL activities more seriously increases as students become more committed to SBL as a learning method.

**Perspectives on Teaching.** Brookfield (2006) claims skillful teaching is grounded in three core assumptions. First, skillful teaching is whatever helps students learn, second, skillful educators critically reflect on their practice, and third, skillful educators are constantly aware how students experience their learning and perceive educators' actions. Brookfield's second and third assumptions were relevant to the research questions asked in this study. Building on Brookfield's second assumption, Pratt (1998) considers it essential for educators to understand their core beliefs and assumptions behind their intentions and the actions that influence their choices. In the case of this study, these choices entail the design of simulation activities. If beliefs are not recognized or understood, then there is a risk design choices are based on haphazard or misalliance with underlying intentions.

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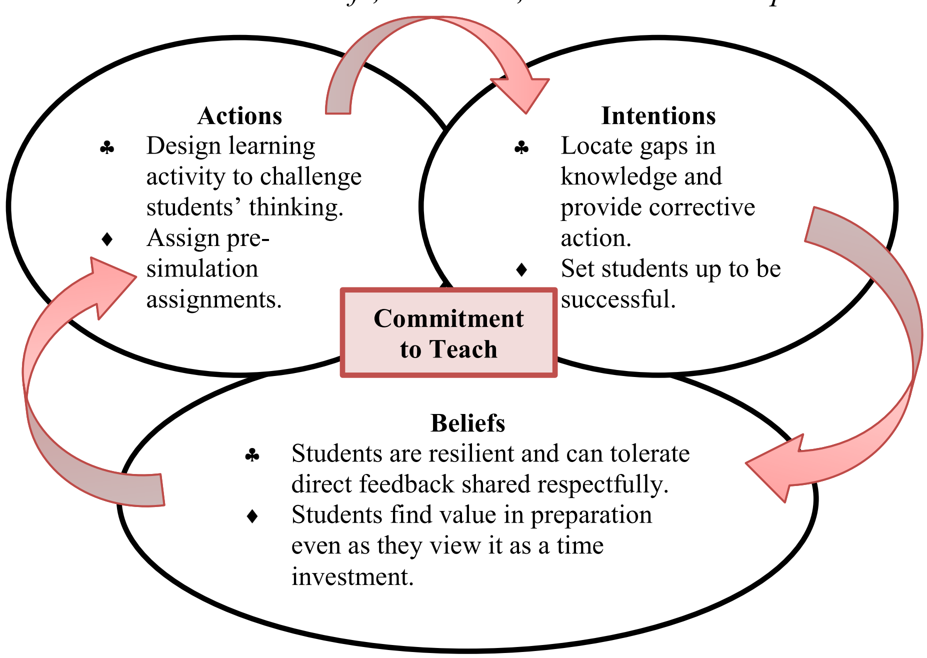
Program administrators have the responsibility to promote and provide opportunities for educator development. One option program administrators can consider to promote nurse educators' critical reflection on teaching practices is to conduct their own Q-study using the Q-sample as constructed in this study. As a collective group of educators, it would be beneficial to understand the perspectives a group of educators hold and see whether the same overriding perspective, as revealed in this study, exists beyond the nurse educators that participated in this study.

In another option to promote critical reflection, nurse educators could be asked to align their actions, intention, and beliefs as they think of different teaching strategies. This type of reflective activity depicts one's commitment to teach (Pratt, 1998).

Figure 5.2

*Commitment to Teach – Beliefs, Intentions, Actions - An Example*




For example, in Figure 5.2 the action of designing learning activities that challenge students' thinking (♣ example) has the intent to locate gaps in knowledge and is driven by the belief students are resilient and can receive feedback about their identified gaps in

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knowledge if provided in a respectful manner. In a second example, the action of assigning pre-simulation assignments (♦ example) is driven by the intent to set students up to be successful is based on a belief that students find value in preparation even as they view it as a time investment.

The following discussion returns to Pratt's (1998) five perspectives of teaching that include transmission, apprenticeship, developmental, nurturing, and social reform. Even though Pratt's perspectives pertain to educators, it is important to recognize students are the recipients of teaching perspectives and most likely hold preferences for educators who hold different teaching perspectives. Similarities exist in Pratt's apprenticeship, developmental, and nurturing perspectives to the perspectives discovered in this study. For example, in the apprenticeship perspective that "models ways of being" (Pratt, 1998, p.83), learning must be located in authentic situations. This is similar to SBL where students are placed in authentic learning situations and are challenged to develop and reframe their knowledge. The *Facilitate the Discovery* nurse educator and the *Let Me Show You* student perspective have similarities matching this teaching perspective. In the developmental perspective that "cultivates ways of thinking (Pratt, 1998, p. 105), the focus is on developing students' thinking, reasoning, and judgment. The *Facilitate the Discovery* nurse educator and the *Stand By Me* student perspective have similarities matching this teaching perspective. Finally, in Pratt's nurturing perspective that "facilitates self-efficacy" (Pratt, 1998, p. 151), the focus is on the learners' self-concept and self-efficacy. The *Agony of Defeat* student perspective has aspects of thinking that match this teaching perspective.

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Considering the existence of five teaching perspectives identified by Pratt and the existence of five different perspectives as held by nursing students discovered in this study, it actually is favorable to have this variety in perspectives. In other words, nursing students who hold different preferences for teaching methods have the opportunity to be recipients of teaching perspectives that match their learning styles.

**Educational Policy.** Initial and ongoing faculty development is essential for educators as they design, conduct, and evaluate SBL activities (Cannon-Diehl, 2009; Dillard et al., 2009; Jones & Hegge, 2008; McNeill et al., 2012). Without ongoing educator training, simulation programs will not achieve optimal success (Issenberg et al., 2011). Considering this, the following are policy considerations for educator development regarding incorporation of educational and learning theories suited for SBL, the need for technological training with administrative support, and attendance at educational programs.

***Educational and learning theories for SBL.*** Nursing programs ought to have in place policies on how extant educational and learning theories are incorporated into SBL design. No one educational or learning theory stands superior to others; however, there are educational/learning theories that are more suitable for use in SBL. The selection of which theory, framework, or combination will depend on the goals of the SBL program and the needs of the learners and educators it serves. Based on the review of the literature (Manuscript Two), examples of educational and learning theories appropriate for SBL include Vygotsky's (1978) zone of proximal development, Lave and Wenger's (1991) situated learning, Fink's (2003) six dimensions for significant learning, Gagne's (1192) instructional design, and Dreyfus and Dreyfus's (1996) deliberate practice. Inclusion of

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educational and learning theories into the development theoretical frameworks specific for SBL is important.

***Technological Education and Administrative Support.*** It is clear from the perspectives discovered in this study as held by both nursing students and nurse educators that creating and maintaining simulation realism requires a solid knowledge base in the operation of the technology. Student frustration and increased anxiety can occur if equipment does not function and/or those operating the technology do not know how to use or troubleshoot it. In order to avoid these technical hitches, it is necessary to have ongoing educator development and practice to maintain proficiency in the use of simulation technology. Even as educators gain knowledge on instructional approaches for SBL, becoming proficient requires sustained efforts with collegial support. Educators can find it difficult to do this alone. Even with initial upfront cost for simulation equipment (manikins, audio recording equipment, hospital supplies, etc.), administrators need to also budget for ongoing faculty instruction both for technology and simulation pedagogical theory.

***Educational Programs on SBL.*** Creating cost-efficient, meaningful, and applicable SBL development programs aimed at the particular needs of educators can be enhanced through an awareness of what perspectives educators and nursing students currently hold about simulation design. Program topics and educational activities for possible implementation during educational conferences or other educational development programs include:

1. Use the perspectives discovered in this study as a forum or structure for educational discussions.

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2. Design an educational program or workshop by conducting a Q-sort with the 60 statement Q-Sample with conference participants. During break, conduct factor analysis and then allow participants time to interpret their own resulting factors. This type of interactive activity stimulates discussion and is valuable in uncovering underlying beliefs and values about teaching and learning.
3. Construct an educational case study of a SBL activity comprised of nursing students holding the different perspectives about simulation design. Direct nurse educators to problem solve how this would influence any difference in how they conduct SBL activities.
4. Develop a conference session specifically focused on how to emotionally prepare students for SBL activities and emotionally support students during and after the simulation experience.

**Examination of Conceptual Components of the NLN-JSF**

The NLN-JSF was introduced in Chapter 1.0 with Chapter 2.0 (Section 2.2) detailing its development and recent revision. This study focused its examination at sphere two of the NLN-JSF that contained the five simulation design characteristics (objectives, student support, fidelity, problem solving, and debriefing). As stated, definitions of fidelity and cueing were offered in Manuscript One. The concept of student support, as a simulation design characteristic, remains unclear and because of this study, it is recommended student support be subdivided to contain dimensions of instructional and emotional support. Instructional support entails providing information and cues to the student to facilitate reaching learning objectives (Alessi, 2000b; Jeffries, 2012). Conceptualizing emotional support starts with gaining insight into the student experience.

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Preliminary insight on this experience was gained from this study. It is helpful to consider Brookfield's (2006) claim that students experience an epistemological panic as they come to realize "knowledge and truth are contextual and open" and as students learn they realize "their lives as learners will be marked with continual inquiry, questioning of assumptions, and reframing perspectives, just as their teachers say" (p. 90). This is what happens during simulation activities. In simulation activities, students are challenged to reexamine their pre-existing assumptions and knowledge about how they provide and deliver nursing care to clients. This becomes a crucial "intellectual anxiety attack" (Brookfield, 2006, p. 90), but one that is necessary during the learning process. Consequently, we as educators need to attend to the emotional preparation of students (see prior suggestions) for this epistemological transformation.

In Chapter 1.0, the investigator described how sphere two of the NL-JSF was expanded to depict the positioning of the five simulation design characteristics (Figure 1.2, p. 15). Because of this study, minor revision to sphere two (Figure 5.3) include the division of student support into two dimensions and minor realignment of where two other simulation design characteristics (objectives and problem solving) have an effect. The following explains the reasons behind these changes. First, student support should be comprised of two dimensions; the emotional and instructional support that students need during the pre-brief, simulation activity, and the debriefing. As seen in Figure 5.3, student support has now been subdivided into these two dimensions. Since learning objectives drive the design of the scenario events and are revisited in debriefing discussion, a second revision added an arrow linking objectives to the simulation activity and the debriefing. Third, since problem solving happens during the simulation activity, an arrow was added

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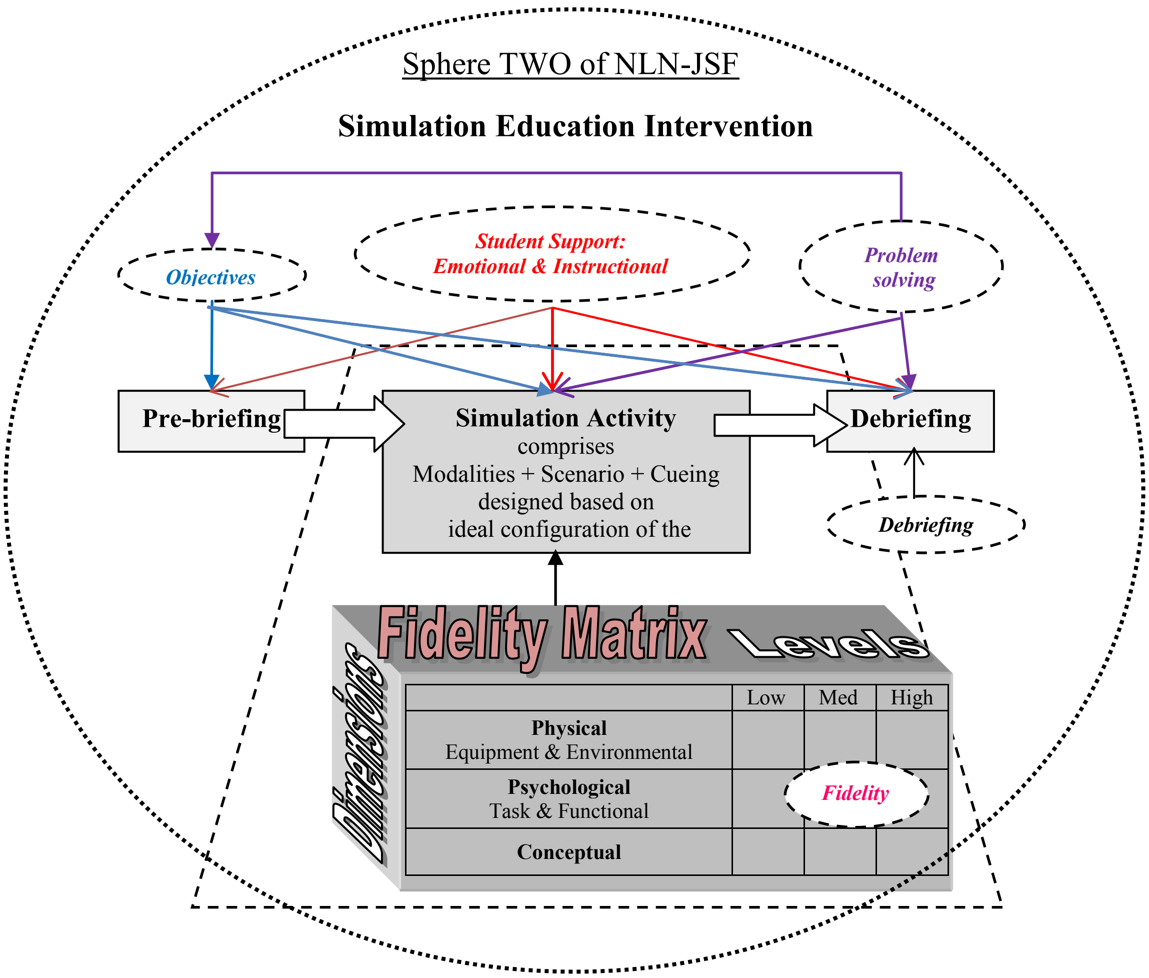
linking problem solving to the simulation activity. The concepts of debriefing and fidelity were left unchanged from the original expansion.

Figure 5.3

*Expansion of Sphere Two of the NLN-JSF - Revisited*




Related to the concepts contained in the NLN-JSF was an interesting realization that occurred during Q-sample construction. During the process to construct the Q-sample, it became apparent the opinion statements gathered from nurse educators embedded the concepts from the NLN-JSF. Initially, it was anticipated the investigator would need to combine two separate opinion statements for each of the 15 factorial categories; for example, merging a statement about the teacher with a statement about

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fidelity, or a statement about educational practice with a statement about support. However, as opinion statements were reviewed, it was apparent they readily factored into one or more of the 15 categories without the need to combine two statements together. Based on this realization, it is conceivable that nurse educators consciously or unconsciously take into account the teacher, student, or educational practices in conjunction with objectives, problem solving, fidelity, debriefing (concepts within the NLN-JSF) as they consider simulation design.

Currently, members within the INACSL organization have been discussing initiatives to advance the NLN-JSF from a theoretical framework to theory (Ravert & McAfooes, 2013). Structural components to theories include assumptions, principles, and propositions (Fawcett, 2005; Meleis, 2007). In order to move the NLN-JSF to the level of a theory, identifying and testing assumptions and principles that provide the structure to the NLN-JSF are necessary. In the 2012 revision of the NLN-JSF (Jeffries & Rogers, 2012), these were yet to be identified. Because of the findings from this study, a statement was identified that could be considered as a potential principle as the NLN-JSF moves forward in theory development. This principle could read 'simulation realism is optimized and maintained though functional equipment and technology that educators know how to use and troubleshoot.'

**Future Research**

Findings from this study generate further questions that need exploration. Several areas for further investigation have already been suggested such as exploring the opposing views nurse educators hold regarding role assignment and the degree in providing student support including when and if to stop or repeat a simulation. In

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addition, studies investigating student preparation that includes pre-simulation assignments and reaffirming that students are clear on the purpose of the SBL activity need exploration. Furthermore, student support, as a concept, needs to undergo conceptual analysis. In addition to these areas, the following are subsequent steps in educational research.

1. Explore how students' academic abilities and preparation for SBL activities relate to the different perspectives nursing students hold about simulation design. Of particular interest was the finding that *The Agony of Defeat* perspective placed a lesser value on pre-simulation assignments and reviewing of learning objectives. If students holding this perspective are less likely to be prepared for simulation activities, this may be a factor influencing the feeling of defeat.
2. Since student anxiety is a common reported experience with simulation activities, it would be of benefit to explore whether nursing students holding different perspectives vary in their ratings of anxiety.
3. Considering that Q-methodology employs an abductive form of logic where initial 'guesses' generate hypotheses (Watts & Stenner, 2012), the findings from this study suggest possible areas for future hypothesis testing. For example, the need to examine whether Kolb's (1984) learning styles, Benner's (1984) novice and advanced beginner levels of competency, or whether certain learning disabilities are associated with any of the five nursing student perspectives discovered in this study.
4. Since students experience SBL in unique and personal way with a diverse mix in their expectations of each other, it is worth investigating different options to assign students to simulation groups. For example, if students were assigned to groups based

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on similar learning styles or similar perspectives as held about simulation design, what impact would this have on learning outcomes or level of anxiety? If students who hold a *Let Me Show You* perspective are group together, would these students be able to reach learning objectives quicker? If students who hold a *Let Me Think it Through* perspective are group together, would these students be able to figure out and deal with the problem if given enough time?

5. Since the perspectives discovered in this study may have differed based on whether the nursing student or nurse educator was thinking of a formative assessment or summative evaluation as he/she conducted the sorting of statements, a follow up study could be designed to have participants sort the Q-sample under two different conditions of instructions. For one condition of instruction, participants could be asked to sort the statements with a formative simulation in mind. This same group of participants could then be asked to sort the statements with a summative simulation in mind. Such a study would provide useful information in whether best educational practices in the operationalizing simulation design characteristics differ based on a formative or evaluative purpose.
6. The research design, as employed in this study, could be reconfigured to explore perspectives about clinical teaching. Understanding how perspectives about clinical teaching vary between educators and nursing students would offer valuable insight into underlying values and beliefs about clinical teaching. In particular, the opinions on how educators develop students' clinical reasoning skills could be explored. It would be helpful to understand how the level of educator preparation (MSN, DNP, PhD) affects one's perspectives about teaching and learning.

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7. As a follow up to this study, an instrument to determine student perspectives about SBL design could be developed. Such an instrument would be helpful in offering educators a tool to gain a greater understanding of the students they are educating.
8. Explore perspectives about SBL from an interprofessional focus. Since healthcare professionals do not practice in silos, neither should be their educational experiences. Luckily, scholars and researchers in SBL recognize this and efforts to collaborate between disciplines are in process (IPEC, 2013). However, there may be philosophical differences in the education of nurses and physicians. Discovering underlying perspectives and shared meaning towards teaching methods is one way to enhance educational collaboration between disciplines.

## Chapter Summary

The purpose of this chapter was to synthesize this body of work with Figure 5.1 offering a visual guide to the discussion. The identified problems regarding SBL were lack of pedagogical understanding and lack of conceptual clarity in language used for simulation design. These problems contributed to the need to review in a systematic process the literature to see how educators (across professions) conceptualize the terms fidelity and cueing. In another systematic review, theoretical frameworks developed to guide SBL were reviewed and analyzed. Following this review of literature, a study was designed to explore perspectives held by nurse educators and nursing students regarding simulation design. Concluding the chapter was a discussion on the implications this body of work (literature review and study findings) offers for theoretical guidance, educational practice, educational policy, and future research for the pedagogy surrounding simulation based learning as an educational intervention.

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Zigmont, J., J., Kappus, L., J., & Sudikoff, S., N. (2011). Theoretical foundations of learning through simulation. *Seminars in Perinatology, 35*(2), 47-51. doi:10.1053/j.semperi.2011.01.002

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# APPENDICES

## Appendix A

Permission to use National League of Nursing –
Jeffries Simulation Framework
(NLN-JSF)

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National League for Nursing

March 1, 2012

Jane B. Paige,
University of Wisconsin - Milwaukee
jbpaige@uwm.edu

Dear Ms. Paige:

I am writing in response to your e-mail of February 9, 2012, in which you request permission to use an image from an NLN publication for your dissertation and within a Sigma Theta Tau small grant application

**NLN Material Copyright Request**

1. Use the Theoretical framework for simulation design found in the publication listed below for your dissertation.
2. Use the Theoretical Framework for Simulation from the publication listed below within a Sigma Theta Tau small grant application.

> Jeffries, P. & Rodgers, K. (2007). Theoretical framework for simulation design. In P. Jeffreis (Ed.) Simulation in nursing education: From conceptualization to evaluation (pp. 21-33). New York: National League for Nursing.

**Permission Granted to:**

1. Use the Theoretical framework for simulation design found in the publication listed above for your dissertation.
2. Use the Theoretical Framework for Simulation from the publication listed above within a Sigma Theta Tau small grant application.

In granting permission to include the material noted above, it is understood that the following assumptions operate and "caveats" will be respected:

- The material will be included only in your dissertation and within a Sigma Theta Tau small grant application.
- The material will not be modified in any way.
- The material will be cited as noted above.
- The dissertation and small grant application in which the requested material appears will acknowledge that it has been included with the permission of the National League for Nursing, New York, NY
- The National League for Nursing owns these rights being granted
- No fees are being charged by the NLN for this permission.

I am pleased that material published by the NLN is seen as valuable, and I'm pleased that we are able to grant permission for its use. Please call me ***(212-812-0329)*** with any questions about items noted in this letter. Thank you.

Most sincerely,

Linda S. Christensen, JD, MSN, RN
Chief Administration Officer
National League for Nursing

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# Appendix B

Q-Sample of 60 Statements

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**Q-Sample Organized by Factorial Design**

**Student x Objectives**

#10 Run simulations with 2-3 students to promote the ‘one whole brain’ concept. Between the 3 of them, they should be able to remember enough to get through the simulation.

#43 During student orientation, discuss confidentiality of scenario, or not telling other students what the scenario is about, as this could help or hinder the simulation experience for other students.

#23 Prior to the first simulation, have students observe a simulation and then allow hands-on orientation with the manikin.

#42 Assign students pre-simulation assignments to help students be more prepared to take care of the simulated patient.

#13 Assign student roles randomly at the start of the simulation. This way students need to be prepared for all roles and not just their assigned role.

**Teacher x Objectives**

#11 Pilot test newly developed or adopted scenario with real participants to ensure no element has been forgotten, all resources are available, and it can run smoothly and realistically.

#16 Review simulation objectives verbally with students. This allows time for nurse educators to stress the purpose of the simulation, and how meeting these objectives will facilitate learning

#29 Schedule simulations following theoretical content in order for students to apply concepts learned in the classroom.

#4 Ideally, three key positions are needed for simulation programs. A subject matter expert (educator with expertise in topic content), an instructional designer (person with expertise in teaching techniques), and an information technology specialist (person with technological expertise).

**Educational Practices x Objectives**

#54 Consider mixing students from different levels in the program. This allows senior students to practice delegation and junior students to see how smart they will be/should be closer to graduation.

#48 Simulations should be less than 30 minutes in length; otherwise, students lose interest and become overwhelmed.

#17 Design and keep objectives general so students are not informed of the specific focus of the simulation.

#56 It is acceptable to use four hours simulation time to replace 6 hours of clinical experience.

**Student x Problem Solving**

#33 Prior to a simulation, caution students to not make things up (assessment data/findings) or assume things (i.e. do not need to do something) if they do not have what they are looking for.

#25 Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role.

#8 Place "weaker" students in roles that force them to perform. Doing so allows nurse educators to better evaluate these students.

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| | |
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| #15 | Assign students to play family role characters. This allows students a better understanding of the experience of family members. |
| | **Teacher x Problem Solving** |
| #38 | When running a simulation, use only nurse educators who are very familiar and proficient with operating the simulator and have sufficient content knowledge about the scenario. |
| #22 | Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. |
| #46 | Nurse educators who use simulation should be master's prepared, as most clinical instructors are required to be. |
| #18 | Only assign nurse educators to teach with simulation who have education in current best simulation practices, understanding of the utility of simulation, its limits and functionality, and the amount of preparatory time needed to do it well. |
| | **Educational Practices x Problem Solving** |
| #27 | If a simulation runs perfectly and the students quickly complete it, nurse educators can ad lib some different complexity into the simulation. |
| #1 | Do not make students believe that all patients survive as this may portray a false impression of real patient care. |
| #31 | Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical. |
| #28 | End a simulation when students are not actively providing care, for example when the patient has been transferred to another unit, the patient has recovered, or consensus reached by the team. |
| | **Student x Fidelity** |
| #45 | Avoid having students play role characters in a simulation, as they tend to want to help the other classmates instead of sticking to their role. |
| #19 | The more expert the learner, the more realistic the simulation needs to be. |
| #59 | Students need to know where they are during a simulation, therefore use persistent visual signs and/or sensory sounds (e.g., white board marked "OR", "Burn Ward", "Bedroom", alarms sounding, etc.) |
| | **Teacher x Fidelity** |
| #14 | Do not use the word "pretend." During pre-briefing, tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. |
| #24 | Be "real" about the lack of reality in a simulation. This is appreciated by students and they engage more fully than if this issue is not discussed. |
| #53 | How students interpret realism in a simulation needs to be understood by nurse educators. |
| #36 | Nurse educators need to treat the simulation room and patient like a real person since students take simulation as seriously as do the educators. |
| | **Educational Practices x Fidelity** |
| #55 | It is best if role playing characters are not well known to the students. |
| #2 | Create a simulation family where there are relationships, spouses, children, histories, jobs, etc. as members of this family. |
| #35 | Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds |

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| | should be as realistic as possible, equipment should be as true to what is used in real practice as possible. |
| #3 | Using a standardized patient or a real human makes a simulation more realistic. |
| | **Student x Debriefing** |
| #52 | Nurse educators need to be available to students who want to talk about something that just did not "fit" in debriefing, like a personal situation or reaction to one of the patients. |
| #21 | There should be consequences for students if they do not take simulation seriously. |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. |
| #51 | Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. |
| | **Teacher x Debriefing** |
| #44 | Communication of the student's performance in simulations needs to occur between the nurse educator conducting the simulation and the students' clinical instructor. |
| #32 | Students' clinical instructors need to be present during a simulation, but not involved, since some clinical instructor take on a more instructional rather than reflective role. |
| #40 | During debriefing, let students do most of the talking on how they came to conclusions. The nurse educator interferes only if conclusions are erroneous. |
| | **Educational Practices x Debriefing** |
| #34 | When grading a simulation, record the number of cues given and factor this in when determining student's grade. |
| #30 | Do not grade simulations. There are too many variables that cannot be controlled to make it fair for all students |
| #6 | During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. |
| #50 | Use both verbal and written debriefing for simulations where students need time to consider and think through events such as end-of-life simulations. Comments by students a week later are much richer and thoughtful than during the immediate debrief. |
| #5 | Since, debriefing is the most important part of simulation; a theory-based model should always guide debriefing to avoid the loss of learning opportunities due to poor debriefing techniques. |
| | **Student x Support** |
| #20 | Students should be left to figure out problems on their own during the actual running of the simulation. |
| #7 | Ask students to "think aloud" during the simulation. This helps other students, who do not deal with the situation as quickly, hear what other students are thinking. |
| #58 | Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. |
| #60 | Take into consideration, students should not feel defeated when leaving the |

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| | simulation lab. |
| | **Teacher x Support** |
| #12 | Nurse educators should journal to gain a better understanding of simulation as a teaching tool. |
| #49 | Offer students preplanned information or cues during the simulation. To accomplish this, it is necessary for nurse educators to predict what additional cues students will need to progress in the scenario. |
| #9 | Nurse educators should not be present in the room during a simulation, as students tend to rely on the educator to get through the scenario. |
| #39 | Use of humor is important in simulations. |
| | **Educational Practices x Support** |
| #26 | Start with cues that are vague and repeat once or twice with more direct and obvious cues. |
| #47 | Script and deliver cues in the same way for each simulation, including number of times offered, how, and when. |
| #41 | If students are going to make an error during a simulation, first give them cues to change their minds. But, if they say, "I am good" or "let's go do this", let students make the error and help them discover the error or omission in debriefing. |
| #37 | Since students can feel so dejected if they did not perform well, it is helpful to repeat the same simulation. |

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# Appendix C

*Consents*

Phase II Nurse Educator and Nursing Student
Phase III Nurse Educator and Nursing Student

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IRB Protocol Number 12.368
IRB Approval Date May 9, 2012

Consent Letter Phase II Nurse Educator

Dear Nurse Educator,

You are invited to participate in a research study entitled, ***Simulation design characteristics: Perspectives held by nurse educators and nursing students: Phase II – Feasibility Study of Card Sort Process.*** This study is being conducted by Jane Paige, a University of Wisconsin-Milwaukee PhD candidate.

The purpose of this study is to describe and compare different perspectives nurse educators and nursing students have about simulation design characteristics and how they are operationalized within a simulation based learning activity. This feasibility study tests the wording of opinion statements and tests a process to rank order these opinion statements.

If you agree to participate, you will be asked to complete four things:

1. Rank a list of 60 opinion statements on simulation design and order them using a grid format.
2. Include a short description of why you placed the two statements at either end of the grid.
3. Complete this same rank ordering process two weeks later.
4. Offer feedback to the investigator in a phone interview on this rank ordering process and the wording of opinion statements.

Four nurse educators will be recruited for this Phase II study. The anticipated time investment is 45 minutes for each of the rank orderings of the opinion statements and 15 minutes for the phone interview. You are asked to provide your contact phone number directly on the Tabulation Sheet in order for investigator to arrange a time for post-sort phone interview.

There are minimal risks to this study. At a minimum, you may feel some stress with reflecting on your personal thoughts. This study is completely independent from your nursing program. Your nursing program does not have information on who did or did not participate in this study. There are no costs for participating. Benefits of participating in this study include the potential for greater self-awareness of how you prioritize simulation design options. In appreciation for your time, you will receive an $8.00 Starbucks gift certificate.

Your information collected for this study is completely confidential and no individual participant will ever be identified with his/her research information. Data from this study will be saved on password protected computer or in a locked file drawer, until investigator has completed requirements for PhD and all publications associated with this study are complete (anticipate 2013). Only principle investigator, Jane Paige, and major professor, Dr. Karen Morin, will have access to the research information. However, the

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nstitutional Review Board at UW-Milwaukee or appropriate federal agencies like the Office for Human Research Protections may review this study's records.

Your participation in this study is voluntary. You may choose not to take part in this study, or if you decide to take part, you can change your mind later and withdraw from the study. You are free to not answer any questions or withdraw at any time. Your decision will not change any present or future relationships with the University of Wisconsin Milwaukee. There are no known alternatives available to participating in this research study other than not taking part.

If you have questions about the study or study procedures, you are free to contact the investigator at the address and phone number below. If you have questions about your rights as a study participant or complaints about your treatment as a research subject, contact the Institutional Review Board at (414)229-3173 or irbinfo@uwm.edu

To voluntarily agree to take part in this study, you must be 18 years of age or older. By completing the card sort(s) and post-card sort interview, you are giving your consent to voluntarily participate in this research project.

I thank you for considering the opportunity to participate in this study!

Jane Paige MSN, RN
UW-Milwaukee PhD candidate
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#262-385-1542 (mobile)
jbpaige@uwm.edu

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IRB Protocol Number 12.368
IRB Approval Date May 9, 2012

Consent Phase II Nursing Student

Dear Nursing Student,

You are invited to participate in a research study entitled, ***Simulation design characteristics: Perspectives held by nurse educators and nursing students: Phase II – Feasibility Study of Card Sort Process.*** This study is being conducted by Jane Paige, a University of Wisconsin-Milwaukee PhD candidate.

The purpose of this study is to describe opinions nursing students have on how simulations are designed and compare them to nurse educators' opinions. This feasibility study tests the wording of opinion statements on simulation design, a rank ordering process of sorting these opinion statements, and use of the National Student Nursing Association (NSNA) as a recruitment strategy.

If you agree to participate, you will be asked to complete four things:

1. Rank a list of 60 opinion statements on simulation design and order them using a grid format.
2. Include a short description of why you placed the two statements at either end of the grid.
3. Complete this same rank ordering process two weeks later
4. Offer feedback to the investigator in a phone interview on this rank ordering process and the wording of opinion statements.

Four nursing students will be recruited for this Phase II Feasibility study. The anticipated time investment is 45 minutes for each of the rank orderings of the opinion statements and 15 minutes for the phone interview. You are asked to provide your contact phone number directly on the Tabulation Sheet in order for investigator to arrange a time for post-sort phone interview.

There are minimal risks to this study. At a minimum, you may feel some stress with reflecting on your personal thoughts. This study is completely independent from your nursing program. Your nursing program does not have information on who did or did not participate in this study. There are no costs for participating. Benefits of participating in this study include the potential to improve the design of simulations considering your student perspective. In appreciation for your time, you will receive an $8.00 Starbucks gift certificate.

Your information collected for this study is completely confidential and no individual participant will ever be identified with his/her research information. Data from this study will be saved on password protected computer or in a locked file drawer until investigator has completed requirements for PhD and all publications associated with this study are complete (anticipate 2013). Only principle investigator, Jane Paige, and major professor, Dr. Karen Morin, will have access to the research information. However, the Institutional

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Review Board at UW-Milwaukee or appropriate federal agencies like the Office for Human Research Protections may review this study's records.

Your participation in this study is voluntary. You may choose not to take part in this study, or if you decide to take part, you can change your mind later and withdraw from the study. You are free to not answer any questions or withdraw at any time. Your decision will not change any present or future relationships with the University of Wisconsin Milwaukee. There are no known alternatives available to participating in this research study other than not taking part.

If you have questions about the study or study procedures, you are free to contact the investigator at the address and phone number below. If you have questions about your rights as a study participant or complaints about your treatment as a research subject, contact the Institutional Review Board at (414)229-3173 or irbinfo@uwm.edu

To voluntarily agree to take part in this study, you must be 18 years of age or older. By completing the card sort(s) and post-card sort interview, you are giving your consent to voluntarily participate in this research project.

I thank you for considering the opportunity to participate in this study!

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IRB Protocol Number: 12.368
IRB Approval date: Jan, 3, 2013

Consent Letter Phase III Nurse Educator

Dear Nurse Educator,

You are invited to participate in a research study entitled, ***Simulation design characteristics: Perspectives held by nurse educators and nursing students.*** This study is being conducted by Jane Paige, a University of Wisconsin-Milwaukee PhD candidate.

The purpose of this study is to describe and compare different perspectives nurse educators and nursing students have about simulation design characteristics and how they are operationalized within a simulation based learning activity.

If you agree to participate, you will be asked to complete two activities:

1. Rank a list of 60 opinion statements on simulation design and order them using a grid format.
2. Include a short description of why you placed the two statements at either end of the grid.

Forty-five nurse educators will be recruited for this study. The anticipated time investment is 45 minutes. It is possible you will be selected as one of the 45 nurse educators who best match one of the perspectives determined. In that case, you will be asked to review the investigator's written interpretation of the perspective and provide your feedback on how closely this interpretation matches what you think.

There are minimal risks to this study. At a minimum, you may feel some stress with reflecting on your personal thoughts. This study is completely independent from your nursing program. Your nursing program does not have information on who did or did not participate in this study. There are no costs for participating. Benefits of participating in this study include the potential for greater self-awareness of how you prioritize simulation design options. In appreciation for your time, you will receive a $5.00 Starbucks gift certificate.

Your information collected for this study is completely confidential and no individual participant will ever be identified with his/her research information. Data from this study will be saved on password protected computer or in a locked file drawer, until investigator has completed requirements for PhD and all publications associated with this study are complete (anticipate 2013). Only principle investigator, Jane Paige, and major professor, Dr. Karen Morin, will have access to the research information. However, the Institutional Review Board at UW-Milwaukee or appropriate federal agencies like the Office for Human Research Protections may review this study's records.

Your participation in this study is voluntary. You may choose not to take part in this study, or if you decide to take part, you can change your mind later and withdraw from the study. You are free to not answer any questions or withdraw at any time. Your

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decision will not change any present or future relationships with the University of Wisconsin Milwaukee. There are no known alternatives available to participating in this research study other than not taking part.

If you have questions about the study or study procedures, you are free to contact the investigator at the address and phone number below. If you have questions about your rights as a study participant or complaints about your treatment as a research subject, contact the Institutional Review Board at (414)229-3173 or irbinfo@uwm.edu

To voluntarily agree to take part in this study, you must be 18 years of age or older. By completing the card sorting activity, you are giving your consent to voluntarily participate in this research project.

I thank you for considering the opportunity to participate in this study!

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IRB Protocol Number: 12.368
IRB Approval date: Jan, 3, 2013

Consent Phase III – Nursing Student

Dear Nursing Student,

You are invited to participate in a research study entitled, ***Simulation design characteristics: Perspectives held by nurse educators and nursing students.*** This study is being conducted by Jane Paige, a University of Wisconsin-Milwaukee PhD candidate.

The purpose of this study is to describe and compare different perspectives nurse educators and nursing students have about simulation design characteristics.

If you agree to participate, you will be asked to complete two activities:

1. Rank a list of 60 opinion statements on simulation design and order them using a grid format.
2. Include a short description of why you placed the two statements at either end of the grid.

Forty-five nursing students will be recruited for this study. The anticipated time investment is 45 minutes. It is possible you will be selected as one of the 45 nursing students who best match one of the perspectives determined. In that case, you will be asked to review the investigator's written interpretation of the perspective and provide your feedback on how closely this interpretation matches what you think.

There are minimal risks to this study. At a minimum, you may feel some stress with reflecting on your personal thoughts. This study is completely independent from your nursing program. Your nursing program does not have information on who did or did not participate in this study. There are no costs for participating. Benefits of participating in this study include the potential to improve the design of simulations considering your student perspective. In appreciation for your time, you will receive a $5.00 Starbucks gift certificate.

Your information collected for this study is completely confidential and no individual participant will ever be identified with his/her research information. Data from this study will be saved on password protected computer or in a locked file drawer, until investigator has completed requirements for PhD and all publications associated with this study are complete (anticipate 2013). Only principle investigator, Jane Paige, and major professor, Dr. Karen Morin, will have access to the research information. However, the Institutional Review Board at UW-Milwaukee or appropriate federal agencies like the Office for Human Research Protections may review this study's records.

Your participation in this study is voluntary. You may choose not to take part in this study, or if you decide to take part, you can change your mind later and withdraw from the study. You are free to not answer any questions or withdraw at any time. Your decision will not change any present or future relationships with the University of

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Wisconsin Milwaukee. There are no known alternatives available to participating in this research study other than not taking part.

If you have questions about the study or study procedures, you are free to contact the investigator at the address and phone number below. If you have questions about your rights as a study participant or complaints about your treatment as a research subject, contact the Institutional Review Board at (414)229-3173 or irbinfo@uwm.edu

To voluntarily agree to take part in this study, you must be 18 years of age or older. By completing the card sorting activity, you are giving your consent to voluntarily participate in this research project.

I thank you for considering the opportunity to participate in this study!

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**Appendix D**

Institutional Review Board (IRB)
Phase II and III Approval and Amendments

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UNIVERSITY of WISCONSIN
UWMILWAUKEE
Department of University Safety & Assurances

Melissa Spadanuda
*IRB Administrator*
*Institutional Review Board*
Engelmann 270
P. O. Box 413
Milwaukee, WI 53201-0413
(414) 229-3173 *phone*
(414) 229-6729 *fax*

http://www.irb.uwm.edu
spadanud@uwm.edu

## New Study - Notice of IRB Exempt Status

**Date:** May 9, 2012

**To:** Karen Morin, PhD
**Dept:** College of Nursing

**Cc:** Jane Paige

**IRB#:** 12.368
**Title:** Simulation design characteristics: Perspectives held by nurse educators and nursing students

After review of your research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol has been granted Exempt Status under Category 2 as governed by 45 CFR 46.101(b).

In addition, your protocol has been granted **Level 3** confidentiality for Payments to Research Subjects per UWM Accounting Services Procedure: 2.4.6.

Unless specifically where the change is necessary to eliminate apparent immediate hazards to the subjects, any proposed changes to the protocol must be reviewed by the IRB before implementation. It is the principal investigator's responsibility to adhere to the policies and guidelines set forth by the UWM IRB and maintain proper documentation of its records and promptly report to the IRB any adverse events which require reporting.

It is the principal investigator's responsibility to adhere to UWM and UW System Policies, and any applicable state and federal laws governing activities the principal investigator may seek to employ (e.g., FERPA, Radiation Safety, UWM Data Security, UW System policy on Prizes, Awards and Gifts, state gambling laws, etc.) which are independent of IRB review/approval.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project

Respectfully,

Melissa C. Spadanuda
IRB Administrator

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UNIVERSITY of WISCONSIN
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Department of University Safety & Assurances

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## Modification/Amendment Notice of IRB Exempt Status

**Date:** January 3, 2013

**To:** Karen Morin, PhD
**Dept:** College of Nursing

**Cc:** Jane Paige

**IRB#:** 12.368
**Title:** Simulation design characteristics: Perspectives held by nurse educators and nursing students

After review of your proposed changes to the research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol still meets the criteria for Exempt Status under Category 2 as governed by 45 CFR 46.101 subpart b, and your protocol has received modification/amendment approval for:

- Recruitment of two additional nursing students for Phase II – Feasibility Study
- Recruitment of nursing students and administering the Q-sort in person at the Wisconsin Student Nurses' Association Conference to being held Feb 1-3, 2013 in Wisconsin Dells.
- Minor changes in recruitment letter to be posted on the INACSL listserve.
- Addition of reliability test of statements to Phase III Q-sorts.
- Revision of Study Instruments based on Phase II – Feasibility study
- Updated grant information – (Harriet Werley Research Award – UW-Milwaukee in November 2012 for $1,000 and Sigma Theta Tau International – Eta Nu Chapter – Graduate Student Scholarship Grant in May 2012 for $1500)

Unless specifically where the change is necessary to eliminate apparent immediate hazards to the subjects, any proposed changes to the protocol must be reviewed by the Institutional Review Board before implementation.

Please note that it is the principal investigator's responsibility to adhere to the policies and guidelines set forth by the University of Wisconsin – Milwaukee and its Institutional Review Board. It is the principal investigator's responsibility to maintain proper documentation of its records and promptly report to the Institutional Review Board any adverse events which require reporting.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Respectfully,

Melissa C. Spadanuda
IRB Manager

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UNIVERSITY of WISCONSIN
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**Modification/Amendment Notice of IRB Exempt Status**

**Date:** January 9, 2013

**To:** Karen Morin, PhD
**Dept:** College of Nursing

**Cc:** Jane Paige

**IRB#:** 12.368
**Title:** Simulation design characteristics: Perspectives held by nurse educators and nursing students

After review of your proposed changes to the research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol still meets the criteria for Exempt Status under Category 2 as governed by 45 CFR 46.101 subpart b, and your protocol has received modification/amendment approval for:

- Update to attachment Q to reflect the correct amendment approval date
- Update to the protocol form to reflect the correct payment of $5
- MSOE IRB has agreed to defer its review to UWM IRB

Unless specifically where the change is necessary to eliminate apparent immediate hazards to the subjects, any proposed changes to the protocol must be reviewed by the Institutional Review Board before implementation.

Please note that it is the principal investigator's responsibility to adhere to the policies and guidelines set forth by the University of Wisconsin – Milwaukee and its Institutional Review Board. It is the principal investigator's responsibility to maintain proper documentation of its records and promptly report to the Institutional Review Board any adverse events which require reporting.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Respectfully,

Melissa C. Spadanuda
IRB Manager

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UNIVERSITY of WISCONSIN
UWMILWAUKEE
Department of University Safety & Assurances

Jessica Rice
*IRB Administrator*
*Institutional Review Board*
Engelmann 270
P. O. Box 413
Milwaukee, WI 53201-0413
(414) 229-3182 *phone*
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http://www.irb.uwm.edu
ricej@uwm.edu

**Modification/Amendment Notice of IRB Exempt Status**

**Date:** March 26, 2013

**To:** Karen Morin, PhD
**Dept:** College of Nursing

**Cc:** Jane Paige

**IRB#:** 12.368
**Title:** Simulation design characteristics: Perspectives held by nurse educators and nursing students

After review of your proposed changes to the research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol still meets the criteria for Exempt Status under Category 2 as governed by 45 CFR 46.101 subpart b, and your protocol has received modification/amendment approval for:

- Addition of recruitment via Administrators of Nursing Education of Wisconsin (ANEW) listserv

Unless specifically where the change is necessary to eliminate apparent immediate hazards to the subjects, any proposed changes to the protocol must be reviewed by the Institutional Review Board before implementation.

Please note that it is the principal investigator's responsibility to adhere to the policies and guidelines set forth by the University of Wisconsin – Milwaukee and its Institutional Review Board. It is the principal investigator's responsibility to maintain proper documentation of its records and promptly report to the Institutional Review Board any adverse events which require reporting.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project.

Respectfully,

Jessica Rice
IRB Administrator

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**Appendix E**

*Recruitment Memo*
Posted in
Nursing Students from the National Student Nursing Association (NSNA) newsletter
with the *Recruitment Questionnaire* accessed from the link in the recruitment memo

*Recruitment List-serve Memo*
sent to
Nurse Educators from the International Association for Clinical Simulation and Learning (INACSL) and the
Nurse Educators from the Administrators of Nursing Education of Wisconsin (ANEW)

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**Recruitment Memo posted in the NSNA newsletter in September 2012**

Research Study on Simulation Design

My name is Jane Paige and I am a University of Wisconsin-Milwaukee PhD candidate investigating simulation as a learning strategy used in nursing education. I am conducting a study on simulation design. *I am very interested in hearing YOUR thoughts on how simulations are designed?*

Please click (control click) this Link to Recruitment Questionnaire for further information on how you can participate in this study. An incentive is provided to those participating.

Thank You So Very Much!
IRB #12.368 Date approved May 9, 2012

**Recruitment Memo posted in the NSNA newsletter in March 2013**

Research Study on Simulation Design

My name is Jane Paige and I am a University of Wisconsin-Milwaukee PhD candidate investigating simulation as a learning strategy used in nursing education. I am conducting a study on simulation design.

First, thank you to those who have responded to my initial request in September 2012. However, I continue to seek nursing students meeting particular criteria. If you are a student from a smaller nursing program (less than 100 total nursing students) OR you have participated in less than three simulation activities no matter what size your nursing school is, I want to hear from you!

Please click (control click) this Link to Recruitment Questionnaire for further information on how you can participate in this study. An incentive is provided to those participating.

Thank You So Very Much!
IRB #12.368 Date approved May 9, 2012

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**Recruitment Questionnaire Nursing Students accessed from hyperlink in recruitment memo posted in the NSNA newsletter**

Study on Simulation Design Phase III

Again, my name is Jane Paige. I have collected statements made by nurse educators about designing simulations such as how to provide student support, cueing, debriefing, and incorporating realism.

*I am very interested in hearing from YOU!*

If you agree to take part in this study, I will mail you 60 statements provided from nurse educators about designing simulations. You will then be asked to rank-order these statements based on how you think. Many people consider this rank-ordering activity "fun" and "interactive."

*In appreciation for your time, I will provide you a $5.00 Starbucks gift card.*

This study would be completely independent from your nursing program. Your program will not have information on who did or did not participate in this study. There are no costs for participating. You are also welcome to forward this request to other nursing students you know. If more students reply than needed, nursing students will be enrolled in this study in the order they reply and return study documents.

I want to hear from nursing students across different sizes of programs and from students who have participated in a different number of simulations. This questionnaire helps me recruit students from each of these categories.

Please let me know how many simulations you have participated in.

- ○ Less than 3 simulations
- ○ 3 to 5 simulations
- ○ Greater than 5 simulations

Please provide your best estimate of the enrollment of your nursing program. This is the total number of students enrolled in your nursing program

- ○ Less than 100 students
- ○ 100 to 250 students
- ○ Greater than 250 students

If you agree to participate in this study, I will need to mail you study documents. Please provide me your name and a mailing address. Type all information in this text box. Confidentially is maintained. Thank You again. Jane Paige

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**List-serve recruitment memo posted on the INACSL list-serve January 2013 and February 2013**

Recruitment Memo to INACSL
To: INACSL list serve members
RE: Opportunity to participate in the study, ***Simulation design characteristics: Perspectives held by nurse educators and nursing students.***

This is a request seeking nurse educators willing to participate in a study to describe and compare nurse educators' and nursing students' perspectives about operationalizing design characteristics within simulation based learning (SBL) educational interventions. This is the final phase of a three-phased Q-methodological study. If you agree to participate in this study, you will be mailed (postal service) a list of opinion statements on operationalizing simulation design characteristics and asked to sort and rank order them. Forty-five minutes of your time is anticipated.

You qualify for this study if:

1. You have at least one formal training experience for use of simulation
2. You have participated in one or more simulations
3. You have a BSN or higher level of education and function as a nurse educator (teacher) in an academic program or is a nursing lab coordinator working with simulation
4. You conduct SBL activities with prelicensure nursing students, whether in an associate, diploma, or bachelor's degree program.

In this study, I am seeking nurse educators from different enrollment size of prelicensure nursing programs (less than 100, 100-250, or greater than 250 students) and varying levels of experience with simulations (less than 2 years, 2-5 years, or greater than 5 years).

If you are interested in participating in this study, please click

Link to Recruitment Questionnaire

If the link does not function, please reply to paige@msoe.edu or jbpaige@uwm.edu with the following information

- Size of your nursing program i.e. (less than 100, 100-250, or greater than 250 students)
- Number of years of experience you have had with simulation i.e. less than 2 years, 2-5 years, or greater than 5 years)
- Whether willing to repeat card sort a second time for reliability test
- Your mailing address in order for me to send you the letter of consent, opinion statements, and card sorting grid.

In order to obtain nurse educators from these categories, I am asking if you could forward this recruitment request to nurse educators who are just starting to use simulation.

Thank You Very Much!

Jane Paige MSN, RN, CNE
UW-Milwaukee PhD candidate
Assistant Professor Milwaukee School of Engineering – School of Nursing
IRB #12.368 Date approved Jan 3, 2013

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**List-serve recruitment memo posted on the ANEW list-serve March 2013**

To: List-serve members of the Administrators of Nursing Education of Wisconsin (ANEW)

I am asking list-serve members of ANEW if you can forward this recruitment message to nurse educators or clinical instructors who have participated in simulations meeting the criteria below; that being either a) nurse educators from nursing programs with pre-licensure enrollments of less than 100 student with any degree of experience with simulation or b) nurse educators from nursing programs of greater than 250 students but have less than 2 years of experience with simulation.

---

RE: Opportunity to participate in the study, ***Simulation design characteristics: Perspectives held by nurse educators and nursing students.***

This is a request seeking nurse educators willing to participate in a study to describe and compare nurse educators' and nursing students' perspectives about operationalizing design characteristics within simulation based learning (SBL) educational interventions.

I am specifically seeking nurse educators from:

a. Pre-licensure nursing programs of < 100 students with any degree of experience with simulation
   **OR**
b. Pre-licensure nursing programs of > 250 students but have less than 2 years of experience with simulation

You qualify for this study if:

1. You have at least one formal training experience for use of simulation
2. You have a BSN or higher level of education and function as a nurse educator (teacher) in an academic program or you are a nursing lab coordinator working with simulation
3. You conduct SBL activities with pre-licensure nursing students, whether in an associate, diploma, or bachelor's degree program.

If you agree to participate in this study, you will be mailed (postal service) a list of opinion statements on operationalizing simulation design characteristics and asked to sort and rank order them. Forty-five minutes of your time is anticipated. An incentive is offered.

If you meet the criteria in **a. or b**. above and are interested in participating in this study, please reply to jbpaige@uwm.edu Please include in your reply, the estimated size of your nursing program and your years of experience with simulation.

Thank You Very Much!

From:
Jane Paige MSN, RN, CNE
UW-Milwaukee PhD candidate
jbpaige@uwm.edu
262-385-1542
IRB #12.368 Date approved 3/26/2013

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**Appendix F**

*Study Packet*

Getting Started Directions
Conditions for Instruction of Card Sort
Card Sort Grid
Tabulation Sheets for Nurse Educators and Nursing Students
Sixty Q-Sample Cards with Random Numbering on Backside

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# Simulation Design Study
# Getting Started

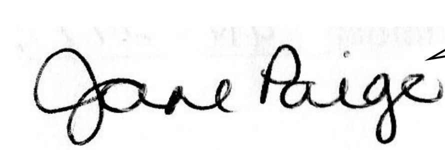
**Thank You** for your interest in this study. You should have received the following seven items in the packet of information mailed to you. Please contact me if item(s) is missing jbpaige@uwm.edu

Items in packet:

1. Coffee Gift coupon
2. Consent Letter for participating in this study.
3. Condition of Instruction for the Card Sort
4. **Tabulation Sheet (green)** Note - Only this needs to be returned to investigator
5. Pre-paid return envelop
6. Stack of 60 cards
7. Card Sort Grid

## Thank You

If you can complete in 2 weeks, that would be great!



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IRB Protocol Number 12.368 IRB Approval date: Jan 3, 2013

# CONDITION OF INSTRUCTIONS FOR THE CARD SORT

This study is about simulation design characteristics. I am interested in your **viewpoint or opinion** on these characteristics for the design of a simulation based learning activity. The definition of a simulation based learning activity for this study is: "A dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement, and integrates the complexities of practical and theoretical learning with opportunity for repetition, feedback, evaluation, and reflection" (Bland et al., 2010).

*These instructions will guide you through the step-by-step process to do this card sort. Please read these steps before you start this card sort process.*

1. Read the consent letter. If you have any questions before you start, please contact the investigator.

2. Find a quiet location where you will not be interrupted. You will need a location where you can lay out the Grid upon which the cards will be placed. A large table would work well. It is anticipated you will need about 45 minutes. Maybe bring your coffee/tea/smoothie with you to enjoy.

3. Fill in demographic data on the **Tabulation Sheet.**

4. Lay down the Grid in front of you. Now take the deck of 60 cards and read each one to get a general sense of the opinion statements. The numbers on the cards (1 to 60) have been assigned to the cards randomly and are only relevant for recording your response.

5. I am asking you to rank-order these statements from your **own** point-of-view. Think about what you would most recommend or most not recommend in the design of a simulation based learning activity in nursing education. Read the 60 statements carefully, split them up into three piles, and place into boxes on the bottom of the Grid. Just to be clear, I am interested in your opinion. Therefore, there is no right or wrong answer.
    a. Pile One: Statements you tend to Most NOT Recommend.
    b. Pile Two: Statements you tend to Most Recommend.
    c. Pile Three: Statements you are neutral on.

6. Take the cards from the "MOST NOT RECOMMEND" box (pile one) and read them again. Select the two statements you would MOST NOT RECOMMEND and place them in the two last boxes on the left of the score sheet, below the "-5" (it does not matter which one goes on top or below).

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7. Now take the cards from the "MOST RECOMMEND" box (pile two) and read them again. Just like before, select the two statements you would MOST RECOMMEND and place them in the two last boxes on the right of the Grid, below the "+5"

8. Now go back to the pile of MOST NOT RECOMMEND cards and select the next four statements you would MOST NOT RECOMMEND and place them in the four boxes below the "-4". Repeat this process for the MOST RECOMMEND pile and place them in the four boxes below the "+4". Do this switching back and forth between pile one and pile two until cards from piles one and two are all placed on the Grid.

9. Finally, take the remaining cards in the neutral box (pile three) and read them again. Arrange the cards in the remaining open boxes of the Grid. Again, it does not matter which card is placed from top to bottom of the column.

10. When you have placed all cards on the Grid, please go over your distribution once more and shift cards if you want to. Do this until you are satisfied with your placement of the cards.

11. I am very interested in your placement of the cards under the numbers -5 and +5. Before you remove any cards from the Grid, think about why you placed these cards here. You may want to consider why you sorted these cards here in relation to other cards. Maybe you had an experience that influenced your sorting choice. Maybe you just realized something about why you think this way. Please explain with as much thought as you can why you sorted these cards to go under the -5 and +5. Write your thoughts on the **Tabulation Sheet** (green colored) in the designated spot.

12. Now turn each card over maintaining their position on the grid. Record the number from the backside of the card into the corresponding spot on the small version of the grid on the **Tabulation Sheet**.

13. Once you have completed this card sort, please return **ONLY** the **Tabulation Sheet** in the pre-paid and addressed envelope and return to investigator.

**Thank you very much for taking the time for this study!!!**
**I hope you have enjoyed this activity.**

Jane Paige

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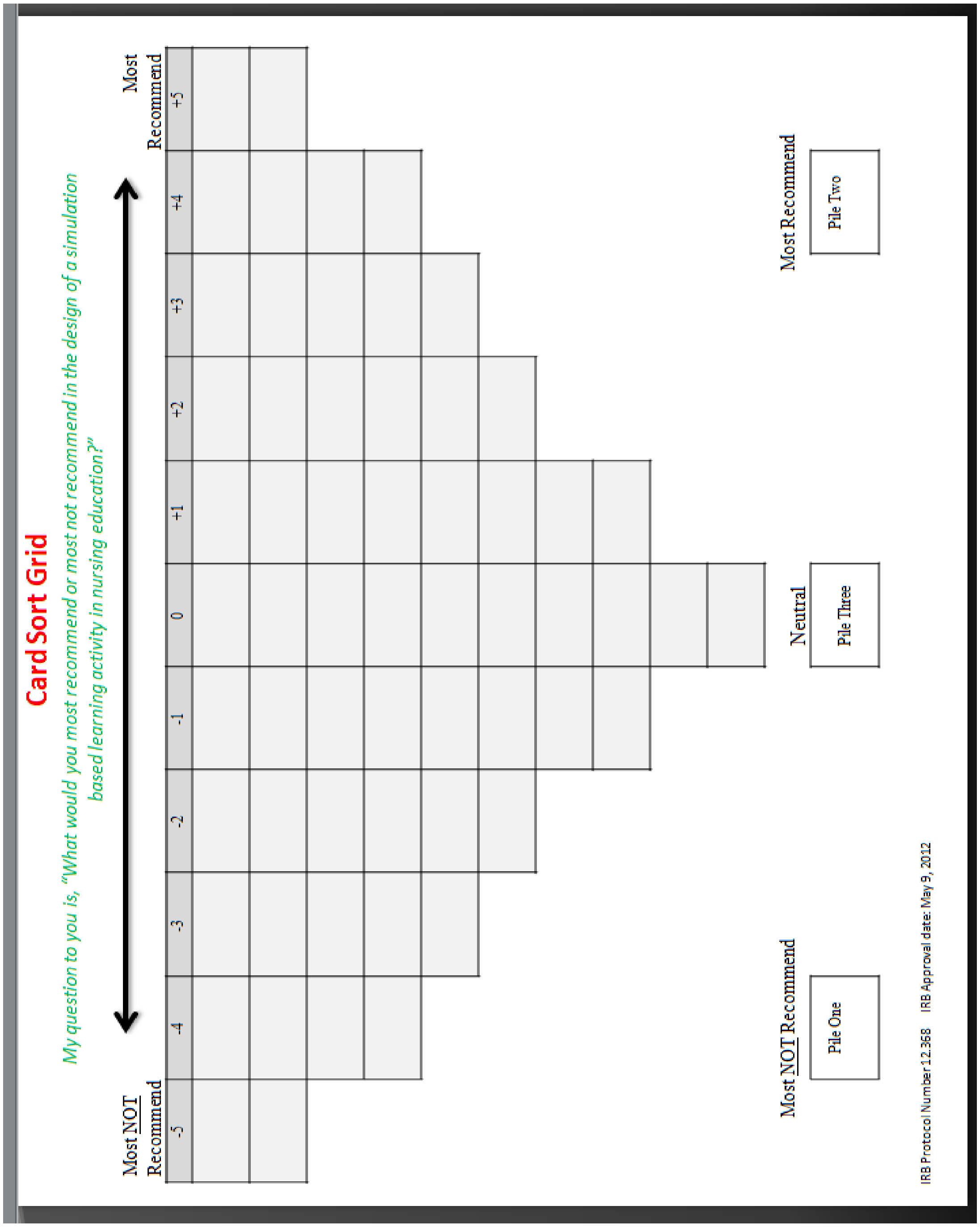


Enlarged to Size of 3 by 4 feet

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| Run simulations with 2-3 students to promote the 'one whole brain' concept. Between the 3 of them, they should be able to remember enough to get through the simulation. | Prior to a simulation, caution students to not make things up (assessment data/findings) or assume things (i.e. do not need to do something) if they do not have what they are looking for. | Avoid having students play role characters in a simulation, as they tend to want to help the other classmates instead of sticking to their role. | Nurse educators need to be available to students who want to talk about something that just did not "fit" in debriefing, like a personal situation or reaction to one of the patients. |
| Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role. | The more expert the learner, the more realistic the simulation needs to be. | There should be consequences for students if they do not take simulation seriously. | Students should be left to figure out problems on their own during the actual running of the simulation. |
| During student orientation, discuss confidentiality of scenario, or not telling other students what the scenario is about, as this could help or hinder the simulation experience for other students. | Place "weaker" students in roles that force them to perform. Doing so allows nurse educators to better evaluate these students. | Students need to know where they are during a simulation, therefore use persistent visual signs and/or sensory sounds (e.g., white board marked "OR", "Burn Ward", "Bedroom", alarms sounding, etc.) | Ask students to "think aloud" during the simulation. This helps other students, who do not deal with the situation as quickly, hear what other students are thinking. |
| Prior to the first simulation, have students observe a simulation and then allow hands-on orientation with the manikin. | Assign students to play family role characters. This allows students a better understanding of the experience of family members. | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. |
| Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. | Take into consideration, students should not feel defeated when leaving the simulation lab. | Assign students pre-simulation assignments to help students be more prepared to take care of the simulated patient. | Assign student roles randomly at the start of the simulation. This way students need to be prepared for all roles and not just their assigned role. |



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| 52 | 45 | 33 | <u>10</u> |
| 20 | 21 | 19 | 25 |
| 07 | 59 | <u>08</u> | 43 |
| 58 | 57 | 15 | 23 |
| 13 | 42 | <u>60</u> | 51 |



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| Pilot test newly developed or adopted scenario with real participants to ensure no element has been forgotten, all resources are available, and it can run smoothly and realistically. | When running a simulation, use only nurse educators who are very familiar and proficient with operating the simulator and have sufficient content knowledge about the scenario. | Do not use the word "pretend." During pre-briefing tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. | Nurse educators should journal to gain a better understanding of simulation as a teaching tool. |
| Be "real" about the lack of reality in a simulation. This is appreciated by students and they engage more fully than if this issue is not discussed. | Communication of the student's performance in simulations needs to occur between the nurse educator conducting the simulation and the students' clinical instructor. | Students' clinical instructors need to be present during a simulation, but not involved, since some clinical instructor take on a more instructional rather than reflective role. | Review simulation objectives verbally with students. This allows time for nurse educators to stress the purpose of the simulation, how meeting these objectives will facilitate learning. |
| Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. | Offer students preplanned information or cues during the simulation. To accomplish this, it is necessary for nurse educators to predict what additional cues students will need to progress in the scenario. | How students interpret realism in a simulation needs to be understood by nurse educators. | Nurse educators should not be present in the room during a simulation, as students tend to rely on the educator to get through the scenario. |
| Schedule simulations following theoretical content in order for students to apply concepts learned in the classroom. | Nurse educators need to treat the simulation room and patient like a real person since students take simulation as seriously as do the educators. | Use of humor is important in simulations. | Ideally, three key positions are needed for simulation programs. A subject matter expert (educator with expertise in topic content), an instructional designer (person with expertise in teaching techniques), and an information technology specialist (person with technological expertise). |
| Nurse educators who use simulation should be master's prepared, as most clinical instructors are required to be. | Only assign nurse educators to teach with simulation who have education in current best simulation practices, understanding of the utility of simulation, its limits and functionality, and the amount of preparatory time needed to do it well. | During debriefing, let students do most of the talking on how they came to conclusions. The nurse educator interferes only if conclusions are erroneous. | Consider mixing students from different levels in the program. This allows senior students to practice delegation and junior students to see how smart they will be/should be closer to graduation. |



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| 16 | 32 | 44 | 24 |
| 09 | 53 | 49 | 22 |
| 04 | 39 | 36 | 29 |
| 54 | 40 | 18 | 46 |



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| If a simulation runs perfectly and the students quickly complete it, nurse educators can ad lib some different complexity into the simulation. | It is best if role-playing characters are not well known to the students. | Start with cues that are vague and repeat once or twice with more direct and obvious cues. | Simulations should be less than 30 minutes in length; otherwise, students lose interest and become overwhelmed. |
| Do not make students believe that all patients survive as this may portray a false impression of real patient care. | When grading a simulation, record the number of cues given and factor this in when determining student's grade. | Design and keep objectives general so students are not informed of the specific focus of the simulation. | Create a simulation family where there are relationships, spouses, children, histories, jobs, etc. as members of this family. |
| Script and deliver cues in the same way for each simulation, including number of times offered, how, and when. | Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds should be as realistic as possible, equipment should be as true to what is used in real practice as possible. | Do not grade simulations. There are too many variables that cannot be controlled to make it fair for all students | Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical. |
| It is acceptable to use four hours simulation time to replace 6 hours of clinical experience. | End a simulation when students are not actively providing care, for example when the patient has been transferred to another unit, the patient has recovered, or consensus reached by the team. | Using a standardized patient or a real human makes a simulation more realistic. | If students are going to make an error during a simulation, first give them cues to change their minds. But, if they say, "I am good" or "let's go do this", let students make the error and help them discover the error or omission in debriefing. |
| During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. | Use both verbal and written debriefing for simulations where students need time to consider and think through events such as end-of-life simulations. Comments by students a week later are much richer and thoughtful than during the immediate debrief. | Since, debriefing is the most important part of simulation; a theory-based model should always guide debriefing to avoid the loss of learning opportunities due to poor debriefing techniques. | Since students can feel so dejected if they did not perform well, it is helpful to repeat the same simulation. |



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| 37 | 05 | 50 | 06 |



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IRB Protocol Number 12.368 IRB Approval date: Jan 3, 2013

**TABULATION SHEET – Nurse Educator**

*Only this needs to be returned to the investigator. Please mail in pre-paid return envelope.*

**Demographic Data:** Please complete demographic data.

1. Gender: [ ___ female] [ ___male]
2. Age (years): [ ___ ≤ 25] [ ___26-30] [ ___31-40] [ ___41-50] [ ___51-60] [ ___>60]
3. Level of educational preparation: [ __BSN] [ __MSN] [__EdD] [ __PhD] [Other/list_____]
4. Type of training/orientation on simulation: Select all that apply. [ __Person-to-person ] [ ____Conference] [ __Manufacture provided] [____school organized in-service] [Other/specify________________]
5. Year(s) of being involved in simulation activities: [ __< 2] [ __ 2-5] [ __> 5]
6. Enrollment of prelicensure nursing program (total number of student across all years): [ __< 100] [ ___100-250] [ __> 250]
7. Type of undergraduate nursing program: [ __ADN] [ ___diploma] [ ___BSN]
8. Do you collaborate with non-nursing healthcare disciplines in simulations: [___Yes] [ ___No] If yes, list disciplines________________________________
9. Region where you are involved in simulation activities:
   [___U.S. Northeast] [___U.S. Midwest] [___U. S. South] [___U.S. West]
   [Other country-specify_________]

If your card sort happens to be the best fit for one of the perspectives on operationalizing simulation design characteristics, I would like you to comment on my description of this perspective. If you are willing to do this please provide a contact email:___________________

## Card Sord Numbers

*Please record the number from the backside of the card as you had sorted on the large Card Sort Grid. Record number in the corresponding box on grid below.*

MOST NOT RECOMMEND MOST RECOMMEND

| -5 | -4 | -3 | -2 | -1 | 0 | +1 | +2 | +3 | +4 | +5 |
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*Before you remove any cards from the Grid, please explain with as much thought as you can why you sorted these cards to go under the -5 and +5. You may want to consider why you sorted these cards here in relation to other cards. Maybe you had an experience that influenced your sorting choice. Maybe you just realized something about why you think this way.*

Please explain with as much thought as you can why you feel strongly about the statements you have placed below the “-5” as MOST NOT RECOMMEND. Record below the card number you are referring to.

Card number #___:

Card number #___:

Please explain with as much thought as you can why you feel strongly about the statements you have placed below the “+5” as MOST RECOMMEND. Record below the card number you are referring to.

Card number #___:

Card number #___:

**Thank you very much for taking the time for this study! I hope you have enjoyed this activity.**

Jane Paige

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IRB Protocol Number 12.368 IRB Approval date: Jan 3, 2013

**TABULATION SHEET – Nursing Student**

*Only this needs to be returned to the investigator. Please mail in pre-paid return envelope.*

**Demographic Data:** Please complete demographic data.

1. Gender: [ ___ female] [ ___male]
2. Age (years): [ ___ ≤ 20] [ ___21-25] [ ___26-30] [ ___31-40] [ ___41-50] [ ___>50]
3. Number of prior simulation based learning activities you have participated in [ __< 3] [ __ 3-5] [ __> 5]
4. Enrollment size of your prelicensure nursing program (total number of student across all years) [ __< 100] [ ___100-250] [ __> 250]
5. Type of undergraduate nursing program [ __ADN] [ ___diploma] [ ___BSN]
6. Region where you are involved in simulation activities:
[___U.S. Northeast] [___U.S. Midwest] [___U. S. South] [___U.S. West]
[Other country-specify________]

If your card sort happens to be the best fit for one of the perspectives on operationalizing simulation design characteristics, I would like you to comment on my description of this perspective. If you are willing to do this please provide a contact email________________________________

## Card Sort Numbers

*Please record the number from the backside of the card as you had sorted on the large Card Sort Grid. Record number in the corresponding box on grid below.*

MOST NOT RECOMMEND MOST RECOMMEND

| -5 | -4 | -3 | -2 | -1 | 0 | +1 | +2 | +3 | +4 | +5 |
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**OVER**

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*Before you remove any cards from the Grid, please explain with as much thought as you can why you sorted these cards to go under the -5 and +5. You may want to consider why you sorted these cards here in relation to other cards. Maybe you had an experience that influenced your sorting choice. Maybe you just realized something about why you think this way.*

Please explain with as much thought as you can why you feel strongly about the statements you have placed below the "-5" as MOST NOT RECOMMEND. Record below the card number you are referring to.

Card number #___:

Card number #___:

Please explain with as much thought as you can why you feel strongly about the statements you have placed below the "+5" as MOST RECOMMEND. Record below the card number you are referring to.

Card number #___:

Card number #___:

Thank you very much for taking the time for this study! I hope you have enjoyed this activity.

Jane Paige

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# Appendix G

Extended Factor Descriptions
Nurse Educator and Nursing Students

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**Nurse Educator Perspective - *"Facilitate the Discovery"* (Factor A)**

**Participant Information**
Twenty-seven nurse educators define this factor labeled *Facilitate the Discovery* that explained 29% study variance. An additional 16 educators shared this perspective while also loading on one of two secondary bipolar perspectives. Consequently, all but two nurse educators in this study share this perspective about simulation design.

**Interpretation**
As nurse educators consider simulation design, they feel most strongly about getting at students' thinking processes and the reasons behind their decisions (#6, +5). This is primary accomplished during the debriefing where students are encouraged to do most of the talking but are redirected if conclusions are erroneous (#40, +5) *"sometimes, what the student did was right but their reasoning is wrong."* Furthermore, video recording the simulation to view portions in the debrief (#51, -5), or have students view independently is considered *"valuable as students often are unaware of what they say, how they say it, and their body language."* Student thinking is developed during the simulation by allowing them enough time to process information, not cue too soon (#22, +4), and let them troubleshoot equipment independently (#58, -4) as *"skills are often best revealed to students by what they try to do but don't or can't and they learn to resource."* Educators recommend stopping a simulation (#57, -5) if it is clear "*serious incorrect things are being done which could cause harm to the patient much like you would do in clinical."* In planning simulations, it is important to schedule them following theoretical content (#29, +4) and discuss scenario confidentiality to avoid hindering other students' learning opportunities (#43, +4). This can "*promote a safe [psychological] environment as student performing in front of peers are vulnerable and hesitant."* It is appropriate to offer specific scenario objectives to help students prepare (#17, -3) since *"we shouldn't we worried that students will be over-prepared and fly through the simulation."* Students need time to observe and have 'hands-on' practice with the manikins prior to simulation activities (#23, +3). Educators recommend to discuss with students to avoid use of the word 'pretend' (#14, +3). Educators also realize that if they treat the simulation and patients as real it contributes to how seriously students take the simulation (#36, +3). Use of humor is not recommended (#39, -3*).* For example, "*if students encounter a patient by the name of Ima Goner, then they will likely take the entire situation in a joking manner"* and *"students will live up to the standard and role modeling of the instructor."* Creating reality is important and is in the detail of assuring technology is functional, educators know how to use, and it has been pilot tested (#35, +4; #11, +3) because *"poor preparation leads to suboptimal simulation outcomes…and students can be ruined by bad simulations."* Furthermore, it is unnecessary to increase realism as learners gain expertise in their knowledge (#19, -4), rather the *"level of realism is dependent upon learning objectives instead of the level of learner*."

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*Factor Array Scores for Nurse Educator Perspective "Facilitate the Discovery"*

| . | **Number and Statement** (+5 Most Recommend to -5 Most Not Recommend) | Factor Score |
|---|---|---|
| #6 | During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. | +5 |
| #40 | During debriefing, let students do most of the talking on how they came to conclusions. The nurse educator interferes only if conclusions are erroneous. | +5 |
| #29 | Schedule simulations following theoretical content in order for students to apply concepts learned in the classroom. | +4 |
| #43 | During student orientation, discuss confidentiality of scenario, or not telling other students what the scenario is about, as this could help or hinder the simulation experience for other students. | +4 |
| #22 | Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. | +4 |
| #35 | Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds should be as realistic as possible, equipment should be as true to what is used in real practice as possible. | +4 |
| #36 | Nurse educators need to treat the simulation room and patient like a real person since students take simulation as seriously as do the educators. | +3 |
| #11 | Pilot test newly developed or adopted scenario with real participants to ensure no element has been forgotten, all resources are available, and it can run smoothly and realistically. | +3 |
| #14 | Do not use the word "pretend." During pre-briefing, tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. | +3 |
| #23 | Prior to the first simulation, have students observe a simulation and then allow hands-on orientation with the manikin. | +3 |
| #39 | Use of humor is important in simulations. | -3 |
| #17 | Design and keep objectives general so students are not informed of the specific focus of the simulation. | -3 |
| #58 | Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. | -4 |
| #19 | The more expert the learner, the more realistic the simulation needs to be. | -4 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | -5 |
| #51 | Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. | -5 |

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## Nursing Student Perspectives

### Nursing Student Perspective – *"Let Me Show You"* (Factor 1)

**Participant Information**
Four nursing students define this factor labeled as *Let Me Show You* explaining 11% of the study variance. These students come from small (< 100 students) and large (>250 students) associate and bachelor degree nursing programs and have a varying amount of experience with simulation. Their ages range from 26 to 40 years and they attend nursing schools in the U.S. North and Midwest. Eleven students also share this perspective along with another perspective.

**Interpretation**
When participating in a simulation, students holding this perspective want to figure things out on their own (#20, +4), receive minimal assistance and cueing (#22, +4; #32, +1) from the educator who should not be in the room (#9, +3), and let the simulation happen as it happens (#57, +3). These students want to do most of the talking during the debriefing (#40, +4) to figure out what they know and/or do not know about nursing. They prefer post simulation debriefing to be verbal rather than written (#50, -5) most likely related to their comfort talking during debriefing. They are least concerned, compared to other perspectives, that simulation objectives are not specific (#17, 0) or that cues would be scripted and delivered the same way between students (#47, -4). They feel all students should spend time preparing for all simulation roles (#13, +5) as *"preparing for all roles…allows students to deal with adversity when stronger students are not able to step up as much as they would like."* They are not opposed to using simulation for other students that need extra help (#31, +3) however; this does not involve repeating the same simulation (#37, -2). They are not interested in playing non-nursing roles (#25, +5) since they *"want as much nursing experience as possible*." They also see no benefit in mixing students across different levels within the nursing program (#54, -5) because *"each level of learning something different."* These students value simulation reality consistent with other perspectives, but are least likely to recommend higher simulation realism as they progress in the program (#19, -3). They are also less worried that a simulation has been pilot tested (#11, -2), that only educators trained in simulation run them (#18, -1), or that consequences be given if students do not take simulation seriously (#21, -3).

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**Factor Array for Nursing Student Perspective "*Let Me Show You*" (Factor 1)**

| | Number and Statement (5 Most Recommend to -5 Most Not Recommend) | Factor Array Scores 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| #13 | Assign student roles randomly at the start of the simulation. This way students need to be prepared for all roles and not just their assigned role. | **5*** | 2 | 2 | 1 | 0 |
| #25 | Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role. | **5** | 5 | -4 | -1 | 0 |
| #40 | During debriefing, let students do most of the talking on how they came to conclusions. The nurse educator interferes only if conclusions are erroneous. | **4*** | -2 | 0 | 2 | 1 |
| #20 | Students should be left to figure out problems on their own during the actual running of the simulation. | **4*** | -5 | -3 | -2 | 1 |
| #22 | Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. | **4** | 3 | 2 | 1 | 3 |
| #9 | Nurse educators should not be present in the room during a simulation, as students tend to rely on the educator to get through the scenario. | **3†** | -4 | 0 | -3 | 1 |
| #31 | Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical. | **3** | 1 | 1 | -5 | 3 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | **3** | -2 | -4 | 3 | 2 |
| #32 | Students' clinical instructors need to be present during a simulation, but not involved, since some clinical instructor take on a more instructional rather than reflective role. | **1** | -3 | -3 | 1 | -2 |
| #17 | Design and keep objectives general so students are not informed of the specific focus of the simulation. | **0** | -5 | -3 | 0 | -4 |
| #18 | Only assign nurse educators to teach with simulation who have education in current best simulation practices, understanding of the utility of simulation, its limits and functionality, and the amount of preparatory time needed to do it well. | **-1** | 3 | -1 | 3 | 0 |
| #11 | Pilot test newly developed or adopted scenario with real participants to ensure no element has been forgotten, all resources are available, and it can run smoothly and realistically. | **-2†** | 0 | 0 | 0 | 1 |
| #37 | Since students can feel so dejected if they did not perform well, it is helpful to repeat the same simulation. | **-2** | -1 | -1 | -1 | 0 |
| #21 | There should be consequences for students if they do not take simulation seriously. | **-3** | 0 | -2 | 1 | 4 |
| #19 | The more expert the learner, the more realistic the simulation needs to be. | **-3†** | -1 | 1 | 0 | 3 |
| #47 | Script and deliver cues in the same way for each simulation, including number of times offered, how, and when. | **-4** | -3 | 1 | -4 | -2 |
| #50 | Use both verbal and written debriefing for simulations where students need time to consider and think through events such as end-of-life simulations. Comments by students a week later are much richer and thoughtful than during the immediate debrief. | **-5*** | -3 | 1 | 4 | 0 |
| #54 | Consider mixing students from different levels in the program. This allows senior students to practice delegation and junior students to see how smart they will be/should be closer to graduation | **-5*** | 0 | 2 | -1 | 2 |

*Note*. Characterizing statement + or -5. Distinguishing statement (*$p < .01$) or (†$p < .05$). Higher/Lower ranked statement compared to other factors

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**Nursing Student Perspective –*"Stand by Me"* (Factor 2)**

**Participant Information**

Eleven nursing students define this factor labeled as *Stand by Me* explaining 10% percent of the study variance. These students come from small (< 100 students), medium (100-250 students), and large (>250 students) associate and bachelor degree programs and have a varying amount of experience with simulation. Their ages range from 20 to 50 years and attend nursing schools across the U.S.  Five additional students share this perspective along with another perspective.

**Interpretation**

When participating in a simulation, students holding this perspective want structure to and guidance in their learning occurring before, during, and after the simulation. Prior to their first simulation, students want to be orientated to and have an opportunity to practice with the manikins (#23, +4). They desire specific simulation objectives (#17, -5) and find it helpful when these objectives are reviewed verbally (#16, +3). They want to understand *"why are we doing this?"* If this is not clear to students or they are uncertain what is expected of them, mistrust of the learning experience may happen, *"positive reinforcement of being prepared is better than being set up to fail."* Students recommend simulations be scheduled following theoretical content (#29, +4) as *"it reinforces concepts and helps them sink in."* They want to be prepared and apply what they just learnt. They are less interested in role-playing non-nursing roles (#25, +5; #15, -4) as this *"reduces the reality"* of the simulation and could "*confuse the student"* if the role is not well *"scripted."* Similar with other perspectives, simulation reality is important, however using or not using the word "pretend" during a simulation is not an issue (#14, 0) to them compared to other perspectives. Yet, these students clearly prefer interacting with actual patients in the clinical setting rather than simulated patients (#56, -4) in part because, *"two less hours spent in a clinical-like experience (simulation) is cheating the student out of learning time they paid for."* During the simulation, students appreciate working *"together as it calms anxiety*" along with collaborating with their peers on how other students are thinking about the situation at hand (#7, +2). Students are okay with the educator or clinical instructor being present in the simulation room (#9, -4). This way, educators are available to offer direction on use of equipment, *"which if left to solve on own, objectives of sim takes a back seat"* (#58, +3; #32, -3). Students want guidance in figuring out the situation if they are unable (#20, -5) to avoid *"unnecessary stress."* They consider it acceptable to stop a simulation to correct mistakes and misassumptions when/as they happen (#57, -2) instead of correcting them later.  During the debriefing, students count on the educator to ask questions (#6, +5) to get at their thinking process as they are not as comfortable doing all the talking (#40, -2). Student holding this perspective want educators who are well versed in simulation technology, know how to offer cues to guide their decision making (#26, +2), and *"let students make decisions but provide guidance upon request or if they [student] get struck"* (#18, +3). As such, they would be comfortable if educators ad lib some complexity into the simulation (#27, +2) to *"help students grow more*."

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**Factor Array for Nursing Student Perspective "*Stand By Me*" (Factor 2)**

| Number and Statement (5 Most Recommend to -5 Most Not Recommend) | | Factor Array Scores 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| #6 | During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. | 3 | **5** | 2 | 1 | 4 |
| #25 | Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role. | 5 | **5** | -4 | -1 | 0 |
| #29 | Schedule simulations following theoretical content in order for students to apply concepts learned in the classroom. | 2 | **4** | 2 | 2 | 2 |
| #23 | Prior to the first simulation, have students observe a simulation and then allow hands-on orientation with the manikin. | 2 | **4** | 0 | 2 | -1 |
| #58 | Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. | -1 | **3*** | -1 | -4 | -3 |
| #16 | Review simulation objectives verbally with students. This allows time for nurse educators to stress the purpose of the simulation, and how meeting these objectives will facilitate learning. | 1 | **3†** | -2 | -1 | -1 |
| #18 | Only assign nurse educators to teach with simulation who have education in current best simulation practices, understanding of the utility of simulation, its limits and functionality, and the amount of preparatory time needed to do it well. | -1 | **3** | -1 | 3 | 0 |
| #26 | Start with cues that are vague and repeat once or twice with more direct and obvious cues. | 0 | **2*** | -1 | -2 | -3 |
| #27 | If a simulation runs perfectly and the students quickly complete it, nurse educators can ad lib some different complexity into the simulation. | -1 | **2*** | 0 | -2 | -2 |
| #7 | Ask students to "think aloud" during the simulation. This helps other students, who do not deal with the situation as quickly, hear what other students are thinking. | -2 | **2*** | -1 | -3 | -2 |
| #14 | Do not use the word "pretend." During pre-briefing, tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. | 2 | **0*** | 3 | -3 | 5 |
| #40 | During debriefing, let students do most of the talking on how they came to conclusions. The nurse educator interferes only if conclusions are erroneous. | 4 | **-2*** | 0 | 2 | 1 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | 3 | **-2*** | -4 | 3 | 2 |
| #50 | Use both verbal and written debriefing for simulations where students need time to consider and think through events such as end-of-life simulations. Comments by students a week later are much richer and thoughtful than during the immediate debrief. | -5 | **-3*** | 1 | 4 | 0 |
| #32 | Students' clinical instructors need to be present during a simulation, but not involved, since some clinical instructor take on a more instructional rather than reflective role. | 1 | **-3** | -3 | 1 | -2 |
| #15 | Assign students to play family role characters. This allows students a better understanding of the experience of family members. | 0 | **-4*** | 0 | 3 | 1 |
| #9 | Nurse educators should not be present in the room during a simulation, as students tend to rely on the educator to get through the scenario. | 3 | **-4** | 0 | -3 | 1 |
| #56 | It is acceptable to use four hours simulation time to replace 6 hours of clinical experience. | -3 | **-4** | 1 | -3 | -3 |
| #17 | Design and keep objectives general so students are not informed of the specific focus of the simulation. | 0 | **-5*** | -3 | 0 | -4 |
| #20 | Students should be left to figure out problems on their own during the actual running of the simulation. | 4 | **-5*** | -3 | -2 | 1 |

*Note*. Characterizing statement + or -5. Distinguishing statement (**p* < .01) or († *p* < .05).

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**Nursing Student Perspective - "*The Agony of Defeat" (Factor 3)***

**Participant Information**

Five nursing students define this factor labeled as *The Agony of Defeat* explaining 8% of the study variance. These students come from small (< 100 students) and large (>250 students) associate and bachelor degree nursing programs and have a varying amount of experience with simulation. Their ages range from 21 to 40 years and they attend nursing schools in the U.S. Midwest and West. Four students also share this perspective along with another perspective.

**Interpretation**

Compared to other perspectives, student holding this perspective are most concerned about how they feel following the simulation experience, *"we can't make everyone love and enjoy the learning from simulation,"* but it is *"very important that everyone feels like a 'super' nurse when they leave."* Students sharing this perspective want to leave the simulation feeling good about them self as opposed to feeling defeated (#60, +5) and *"walk out feeling they learned and accomplished something."* In part, this feeling of defeat relates to whether grading of simulations occurs (#30, +5; #34, -5; #47, +1). Students consider use of simulation as a learning tool rather than some form of assessment, *"the sim lab should not be a scary/intense experience or students will dread it."* Instead, students recommend points be allocated for *"showing up prepared and participating"* or use of *"a pass or fail"* assessment. Students sharing this view, compared to other perspectives, are least likely to find value in pre-simulation assignments (#42, -2) or reviewing of objectives (#16, -2) presumably since they can rely on each other to get through the simulation (#10, +4) or talk to the educator individually after the simulation (#52, +2). These students do not recommend singling out weaker students (#8, -5) as *"it puts too much pressure on them and could be embarrassing*." It is okay to stop a simulation to offer guidance to avoid this feeling of defeat (#57, -4) and simulations should last no longer than 30 minutes (#48, +4). While participating in a simulation, students consider use of humor important (#39, +4). This humor may manifest itself from the creation of a simulation family in which are relationships and storylines (#2, +3), in use of standardized patients (#3, +4) with realistic personalities, and not ending the simulation until the story ends (#28, +3). Diverging from other perspectives, students value the opportunity to role-play non-nursing characters (#25, -4) and mix with students across program levels (#54, +2).The level of educator preparation and knowledge on simulation use is not seen as relevant in this perspective compared to others (#46, -4; #4, -3; #5, -3; #38, -2; #18, -1). Students also view simulation as an acceptable replacement for clinical (#56, +1) differing from other perspectives not recommending this replacement. Even though students recommend creation of simulation realism, it was not ranked as high compared to other perspectives (#35, +3). However, students do want educators to understand their perception of realism (#53, +1).

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**Factor Array for Nursing Student Perspective *"The Agony of Defeat"* (Factor 3)**

| | Number and Statement (5 Most Recommend to -5 Most Not Recommend) | Factor Array Scores | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | **3** | 4 | 5 |
| #30 | Do not grade simulations. There are too many variables that cannot be controlled to make it fair for all students | 2 | 0 | **5*** | 2 | -4 |
| #60 | Take into consideration, students should not feel defeated when leaving the simulation lab. | 1 | 3 | **5** | 5 | -1 |
| #10 | Run simulations with 2-3 students to promote the 'one whole brain' concept. Between the 3 of them, they should be able to remember enough to get through the simulation. | 2 | 1 | **4*** | -1 | -3 |
| #39 | Use of humor is important in simulations. | -1 | -2 | **4*** | -2 | -4 |
| #3 | Using a standardized patient or a real human makes a simulation more realistic. | 0 | -2 | **4** | 3 | 2 |
| #48 | Simulations should be less than 30 minutes in length; otherwise, students lose interest and become overwhelmed. | 1 | 1 | **4** | 4 | -2 |
| #2 | Create a simulation family where there are relationships, spouses, children, histories, jobs, etc. as members of this family. | 1 | -1 | **3** | 0 | 3 |
| #28 | End a simulation when students are not actively providing care, for example when the patient has been transferred to another unit, the patient has recovered, or consensus reached by the team. | 0 | 1 | **3** | 0 | -1 |
| #52 | Nurse educators need to be available to students who want to talk about something that just did not "fit" in debriefing, like a personal situation or reaction to one of the patients. | 1 | 1 | **2** | 1 | 0 |
| #54 | Consider mixing students from different levels in the program. This allows senior students to practice delegation and junior students to see how smart they will be/should be closer to graduation. [a] | -5 | 0 | **2** | -1 | 2 |
| #47 | Script and deliver cues in the same way for each simulation, including number of times offered, how, and when. | -4 | -3 | **1*** | -4 | -2 |
| #53 | How students interpret realism in a simulation needs to be understood by nurse educators. | -1 | -1 | **1** | 0 | -1 |
| #56 | It is acceptable to use four hours simulation time to replace 6 hours of clinical experience. | -3 | -4 | **1*** | -3 | -3 |
| #35 | Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds should be as realistic as possible, equipment should be as true to what is used in real practice as possible. | 4 | 4 | **3** | 4 | 5 |
| #18 | Only assign nurse educators to teach with simulation who have education in current best simulation practices, understanding of the utility of simulation, its limits and functionality, and the amount of preparatory time needed to do it well. | -1 | 3 | **-1** | 3 | 0 |
| #16 | Review simulation objectives verbally with students. This allows time for nurse educators to stress the purpose of the simulation, and how meeting these objectives will facilitate learning | 1 | 3 | **-2** | -1 | -1 |
| #42 | Assign students pre-simulation assignments to help students be more prepared to take care of the simulated patient. | 0 | 2 | **-2*** | 2 | 3 |
| #38 | When running a simulation, use only nurse educators who are very familiar and proficient with operating the simulator and have sufficient content knowledge about the scenario. | 1 | 4 | **-2*** | 5 | 1 |
| #5 | Since, debriefing is the most important part of simulation; a theory-based model should always guide debriefing to avoid the loss of learning opportunities due to poor debriefing techniques. | 0 | 1 | **-3†** | 0 | 0 |
| #4 | Ideally, three key positions are needed for simulation programs. A subject matter expert (educator with expertise in topic content), an instructional designer (person with expertise in teaching techniques), and an information technology specialist (person with technological expertise). | -2 | -1 | **-3** | 3 | 0 |
| #46 | Nurse educators who use simulation should be master's prepared, as most | 0 | 1 | **-4** | 4 | -4 |

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| | clinical instructors are required to be. | | | | | |
| #25 | Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role. | 5 | 5 | **-4*** | -1 | 0 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | 3 | -2 | **-4*** | 3 | 2 |
| #34 | When grading a simulation, record the number of cues given and factor this in when determining student's grade. | -4 | -4 | **-5** | -1 | 2 |
| #8 | Place "weaker" students in roles that force them to perform. Doing so allows nurse educators to better evaluate these students. | -4 | -2 | **-5** | -4 | 0 |

*Note*. Characterizing statement + or -5. Distinguishing statement (*$p < .01$) or (†$p < .05$).
Higher/Lower ranked statement compared to other factors

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**Nursing Student Perspective "*Let me Think it Through*" (Factor 4)**

**Participant Information**

Three nursing students define this factor labeled *Let me Think it Through* explaining 7% of the study variance. These students come from medium (100-250 students) and large (>250 students) associate and bachelor degree nursing programs and have participated in more than three simulation experiences. Their ages range from 21 to 50 years and they attend nursing schools in the U.S Midwest and South. Seven students also share this perspective along with another perspective.

**Interpretation**

Comparably, student holding this perspective see greater value from simulation if educators are properly trained in simulation technology (#38, +5; #4, +3) and understand how to use and work it (#46, +4; #18, +3),*"information technologist* [is needed and it]…*doesn't help us learn when the main piece of equipment (manikin) is broken and no one can fix it."* Students may see a connection between educators' level of training and teaching expertise with their feelings of defeat (#60, +5) or being singled-out if struggling (#31, -5). For example, a preference exists in not being interrupted to provide assistance with equipment (#58, -4) or redirected by cueing (#41, -5; #49, -3) as it throws off one's train of thought, *"I don't like it when my thoughts are stopped, it makes me feel stupid and makes me more nervous."* Students prefer not stopping a simulation (#57, +3) or having others think aloud (#7; -3) as it could interferes with independent thought as in *"students need to learn on their own without someone else putting the idea in their head"* and *"the student should be allowed to work on his/her patient independently until asks for help."* Diverging from other perspectives, these students recommend written in addition to verbal debriefings (#50, +4), are less interested being questioned during debriefing (#6, +1) and are more inclined to view videotaping unnecessary (#51, 0). Most likely, this relates to their need to have time and work things out independently in their mind. They value simulation realism, but have a slightly different take compared to other perspectives. Instead, these students appreciate having a conversation about the degree of realism (#24, +2). They also have no qualms with playing role characters (#45, -4; #15, +3), while making things up (#33, -2) and pretending (#14, -3) during a simulation is acceptable.

**Factor Array for Nursing Student Perspective "*Let Me Think it Through*" (Factor 4)**

| Number and Statement (5 Most Recommend to -5 Most Not Recommend) | | Factor Array Scores 1 | 2 | 3 | **4** | 5 |
|---|---|---|---|---|---|---|
| #38 | When running a simulation, use only nurse educators who are very familiar and proficient with operating the simulator and have sufficient content knowledge about the scenario. | 1 | 4 | -2 | **5** | 1 |
| #60 | Take into consideration, students should not feel defeated when leaving the simulation lab. | 1 | 3 | 5 | **5** | -1 |
| #46 | Nurse educators who use simulation should be master's prepared, as most clinical instructors are required to be. | 0 | 1 | -4 | **4*** | -4 |
| #50 | Use both verbal and written debriefing for simulations where students need time to consider and think through events such as end-of-life simulations. Comments by students a week later are much richer and thoughtful than during the immediate debrief. | -5 | -3 | 1 | **4*** | 0 |

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|---|---|---|---|---|---|---|
| #4 | Ideally, three key positions are needed for simulation programs. A subject matter expert (educator with expertise in topic content), an instructional designer (person with expertise in teaching techniques), and an information technology specialist (person with technological expertise). | -2 | -1 | -3 | **3*** | 0 |
| #15 | Assign students to play family role characters. This allows students a better understanding of the experience of family members. | 0 | -4 | 0 | **3** | 1 |
| #18 | Only assign nurse educators to teach with simulation who have education in current best simulation practices, understanding of the utility of simulation, its limits and functionality, and the amount of preparatory time needed to do it well. | -1 | 3 | -1 | **3** | 0 |
| #57 | Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | 3 | -2 | -4 | **3** | 2 |
| #24 | Be "real" about the lack of reality in a simulation. This is appreciated by students and they engage more fully than if this issue is not discussed. | -3 | -1 | 0 | **2†** | -5 |
| #51 | Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. | -4 | -3 | -4 | **0†** | -5 |
| #6 | During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. | 3 | 5 | 2 | **1** | 4 |
| #22 | Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. | 4 | 3 | 2 | **1** | 3 |
| #33 | Prior to a simulation, caution students to not make things up (assessment data/findings) or assume things (i.e. do not need to do something) if they do not have what they are looking for. | 1 | 0 | 1 | **-2†** | 1 |
| #49 | Offer students preplanned information or cues during the simulation. To accomplish this, it is necessary for nurse educators to predict what additional cues students will need to progress in the scenario. | -2 | 1 | 0 | **-3** | 0 |
| #7 | Ask students to "think aloud" during the simulation. This helps other students, who do not deal with the situation as quickly, hear what other students are thinking. | -2 | 2 | -1 | **-3** | -2 |
| #14 | Do not use the word "pretend." During pre-briefing, tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. | 2 | 0 | 3 | **-3*** | 5 |
| #58 | Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. | -1 | 3 | -1 | **-4** | -3 |
| #45 | Avoid having students play role characters in a simulation, as they tend to want to help the other classmates instead of sticking to their role. | -2 | -2 | -2 | **-4** | -3 |
| #31 | Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical. | 3 | 1 | 1 | **-5*** | 3 |
| #41 | If students are going to make an error during a simulation, first give them cues to change their minds. But, if they say, "I am good" or "let's go do this", let students make the error and help them discover the error or omission in debriefing. | -1 | 0 | 0 | **-5*** | -1 |

*Note*. Characterizing statement + or -5. Distinguishing statement (*$p < .01$) or (†$p < .05$). Higher/Lower ranked statement compared to other factors

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**Nursing Student - *"I'm Engaging and so Should You"* (Factor 5)**

**Participant Information**
Four nursing students define this factor labeled *I'm Engaging and so Should You* explaining 6% of the study variance. These students come from small (< 100 students) and large (>250 students) bachelor degree nursing programs and have participated in five or less simulation experiences. Their ages range from 20 to 30 years and they attend nursing schools in the U.S. Midwest and West. Two other students also share this perspective along with another perspective.

**Interpretation**
Even though all perspectives recommend creating a realistic simulation, students holding this perspective have the strongest feelings about realism. They see reality created in the detail and functioning of the equipment (#35, +5), as well as how seriously educators (#36, +4, #39, -4) and students take the simulations (#21, +4). Focusing on the lack of realism is unnecessary (#24, -5) and use of the word 'pretend' is not acceptable during a simulation (#14, +5). However, as learners gain expertise, realism should be increased (#19, 3). Creating simulation families where there are relationships and histories (#2, +3), permitting patients to die (#1, +4), having persistent cues to know where they are in a simulation (#59, +2), and not limiting simulations to less than 30 minutes (#48, -2), are design characteristics that enhance reality. For example, students elaborated, *"it is more realistic to spend more time than 30 minutes in a simulation… and use a real human."* Furthermore, "*whenever the educator believed in the importance of the simulations and treated situation as real…I took the simulation seriously… and carrying through all actions instead of pretending helps a student develop good habits."* Contrary to other perspectives, students feel they as well as their peers are responsible for their own learning in simulations. For example, it is acceptable to use simulation for 1:1 learning (#31, +3), allow grading of simulations (#30, -4; #34, +2), and deliver consequences if students do not take simulation seriously (#21, +4) as in *"discipline should be enforced for student who do not take things seriously in the simulation."* It is also more recommended, compared to other perspectives, to view video recordings of the simulations (#51, -5), have pre-simulation assignments (#42, +3), and place 'weaker' students in roles that force them to perform (#8, 0) *"weak student need help! Simulation is a wake-up call for them."* Less recommended is allowing dependency of students on others (#10, -3; #7, -2; #58, -3) as in "*students who do not deal with the situation as quickly"* should not have the *"same chance to draw conclusions themselves."* Out of all perspectives, those sharing this view are least concerned about students feeling defeated following a simulation (#60, -1).

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**Factor Array for Nursing Student Perspective *"I'm Engaging and So Should You"* (Factor 5)**

| Item Number and Statement (5 Most Recommend to -5 Most Not Recommend) | | Factor Array Scores 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| #14 | Do not use the word "pretend." During pre-briefing, tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. | 2 | 0 | 3 | -3 | **5*** |
| #35 | Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds should be as realistic as possible, equipment should be as true to what is used in real practice as possible. | 4 | 4 | 3 | 4 | **5** |
| #21 | There should be consequences for students if they do not take simulation seriously. | -3 | 0 | -2 | 1 | **4*** |
| #1 | Do not make students believe that all patients survive as this may portray a false impression of real patient care. | 0 | 0 | 1 | -1 | **4*** |
| #36 | Nurse educators need to treat the simulation room and patient like a real person since students take simulation as seriously as do the educators. | 3 | 2 | -2 | -1 | **4** |
| #2 | Create a simulation family where there are relationships, spouses, children, histories, jobs, etc. as members of this family. | 1 | -1 | 3 | 0 | **3** |
| #19 | The more expert the learner, the more realistic the simulation needs to be. | -3 | -1 | 1 | 0 | **3** |
| #31 | Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical. | 3 | 1 | 1 | -5 | **3** |
| #42 | Assign students pre-simulation assignments to help students be more prepared to take care of the simulated patient. | 0 | 2 | -2 | 2 | **3** |
| #59 | Students need to know where they are during a simulation, therefore use persistent visual signs and/or sensory sounds (e.g., white board marked "OR", "Burn Ward", "Bedroom", alarms sounding, etc.). | -1 | -1 | 0 | 1 | **2*** |
| #34 | When grading a simulation, record the number of cues given and factor this in when determining student's grade. | -4 | -4 | -5 | -1 | **2*** |
| #8 | Place "weaker" students in roles that force them to perform. Doing so allows nurse educators to better evaluate these students. | -4 | -2 | -5 | -4 | **0*** |
| #60 | Take into consideration, students should not feel defeated when leaving the simulation lab. | 1 | 3 | 5 | 5 | **-1*** |
| #7 | Offer students preplanned information or cues during the simulation. To accomplish this, it is necessary for nurse educators to predict what additional cues students will need to progress in the scenario. | -2 | 2 | -1 | -3 | **-2** |
| #55 | It is best if role playing characters are not well known to the students. | 0 | 0 | -1 | 0 | **-2†** |
| #48 | Simulations should be less than 30 minutes in length; otherwise, students lose interest and become overwhelmed. | 1 | 1 | 4 | 4 | **-2*** |
| #58 | Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. | -1 | 3 | -1 | -4 | **-3** |
| #10 | Run simulations with 2-3 students to promote the 'one whole brain' concept. Between the 3 of them, they should be able to remember enough to get through the simulation. | 2 | 1 | 4 | -1 | **-3** |
| #39 | Use of humor is important in simulations. | -1 | -2 | 4 | -2 | **-4** |
| #30 | Do not grade simulations. There are too many variables that cannot be controlled to make it fair for all students | 2 | 0 | 5 | 2 | **-4*** |
| #24 | Be "real" about the lack of reality in a simulation. This is appreciated by students and they engage more fully than if this issue is not discussed. | -3 | -1 | 0 | 2 | **-5** |
| #51 | Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. | -4 | -3 | -4 | 0 | **-5** |

*Note*. Characterizing statement + or -5. Distinguishing statement (* $p < .01$) or († $p < .05$). Higher/Lower ranked statement compared to other factors

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**Appendix H**

Factor Arrays - Complete
Nurse Educator and Nursing Student Perspectives

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*Factor Array – Ranking of Statements (Q-Sample) by Nurse Educators (NE) and Nursing Students (NS)*

| | NS | | | | | NE |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **A** |
| 1. Do not make students believe that all patients survive as this may portray a false impression of real patient care. | 0 | 0 | 1 | -1 | **4*** | -1 |
| 2. Create a simulation family where there are relationships, spouses, children, histories, jobs, etc. as members of this family. | 1 | -1 | 3 | 0 | 3 | -1 |
| 3. Using a standardized patient or a real human makes a simulation more realistic. | 0 | -2 | 4 | 3 | 2 | 1 |
| 4. Ideally, three key positions are needed for simulation programs. A subject matter expert (educator with expertise in topic content), an instructional designer (person with expertise in teaching techniques), and an information technology specialist (person with technological expertise). | -2 | -1 | -3 | **3*** | 0 | 1 |
| 5. Since, debriefing is the most important part of simulation; a theory-based model should always guide debriefing to avoid the loss of learning opportunities due to poor debriefing techniques. | 0 | 1 | -3 | 0 | 0 | 2 |
| 6. During debriefing, ask questions that get at why students decided to do what they did. Many times students make decisions based on false assumptions. | 3 | 5 | 2 | 1 | 4 | 5 |
| 7. Ask students to "think aloud" during the simulation. This helps other students, who do not deal with the situation as quickly, hear what other students are thinking. | -2 | **2*** | -1 | -3 | -2 | 2 |
| 8. Place "weaker" students in roles that force them to perform. Doing so allows nurse educators to better evaluate these students. | -4 | -2 | -5 | -4 | **0*** | -2 |
| 9. Nurse educators should not be present in the room during a simulation, as students tend to rely on the educator to get through the scenario. | 3 | -4 | 0 | -3 | 1 | 1 |
| 10. Run simulations with 2-3 students to promote the 'one whole brain' concept. Between the 3 of them, they should be able to remember enough to get through the simulation. | 2 | 1 | **4*** | -1 | -3 | 1 |
| 11. Pilot test newly developed or adopted scenario with real participants to ensure no element has been forgotten, all resources are available, and it can run smoothly and realistically. | -2 | 0 | 0 | 0 | 1 | 3 |
| 12. Nurse educators should journal to gain a better understanding of simulation as a teaching tool. | -3 | -3 | -1 | 0 | -1 | -3 |
| 13. Assign student roles randomly at the start of the simulation. This way students need to be prepared for all roles and not just their assigned role. | **5*** | 2 | 2 | 1 | 0 | 2 |
| 14. Do not use the word "pretend." During pre-briefing, tell students if they are going to carry out an action, then do it, i.e. give medications, wash hands, etc. | 2 | **0*** | 3 | **-3*** | **5*** | 3 |
| 15. Assign students to play family role characters. This allows students a better understanding of the experience of family members. | 0 | **-4*** | 0 | 3 | 1 | 0 |
| 16. Review simulation objectives verbally with students. This allows time for nurse educators to stress the purpose of the simulation, and how meeting these objectives will facilitate learning | 1 | 3 | -2 | -1 | -1 | 3 |
| 17. Design and keep objectives general so students are not informed of the specific focus of the simulation. | 0 | **-5*** | -3 | 0 | -4 | -3 |
| 18. Only assign nurse educators to teach with simulation who have education in current best simulation practices, understanding of the utility of simulation, its limits and functionality, and the amount of preparatory time needed to do it well. | -1 | 3 | -1 | 3 | 0 | 1 |
| 19. The more expert the learner, the more realistic the simulation needs to be. | -3 | -1 | 1 | 0 | 3 | -4 |
| 20. Students should be left to figure out problems on their own during | **4*** | **-5*** | -3 | -2 | **1*** | 0 |

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| | NS | | | | | NE |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **A** |
| the actual running of the simulation. | | | | | | |
| 21. There should be consequences for students if they do not take simulation seriously. | -3 | 0 | -2 | 1 | **4*** | -1 |
| 22. Nurse educators conducting simulations need to control the impulse to prematurely cue or interrupt the student during simulation. This allows students time to think and process information. | 4 | 3 | 2 | 1 | 3 | 4 |
| 23. Prior to the first simulation, have students observe a simulation and then allow hands-on orientation with the manikin. | 2 | 4 | 0 | 2 | -1 | 3 |
| 24. Be "real" about the lack of reality in a simulation. This is appreciated by students and they engage more fully than if this issue is not discussed. | -3 | -1 | 0 | 2 | -5 | 0 |
| 25. Do not assign students roles outside their scope of practice such as doctor or respiratory therapist as they may not have a clear impression when or how they are required to act in this role. | 5 | 5 | **-4*** | -1 | 0 | -1 |
| 26. Start with cues that are vague and repeat once or twice with more direct and obvious cues. | 0 | **2*** | -1 | -2 | -3 | -1 |
| 27. If a simulation runs perfectly and the students quickly complete it, nurse educators can ad lib some different complexity into the simulation. | -1 | **2*** | 0 | -2 | -2 | -3 |
| 28. End a simulation when students are not actively providing care, for example when the patient has been transferred to another unit, the patient has recovered, or consensus reached by the team. | 0 | 1 | 3 | 0 | -1 | 0 |
| 29. Schedule simulations following theoretical content in order for students to apply concepts learned in the classroom. | 2 | 4 | 2 | 2 | 2 | 4 |
| 30. Do not grade simulations. There are too many variables that cannot be controlled to make it fair for all students. | 2 | 0 | **5*** | 2 | **-4*** | -2 |
| 31. Use simulation for one-on-one learning/evaluation of students who are struggling or possibly unsafe in clinical. | 3 | 1 | 1 | **-5*** | 3 | -1 |
| 32. Students' clinical instructors need to be present during a simulation, but not involved, since some clinical instructor take on a more instructional rather than reflective role. | 1 | -3 | -3 | 1 | -2 | -3 |
| 33. Prior to a simulation, caution students to not make things up (assessment data/findings) or assume things (i.e. do not need to do something) if they do not have what they are looking for. | 1 | 0 | 1 | -2 | 1 | 1 |
| 34. When grading a simulation, record the number of cues given and factor this in when determining student's grade. | -4 | -4 | -5 | -1 | **2*** | -4 |
| 35. Creating reality is very important and is in the details. That means that manikins need to function properly, audio should be as high quality as possible, body sounds should be as realistic as possible, equipment should be as true to what is used in real practice as possible. | 4 | 4 | 3 | 4 | 5 | 4 |
| 36. Nurse educators need to treat the simulation room and patient like a real person since students take simulation as seriously as do the educators. | 3 | 2 | -2 | -1 | 4 | 3 |
| 37. Since students can feel so dejected if they did not perform well, it is helpful to repeat the same simulation. | -2 | -1 | -1 | -1 | 0 | -2 |
| 38. When running a simulation, use only nurse educators who are very familiar and proficient with operating the simulator and have sufficient content knowledge about the scenario. | 1 | 4 | **-2*** | 5 | 1 | 1 |
| 39. Use of humor is important in simulations. | -1 | -2 | **4*** | -2 | -4 | -3 |
| 40. During debriefing, let students do most of the talking on how they came to conclusions. The nurse educator interferes only if conclusions are erroneous. | **4*** | **-2*** | 0 | 2 | 1 | 5 |
| 41. If students are going to make an error during a simulation, first give | -1 | 0 | 0 | **-5*** | -1 | 0 |

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| | NS | | | | | NE |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **A** |
| them cues to change their minds. But, if they say, "I am good" or "let's go do this", let students make the error and help them discover the error or omission in debriefing. | | | | | | |
| 42. Assign students pre-simulation assignments to help students be more prepared to take care of the simulated patient. | 0 | 2 | **-2*** | 2 | 3 | 2 |
| 43. During student orientation, discuss confidentiality of scenario, or not telling other students what the scenario is about, as this could help or hinder the simulation experience for other students. | 2 | 0 | 3 | 1 | 1 | 4 |
| 44. Communication of the student's performance in simulations needs to occur between the nurse educator conducting the simulation and the students' clinical instructor. | -1 | -1 | -1 | -2 | -1 | -2 |
| 45. Avoid having students play role characters in a simulation, as they tend to want to help the other classmates instead of sticking to their role. | -2 | -2 | -2 | -4 | -3 | -4 |
| 46. Nurse educators who use simulation should be master's prepared, as most clinical instructors are required to be. | 0 | 1 | -4 | **4*** | -4 | -1 |
| 47. Script and deliver cues in the same way for each simulation, including number of times offered, how, and when. | -4 | -3 | **1*** | -4 | -2 | 0 |
| 48. Simulations should be less than 30 minutes in length; otherwise, students lose interest and become overwhelmed. | 1 | 1 | 4 | 4 | **-2*** | 1 |
| 49. Offer students preplanned information or cues during the simulation. To accomplish this, it is necessary for nurse educators to predict what additional cues students will need to progress in the scenario. | -2 | 1 | 0 | -3 | 0 | 0 |
| 50. Use both verbal and written debriefing for simulations where students need time to consider and think through events such as end-of-life simulations. Comments by students a week later are much richer and thoughtful than during the immediate debrief. | **-5*** | **-3*** | 1 | **4*** | 0 | -1 |
| 51. Videotaping simulation is unnecessary and a waste of time. If debriefing is done immediately after a simulation, students remember perfectly well what they just did. Instead, spend time discussing, asking questions, going over thought processes, and decisions made. | -4 | -3 | -4 | 0 | -5 | -5 |
| 52. Nurse educators need to be available to students who want to talk about something that just did not "fit" in debriefing, like a personal situation or reaction to one of the patients. | 1 | 1 | 2 | 1 | 0 | 2 |
| 53. How students interpret realism in a simulation needs to be understood by nurse educators. | -1 | -1 | 1 | 0 | -1 | -2 |
| 54. Consider mixing students from different levels in the program. This allows senior students to practice delegation and junior students to see how smart they will be/should be closer to graduation. | **-5*** | 0 | 2 | -1 | 2 | 0 |
| 55. It is best if role playing characters are not well known to the students. | 0 | 0 | -1 | 0 | 2 | -2 |
| 56. It is acceptable to use four hours simulation time to replace 6 hours of clinical experience. | -3 | -4 | **1*** | -3 | -3 | 0 |
| 57. Do not stop a simulation for any reason. What happens happens. It is then discussed in the debriefing. | 3 | **-2*** | **-4*** | 3 | 2 | -5 |
| 58. Freely assist students on how to operative equipment during the simulation so as not to distract from the content of the simulation. For example, if students need help programming the IV pump, they should say it out loud and someone will come out of the control room to help. | -1 | **3*** | -1 | -4 | -3 | -4 |
| 59. Students need to know where they are during a simulation, therefore use persistent visual signs and/or sensory sounds (e.g., white board | -1 | -1 | 0 | 1 | 2 | 0 |

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| | NS | | | | | NE |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **A** |
| marked "OR", "Burn Ward", "Bedroom", alarms sounding, etc.) | | | | | | |
| 60. Take into consideration, students should not feel defeated when leaving the simulation lab. | 1 | 3 | 5 | 5 | **-1*** | 2 |

*Note*. Columns reveal the comparative rank order (-5 Most Not Recommend to +5 Most Recommend) of statements for a particular perspective. Rows reveal the comparative rank order of a particular statement across perspectives.
*Note*. *Distinguishing statement $p < .01$ between Nursing Student Factors
Perspectives: Nursing Students: Factor 1 "*Let Me Show You*," Factor 2 "*Stand By Me*," Factor 3 "*The Agony of Defeat*," Factor 4 "*Let Me Think it Through*," Factor 5 "*I'm Engaging and So Should You*"
Nurse Educators: Factor A "*Facilitate the Discovery*"

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# CURRICULUM VITAE
## JANE BREKKE PAIGE

**ACADEMIC BACKGROUND**

| | |
|---|---|
| Doctorate Candidate for PhD in Nursing – University of Wisconsin - Milwaukee | Jan 2011 |
| Master of Science in Nursing (MSN) - Concordia University Wisconsin | May 2002 |
| Bachelor of Science in Nursing (BSN) - University of Wisconsin – Eau Claire | May 1980 |

**ACADEMIC/TEACHING EXPERIENCE**

Milwaukee School of Engineering, School of Nursing, Milwaukee, WI

| | |
|---|---|
| Associate Professor | 2013-present |
| Assistant Professor | 2004-2013 |
| Instructor | 2002-2004 |

**PROFESSIONAL EXPERIENCE**

| | |
|---|---|
| Clinical Case Manager – Covenant Health Care | 1999-2005 |
| Co-Director Critical Care – St. Michael Hospital, Milwaukee, WI | 1997-1999 |
| Staff RN, Critical Care – St. Michael Hospital, Milwaukee, WI | 1986-2003 |
| Patient Care Coordinator Cardiovascular Surgery – St. Michael Hospital, Milwaukee, WI | 1991-1993 |
| Assistant Head Nurse Telemetry Unit, St. Michael Hospital, Milwaukee, WI | 1985-1986 |
| Staff Nurse, Luther Hospital, Eau Claire, WI | 1981-1985 |
| Staff Nurse, St. Francis Medical Center, LaCrosse, WI | 1980-1981 |

**PROFESSIONAL LICENSES/CERTIFICATIONS**

| | |
|---|---|
| Wisconsin RN license | 2014 |
| Certified Nurse Educator (CNE) | 2008-2013 |
| Advanced Practice RN, Family Nursing Practitioner, Board Certified from AACN | 2002-2007 |
| Advanced Cardiac Life Support | 2006 |
| Basic Life Support | 2014 |
| CCRN | 1989-2001 |

**PROFESSIONAL AFFLIATIONS/MEMBERSHIP**

| | |
|---|---|
| International Society for the Scientific Study of Subjectivity (ISSSS) | 2012-present |
| Midwest Nursing Research Society (MNRS) | 2010-present |
| Society for Simulation in Healthcare (SSH) | 2010-present |
| National League for Nursing (NLN) | 2006-present |
| American Association of Critical Care (AACN) | 1989-present |
| AACN – Greater Milwaukee Area Chapter (GMAC) | 1989-present |
| International Association for Clinical Simulation and Learning (INACSL) | 2007-present |
| MSOE School of Nursing Honor Society | 2007-present |
| Sigma Theta Tau – International Eta Nu Chapter | 2008-present |
| American Nurses Association | 2002-2010 |
| Wisconsin Nurses Association | 2002-2010 |
| Doctorate Nursing Student Organization – UW-Milwaukee | 2006-2009 President 2008-2009 |

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**PUBLICATIONS/POSTERS/PRESENTATONS [last five years]**

Paige, J. and Morin, K. (2013). Simulation fidelity and cueing: A systematic review of the literature. *Clinical Simulation in Nursing 9*(11), e481-489

Paige, J. (2013, September 5) *Simulation design characteristics: Perspectives held by nurse educators and nursing students.* Paper presentation presented at the 29th Annual International Q Conference, Amsterdam, Netherlands.

Paige, J. (2013, September 7) *Q-Sample development: A critical step for a Q-methodological study.* Poster session presented at the 29th Annual International Q Conference, Amsterdam, Netherlands.

Paige, J., Pellmann, A., and Ninu, C. (2013, April). Strengthening clinical judgment: An academic/practice partnership. *Nursing Matters* 24(4), 3-4

Paige, J. and Smith, R. (2013). Nurse faculty experiences in learning problem based learning: An interpretive phenomenological analysis. *Nursing Education Perspectives 34*(4), 233-239.

Paige, J. (June 2012). *Exploring the meaning of student support, cueing, and fidelity within a simulation based learning educational intervention.* Poster session at the annual conference of the International Association for Clinical Simulation and Learning. San Antonio, TX

Paige, J. & Smith, R. (2011, March). *Nurse faculty experiences in participating in a problem based learning development program.* Poster session presented at the 35th Annual Research Conference-Optimizing environments for health-Midwest Nursing Research Society, Columbus, OH.

Paige, J. (February 7, 2011). *Five perspectives of teaching in higher education.* MSOE School of Nursing Faculty Meeting

Paige, J, Kliebensten, M. & Fenne, M. (January 11, 2011). *Taking the patient to the classroom: The story of a critically ill patient unfolding in a simulated classroom experience.* Presentation at the Interactive Learning Creating Engagement and Accountability. 23rd Annual Conference on Nursing Education. Madison, WI.

Paige, J. & Daley, B. (2009). Situated cognition: A learning framework to support and guide high-fidelity simulation. *Clinical Simulation in Nursing 5(3),* e97-103

**PROFESSIONAL DEVELOPMENT [last five years]**

| | |
|---|---|
| 29th Annual International Q Conference, Amsterdam, Netherlands | Sept 5-7, 2013 |
| 12th Annual International Nursing Simulation/Learning Resource Center Conference, Las Vegas, NV | June 13-15, 2013 |
| 11th Annual International Nursing Simulation/Learning Resource Center Conference, San Antonio, TX | June 21-23, 2012 |
| Q-Methodology Workshop Conducted by Dr. Steven Brown - 2 credit course. Kent State University | May 21 to 25, 2012 |
| 14th Annual Building Bridges to Research Based Nursing Practice Conference: Cultivating Nursing Research. Milwaukee, WI | May 10, 2012 |
| The Beauty and Miracle of Being a Nurse. Nursing Matters Expo 2012. Madison, WI | Feb 16, 2012 |
| Faculty development: Facilitation methods in simulation. Webinar AACN/INACSL | Feb 13, 2012 |
| Adding outcome measurements to simulation for evaluating performance. Webinar AACN/INACSL | Jan 24, 2012 |
| Connect Learning Across Courses with Curriculum Mapping, Peter Wolf, online | July 26, 2011 |

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| | |
|---|---|
| seminar held at MSOE | |
| 10th Annual International Nursing Simulation/Learning Resource Center Conference, Orlando, FL | June 15-18, 2011 |
| 35th Annual Research Conference-Optimizing environments for health- Midwest Nursing Research Society, Columbus, OH. | March 26, 2011 |
| International Meeting on Simulation in Healthcare, SSH Research Consensus Summit, New Orleans, LA | Jan 21-22, 2011 |
| 9th Annual International Nursing Simulation/Learning Resource Centers Conference, Las Vegas, NV | June 16-19, 2010 |
| Critical Thinking and the Stages of Proficiency in Nursing Webinar | June 7, 2010 |
| Using the Genetics/Genomics Competency Center (G2C2) | June 7, 2010 |
| 8th Annual International Nursing Simulation/Learning Resource Centers Conference, St. Louis, MO | June 11, 2009 |
| National League for Nursing On-line course, "Guidelines for Simulation Research." | Summer 2009 |
| Midwest Nursing Research Conference: Promoting Social Justice and Human Rights. Minneapolis, MN | Mar 28, 2009 |

**ACADEMIC SERVICE [last five years]**

| | |
|---|---|
| Faculty Evaluation Review Committee (FERC) | Jan 2013-present |
| Southeast WI Simulation Consortium | Nov 2011-present |
| MSOE School of Nursing Department Review Committee | Chair 2011-1012 |
| MSOE School of Nursing Department Promotions Committee | Chair 2011<br>Member Nov. 9, 2004 |
| MSOE Computer Users Committee | 2004-present |
| Upward Bound - Medical Terminology Course | Summer 2010 |
| MSOE School of Nursing Curriculum Committee | 2009-2011 |
| MSOE Faculty Senate | Member: 2008-May 2010 |
| MSOE SON NCLEX/ATI Improvement Task Force | Mar 2008-present |

| **AWARDS** | Academic Year |
|---|---|
| Harriet Werley Research Award – UW-Milwaukee | Nov 2012 |
| Sigma Theta Tau International – Eta Nu Chapter – Graduate Student Scholarship Grant | May 2012 |
| Chancellors Graduate Award: University of Wisconsin-Milwaukee<br>[for current enrollment in PhD program] | 2008-2009<br>2007-2008<br>2006-2007 |

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