THE EFFECTS OF NURSING PROGRAM SIMULATION EXPERIENCE LEVEL AND TYPE OF ADVANCED ORGANIZER ON CLINICAL JUDGMENT PERFORMANCE, SATISFACTION, SELF-CONFIDENCE, AND PERCEIVED COGNITIVE LOAD OF PRE-LICENSURE NURSING STUDENTS IN SIMULATION BASED LEARNING

A Dissertation

Submitted to the Graduate Faculty of the
University of South Alabama
in partial fulfillment of the
requirements for the degree of

Doctor in Philosophy

in

Instructional Design and Development

by

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THE UNIVERSITY OF SOUTH ALABAMA
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I dedicate this dissertation to my husband, Steve, and son, Josh, for always providing their love and encouraging me to dream big. To my Mom (who did not live to see me complete this journey) and to my Dad, who always believed in me and instilled in me a passion for learning.

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LIST OF ABBREVIATIONS

4C/ID	Four Component Instructional Design Model
AACN	American Association of Colleges of Nursing
ANCOVA	Analysis of Covariance
AO	Advanced Organizer(s)
CBI	Computer-based Instruction
C-CEI®	Creighton Competency Evaluation Instrument
CE	Central Executive
CL	Cognitive Load
CLT	Cognitive Load Theory
CMS	Center for Medicare and Medicaid Services
DASH©SV	Debriefing Assessment for Simulation in Healthcare Student Version
ECL	Extraneous Cognitive Load
EMT	Emergency Medical Technician
GCL	Germane Cognitive Load
GPA	Grade Point Average
IRB	Institutional Review Board
ICL	Intrinsic Cognitive Load
LCJR	Lasater Clinical Judgment Rubric

LPN	Licensed Practical Nurse
LTM	Long Term Memory
NACNEP	National Advisory Council on Nurse Education and Practice
NCLEX-RN®	National Council Licensure Examination – Registered Nurse
NESF	Nursing Education Simulation Framework
NLN	National League for Nursing
NLN-SSLS	National League for Nursing Student Satisfaction and Self-confidence in Learning Scale
NPS	Nursing Program Simulation
PL	Phonological Loop
RDS	Reflective Debriefing Script
SBL	Simulation Based Learning
SPSS	Statistical Package of the Social Sciences
TSDS	Traditional Standardized Debriefing Script
WM	Working Memory

ABSTRACT

Taylor, Tina D., Ph.D., University of South Alabama, May 2018. The effects of nursing program simulation experience level and type of advanced organizer on clinical judgment performance, satisfaction, self-confidence, and perceived cognitive load of pre-licensure nursing students in simulation based learning. Chair of Committee: James P. Van Haneghan, Ph.D.

Nursing education programs face many challenges with training students to become professional nurses who will practice safely in an evolving and complex healthcare system. Nurse educators are obliged to prepare students to meet these challenges, with clinical experience being a key aspect of training. However, limited availability of clinical sites restricts adequate training. Simulation based learning (SBL) activities that mimic real world environments are now transforming the clinical experience, however, research is limited and additional research is needed.

By understanding the demand of cognitive load during SBL, nurse educators can design simulation activities that promote positive outcomes. Advanced organizers (AO) are one way of assisting students to retain information and aid recall. Therefore, this study focused on the effects of AO and participant Nursing Program Simulation (NPS) experience level on clinical judgment performance, satisfaction and self-confidence, and perception of CL during SBL.

This study used a mixed methods sequential research design and examined 99 students enrolled in an associate degree nursing program. Participants were enrolled in one of three courses which used SBL. Students were assigned to comparison groups based on their course level and assigned clinical instructor. Participants were given a mnemonic or a concept map during the SBL pre-briefing phase. A pretest simulation was completed followed by a posttest simulation within a 12-week period to assess for differences in clinical judgment performance. Students were given questionnaires post simulation to determine perception of satisfaction and self-confidence, as well as determine their perceived cognitive load. A focus group interview was conducted post simulation to identify additional emerging themes.

Quantitative analysis showed NPS experienced students had higher clinical judgment performance pretest-posttest scores than NPS novice students. There was an interaction between the combined effects of NPS experience level and type of AO showed NPS experienced students had higher scores with the use of a concept map over a mnemonic, whereas the NPS novice group showed no difference. The analysis found NPS novice group participants had higher perceived satisfaction and self-confidence with the use of a mnemonic, whereas the NPS experienced students had higher perceived satisfaction and self-confidence with a concept map. NPS novice group students had a higher perceived cognitive load with the use of a concept map compared to a mnemonic, but the NPS experienced group showed no differences. Qualitative results showed NPS novice participants seemed to feel more comfortable and satisfied with the use of the mnemonic as a memory aid. Conversely the NPS experienced group seemed more self-confident with the use of a concept map. Therefore, the selection of instructional strategies are important for educators to consider when developing SBL experiences.

CHAPTER I

INTRODUCTION

Background for the Study

Current nursing practice faces many challenges including a growing population of acutely ill hospitalized patients, increasing healthcare costs, rapidly advancing technology, and the need to stay current with evolving medical knowledge (The National Advisory Council on Nurse Education and Practice [NACNEP], 2010). The medical knowledge base, currently doubling every 5 to 8 years, is reliably predicted to begin doubling every year; medical schools, healthcare institutions, practitioners, and students will need to develop strategies for coping with the sheer volume of information, concepts, and skills (Distlehorst, Dunnington, & Folse, 2000). To ensure the delivery of high quality, safe and effective care, the nursing profession must keep pace with this ever-changing healthcare environment (Dreifuerst, 2015). Traditional nursing education practices and rote memorization are no longer an adequate option for today's nursing students (Lasater & Nielsen, 2009).

Nurse educators are under continuous pressure to prepare and graduate highly skilled, critically thinking nurses; often leaving them toiling over how to best prepare pre-licensure nursing students for practice in the increasingly complex healthcare environment (White, Brannan, Long & Kruszka, 2013). An important aspect of nursing education is clinical experiences, which is a context where students can transfer the knowledge they learn from the didactic setting into the application of clinical judgment in a real-world environment.

Clinical judgment is an essential component to “thinking like a nurse,” and consists of critical, creative, scientific, and formal criterial reasoning (Benner, Sutphen, Leonard, Day, & Shulman, 2010). It is necessary for nursing students to obtain clinical education in order to learn how to recognize relevant patient cues, so they can understand how to make the connection between accurate assessment and patient outcomes (Benner, 2001). Even though enrollment into nursing programs has increased due to the demand for nurses in the workforce, the availability of clinical education sites has declined (American Association of Colleges of Nursing, [AACN], 2005). This, in turn, presents nurse educators with the challenge of finding appropriate settings for students to rehearse, practice, gain feedback, and develop their clinical judgment abilities.

With limited clinical sites available, a gap has been identified between expert nurses and novice nurses based on clinical judgment and competency abilities (Benner et al., 2010; Gillespie & Paterson, 2009). Nurses, expert and novice alike, are expected to think critically to process complex information, apply problem-solving skills, and implement interventions to provide positive patient outcomes (Benner et al., 2010). The types of medical issues involving patients are numerous and unpredictable in the real world. Experienced nurses, who have practiced for years, are able to recognize critical changes in their patient’s conditions more rapidly than a novice nurse who just stepped into clinical practice (Benner, 1994). Therefore, nursing educators are tasked with developing essential creative strategies to promote clinical judgment and competency skills for student nurses. According to Issenberg, Chung, and Devine (2011), there are three movements in healthcare that have had a profound impact on changes occurring at all levels of medical education: patient safety, healthcare simulation, and competency-based education. This study focused on healthcare simulation in nursing.

The demand for the next generation of nurses is to be able to be dynamic, flexible, capable of critically thinking, and able to engage in complex decision making (Tanner, 2006). These conditions, accompanied by the increasing difficulty of finding clinical placements for student nurses, has created a growing opportunity for the use of simulation as an adjunct or alternative to clinical placements (Roy & McMahon, 2012). Participation in simulation allows learners to safely practice and apply critical thinking, knowledge, and decision-making skills needed to practice in the modern healthcare setting (Mayrath, Nihalani, Torres, & Robinson, 2011; Shinnick & Woo, 2013).

With the use of simulation growing, this creates a significant change in nursing education. It is important for nurse educators to understand whether students are gaining the knowledge and training needed within the simulation environment, and to determine if the knowledge is transferable to real-world situations by the creation of a schema or mental model. With simulation based learning (SBL), students can apply theoretical training by practicing procedures prior to performance on a live patient (Jeffries, 2005), while promoting active learning to enhance critical thinking (Billings & Halstead, 2016). The goal of most simulation experiences is to enhance clinical judgment and competency skills to ease the transition into the nursing role, as well as to identify any weaknesses related to a student's reasoning abilities (Dillard, Sideras, Ryan, Carlton, Lasater, & Siktberg, 2009). However, as with any innovation, associated problems, issues and concerns usually emerge.

With clinical education students are often paired with a preceptor who can answer their questions in real time. With simulation education, the nurse educator often reviews the objectives and roles, lets the simulation scenario “play out” regardless if mistakes are made, and provides a brief reflection period at the end of the experience. Students typically do not receive real time feedback during the simulation scenario. It generally occurs during the debriefing session. This delayed feedback may hinder knowledge acquisition. Thus, the question can be raised as to how effective the use of simulation in nursing education is in developing clinical judgment abilities of the students while allowing them to build a schema that permits them to transfer what is learned to a real-world environment (Josephsen, 2015).

Cognitive load theory (CLT) has been used by researchers to conceptualize instruction for complex learning situations (Mayrath et al., 2011). As simulation has become an increased part of nursing curricula, nursing educators are becoming more aware of how cognitive constructs and cognitive load affect learning situations (Josephsen, 2015). In SBL, it is presumed students will develop the ability to transfer the psychomotor and clinical judgment skills learned during simulation to the real-world setting (Harris, Pittiglio, Newton & Moore, 2014; Yuan, Williams, & Man, 2014). However, nurse educators need to take into consideration a student’s cognitive load in relation to SBL. If a student’s cognitive load is high, their working memory can become overwhelmed. In this case, the student’s critical thinking and clinical judgment abilities may be delayed or obstructed. The 4C/ID model (van Merriënboer, Kirschner, & Kester, 2003; van Merriënboer & Sweller, 2010) provides an instructional design model that supports the development process of whole-task learning contexts, such as simulation.

This model, therefore, may be used to assist nurse educators to understand how to create SBL experiences that reduces cognitive load and knowledge acquisition.

One method of reducing cognitive load is by utilizing advanced organizers (AO), which are defined as relevant introductory material presented in advance of a lesson of higher abstraction, generality, and inclusiveness than the learning task itself (Ausubel, 2000). According to Ausubel (2000), AO have been shown to be an effective learning strategy to activate existing knowledge whilst providing a foundation to incorporate details of new information into a new schema. Different formats of AO have been widely used in classroom settings including: case studies, concept maps, cue cards, visual aids, and worked out modeling; and have shown a positive effect on learning outcomes (Gil-Garcia & Villegas, 2003; Kang, 2004). Although Ausubel (2000) proposes AO are valuable strategies for learning, other research studies have found the effectiveness of AO to be debatable (Barnes & Clawson, 1975; Hartley & Davies, 1976).

In healthcare, there is limited research on cognitive load and AO in clinical or procedural settings. This study investigated the use of AO (AO1= mnemonic, AO2= concept map) and their impact on cognitive load in SBL. The mnemonic focused on simple learning and acted as a memory aid, whereas the concept map focused on complex learning and required more application of what was learned during theory to the SBL experience. The purpose of this study was to ascertain if the use of AO during SBL would impact cognitive load and promote clinical judgment, satisfaction and self-confidence in pre-licensure nursing students, and to determine how student nursing program simulation (NPS) experience level would have any individual or combined effects on these areas.

Theoretical Framework

To understand how learning with SBL occurs in nursing, it was necessary to understand the theoretical context of learning as a concept for this study. To best understand how students learn during complex simulation activities, this study focused on the learning theories of cognitive load, AO, Benner's (2001) theory on developing nursing expertise, Tanner's Model of Clinical Judgment (2006), and the Nursing Education Simulation Framework (Jeffries, 2005). These areas are covered briefly in this section and discussed further in chapter II.

Cognitive science has sought to explore ways in which information is processed by the brain to construct models of thinking and learning (Reedy, 2015). Cognitive constructs consist of information processing components including working memory, long-term memory, schema, and cognitive load. Cognitive load refers to the total amount of mental effort being used in the working memory (Sweller, 1988).

Working memory is finite. It can only accommodate a limited number of elements simultaneously and can be affected by various types of cognitive load (Josephsen, 2015). Long-term memory is made up of structures that permit one to perceive, think, and solve problems by using knowledge that is built on cognitive structures known as schema or mental models (Sweller, 1988). Schemas are acquired over a lifetime of learning, and may contain other schemas within themselves (Sweller, 1999). Cognitively complex or technically challenging material may be difficult to learn because too many elements can simultaneously inundate the working memory, causing an increased cognitive load (Sweller, 1999). The main goals of cognitive load theory and instruction are to provide guidelines for presentation of information, reduce the working memory load, to encourage schema construction and automation, and to facilitate information being processed by the working memory to be moved to long term memory for future recall (Sweller, 1999). There are three aspects of cognitive load: intrinsic, extraneous, and germane which are discussed in the following paragraphs.

Intrinsic cognitive load deals with the characteristics of the material and is created when any content is being processed by the working memory. Intrinsic cognitive load cannot be altered and contains both low and high elements of interactivity. Low element interactivity, such as learning vocabulary words, has a low working memory load, is easy to understand, elements are learned in sequence, and the elements require non-interaction. High element interactivity, such as SBL, has a high working memory load, is more difficult to understand than low element interactivity elements, the elements are presented simultaneously, and the elements require interaction (Fraser, Ayres, & Sweller, 2015). Although intrinsic cognitive load cannot be altered, it should be considered during content development of the instructional design process so that knowledge can be transferred and schema formed.

Germane cognitive load refers to the working memory resources that the learner devotes to dealing with intrinsic cognitive load. It is extra information that can be altered for learning to occur and is dedicated to acquiring and automating schema in long term memory (Sweller, 1999). Germane cognitive load, such as highlighted words, definition tables, and AO, increase the cognitive work load and is directly relevant to schematic construction and learning.

Extraneous cognitive load is imposed by the manner in which information is presented to the learner and requires extra mental processing efforts (Fraser, Ayres, &

Sweller, 2015). Extraneous cognitive load includes elements such as animations, pictures, and multimodal sensory activities. Therefore, it is important for instructors take into consideration the extraneous cognitive load of the learning experience when designing instruction.

In any learning experience, especially with SBL, it is important for instructors to consider the cognitive load impacts to the learning experience. It is essential for nurse educators to determine ways to reduce novel information while helping learners construct schemas during SBL. AO may be able to assist nurse educators with this task.

AO are deeply rooted in cognitive learning theories. Driscoll (2004) states with cognitive learning theories, learning depends on the processing capacity of the learner, and a key element of this is the student's prior or existing knowledge. Use of an AO can assist in linking what a student already knows to new information. It can aid in transforming this prior knowledge so that it can be applied in a new context or schema.

Ausubel (1960) introduced the concept of AO in his assimilation theory of meaning, learning, and retention. He declared learning to be based on schemata, or mental structures, by which students organize their perceived environment. He stressed students can only learn when they find meaning in learning (Ausubel, 2000).

AO contain different elements of interactivity, which impact working memory in various ways. An AO with a low interactivity element, such as a mnemonic or a cue, is simple and used primarily to activate memory and/or prior knowledge. Conversely, an AO with a high interactivity element, such as a concept map or graphic organizer, is more complex and is used to scaffold and organize information to decrease the load of the working memory (Ausubel, 2000).

According to Novak (2010), prior knowledge is a key factor for influencing learning. People, therefore, learn from their experiences. However, there have been mixed reviews of whether AO impact learning. Barnes and Clawson (1975), stated no clear patterns emerged regarding the facilitative effects of advanced organizers when variables such as length of study, ability level of students, grade level of students, types of organizer used, and cognitive level of the learning task were analyzed separately. Hartley and Davies (1976) go further by stating the research on AO, at best, is confusing, when it comes to their efficiency at decreasing cognitive load and impacting learning.

There is limited research on AO in nursing with most studies focusing on verbal information rather than a performance context (Aslani, Haghani, Moshtaghi, and Zeinali 2013). Due to the limited amount of research on AO in a performance context, and because of the conflicting studies in the past, additional studies are needed to determine if AO will impact learning in the realm of nursing. This research study explored if AO instructional strategies are needed to produce nursing students who can make appropriate decisions regarding patient care in a simulated environment.

With most simulation environments, there are multiple elements, such as patient monitors and interactions with other providers, which are likely to be new to the learner. These novel elements could likely cause an increase in the working memory (Fraser et al., 2015). Fraser, Ayres and Sweller (2015), states information related to the simulation context, such as monitors and medical technology, may be a potential source of high intrinsic load. Therefore, it is important to create simulation schemata to free the load of the working memory. An application framework of this study in relations to advanced organizers, cognitive load and SBL can be seen in Table 1. As you can see in Table 1, each phase of simulation is addressed. Take the pre-briefing phase in Table 1 for example, it speaks of the importance of pre-training. If pre-training is not sequenced appropriately or if the pre-training material is taught by various instructors, the load on working memory may increase and thereby produce an increase in the intrinsic and germane cognitive load. To prevent this increase in working memory, the instructor may consider providing a low interactivity resource such as a mnemonic. The mnemonic may assist in activating prior knowledge during the pre-briefing phase and thus decrease the load required by the working memory. This in turn will potentially decrease the intrinsic cognitive load.

If we take the previous pre-briefing example and consider a high interactivity resource, such as a concept map, then the question arises as to if this instructional tool will it produce the same outcome? The concept map can assist in organizing and scaffolding complex patient information, which in turn can aid in decreasing the load on the working memory. However, this type of advance organizer may initially increase the load of the working memory until schema is formed and automated. Thus, the question remains if a high interactivity element AO would reduce the cognitive load as compared to a low interactivity level AO. Hence, this study focused on two AO, a mnemonic and a concept map, to see if they would impact cognitive load in SBL.

Table 1

Application of AO and CLT to SBL

Stage in SBL	Application in SBL	Type of CL	Issues with Traditional Pre-briefing	Use of AO Mnemonic on CL	Use of AO Concept Map on CL
Pre-briefing	Pre-training	Intrinsic CL Germane CL	May increase ICL and GCL due to varied instructional methods	Guides actions to decrease WM load	Guides actions by scaffolding information to decrease WM load
	Managing emotion	Intrinsic CL Extraneous CL	May increase ICL and ECL due to different instructors performing pre-briefing and using varied instructional methods	Guides actions to decrease ICL and ECL by providing low interactivity resource to decrease WM load	Guides actions by providing resource structure to decrease WM load through high interactivity scaffolding
Scenario	Avoid split attention	Intrinsic CL Extraneous CL	May increase ICL and ECL by requiring attention to multiple aspects of SBL at one time	Guides actions to decrease WM load by providing interactivity resource	May impact ICL and ECL either positively by providing interactivity or negatively by increasing demand on WM
Debriefing	Managing emotion	Intrinsic CL Extraneous CL	May increase ECL and ECL due to different instructors performing debriefing and using varied instructional methods	Guides actions to decrease ICL and ECL by providing low interactivity resource to decrease WM load	Guides actions by providing resource structure to decrease WM load through high interactivity scaffolding

Note: AO is the abbreviation used in this study for Advanced Organizer(s), CLT is the abbreviation used in this study for Cognitive Load Theory, and SBL is the abbreviation used in this study for Simulation Based Learning.

Experiential learning is a cognitive process involving how people adapt to and engage in their own environment (Kolb, 1984). Kolb (1984) states learning knowledge is created through experiences. According to Lisko and O'Dell (2010), knowledge is created by transforming experiences into existing cognitive frameworks, which alters the way one reflects and acts. An individual, therefore, creates knowledge from experiences. Experiential learning supports SBL by exploring and understanding experiences from the past, experiencing the current situation itself, then building new knowledge from the experience, and ultimately allowing the transfer of the newly learned knowledge to a real-world context.

Benner (2001) supported experiential learning in nursing and introduced the concept that nurses develop knowledge, skills and an understanding of patient care over time and through multiple experiences. She proposed that one could gain knowledge and skills "knowing how" without ever learning the theory "knowing that". Benner (2001) developed a model of expertise in nursing that states critical thinking and clinical judgment are indicators demonstrating a progression towards an expertise level in nursing practice (Benner, 2001; Tanner, 2006). Research suggests the development of critical thinking, clinical judgment, and competency skills prepare nurses for the complexity of patient care, and are accomplished through experiential practice (Benner, 2001; Tanner, 2006).

Contextualized pedagogies, such as SBL, assist learners in determining "what", "how" and "when" interventions should take place, while providing care in a dynamically changing environment (Benner et al., 2010). This research study used Benner's (2001) theory on developing expertise in nursing as a foundation to explain the development of expertise in the clinical judgment of student nurses.

I believe, as a nurse and instructional designer, specific instructional strategies are necessary to develop a learner's skills in critical thinking and decision making that lead to clinical judgment. Tanner (2006) based her research on the clinical judgment of nurses and defined it as "an interpretation or conclusion about a patient's needs, concerns, or health problems, and/or the decisions to act (or not), use or modify standard approaches, or improvise new ones as deemed appropriate by the patient's responses" (p. 204). She developed a four-stage model with the goal of developing decision-making abilities in students by transitioning them through each stage. The stages include: *Noticing, Interpreting*, *Responding*, and *Reflecting* and are discussed further in chapter II. It has been shown by the final stage of this model, competency in clinical judgment should be reached.

Jeffries (2007) described the Nursing Education Simulation Framework (NESF) as a theory based guide developed specifically for the design, implementation and evaluation of clinical simulation in nursing education (See Figure 1). Jeffries (2005) proposed the NESF as a structure to identify key strategies to address the need for a more contextual, experiential type of learning through simulation by distinguishing the best teaching practices. The framework provided for a consistent model based on theoretical literature and empirical knowledge of SBL to promote student outcomes (Chickering & Gamson, 1987). Figure 1 illustrates the five major components of the NESF and how the first four components of teacher, student, educational practices, and simulation design characteristics interact with each other to create the resulting learning outcomes.

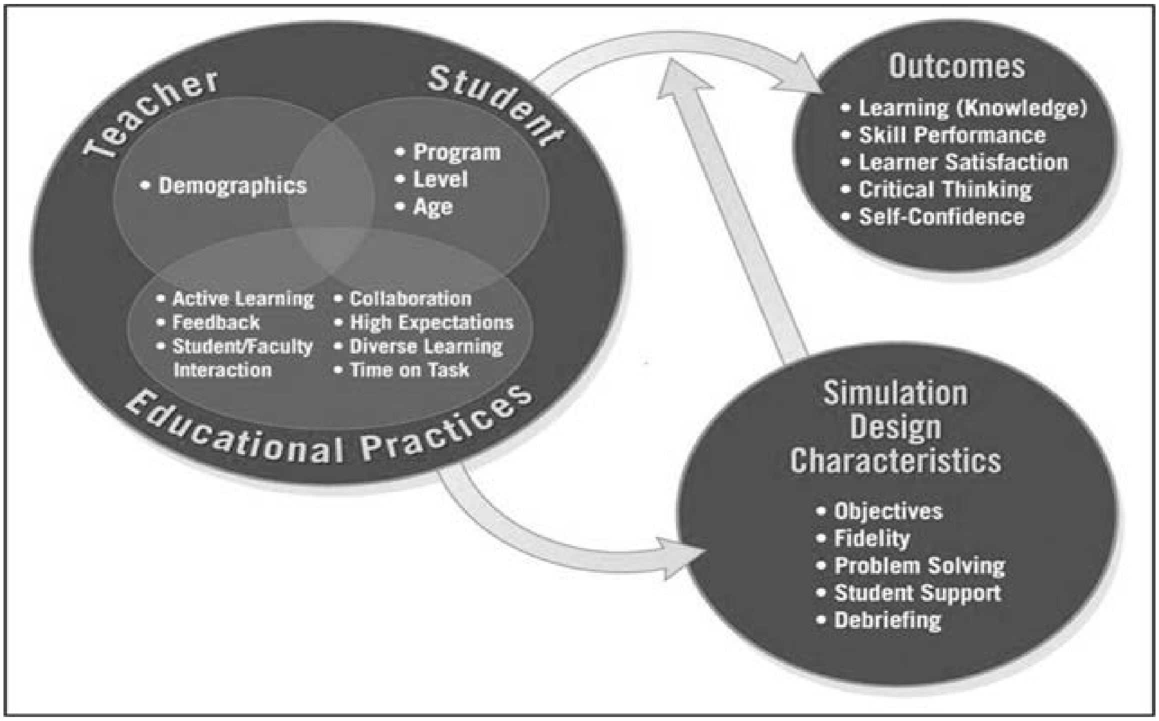

Figure 1. Nursing Education Simulation Framework (adapted from Jeffries. P. R. (2005), "A Framework for Designing, Implementing, and Evaluating Simulations Used as Teaching Strategies in Nursing").

Review of nursing and other healthcare literature along with related literature from non-healthcare disciplines guided the development of the framework (Jeffries, 2006). The NESF was developed and tested in a multi-site research project jointly organized and funded by the National League for Nursing (NLN) and the simulator manufacturer Laerdal Corporation (Jeffries, 2006). The NESF is used by many nursing education programs nationwide (Nehring & Lashley, 2010). The premise of the NESF is that well-designed simulations improve learning outcomes, thus making it a roadmap for SBL in nursing.

The NESF focuses on five individual components: facilitator, participant, educational practices, outcomes, and simulation design characteristics. These components and educational modalities are incorporated into the teaching strategy and simulation design, which in turn influences student outcomes of learning (knowledge), skills performance, critical thinking, learner satisfaction, and self-confidence (Jeffries, 2005). This framework has provided the basis for informed practice with regards to nursing education, the design of the simulation experience, and student outcomes. The NESF and how it impacts this study are be discussed further in chapter II.

Problem Statement

The use of simulation in nursing education is growing and has become an avenue for clinical performance practice (Katz, Peifer, & Armstrong, 2010). Most nursing faculty who are accustomed to didactic instruction are now faced with the challenges of a performance context. With SBL being a novel instructional strategy, nursing instructors are having to discover new ways for learning goals to be reached by students.

While the effects of simulation as an educational strategy and post-simulation debriefing have been extensively studied, the effectiveness of student learning during the pre-briefing phase of simulation education has not been significantly studied or described in the literature. The literature available specific to CLT and AO in SBL is also limited. Therefore, it is important to gain an understanding of how different instructional strategies may impact learning in a performance context.

Although many studies have concentrated on the debriefing phase of the simulation learning experience, this study focused on how learning could be impacted at the beginning of the simulation experience to enhance recall and schema formation. Therefore, this study addressed the problem of identifying potential instructional strategies that aid in reducing cognitive load and hence increases learning and clinical judgment performance during simulation pre-briefing.

Purpose of the Study and Research Questions

The purpose of this quasi-experimental, factorial comparison group research design study will be to investigate CLT in SBL by exploring the use of two AO (AO1= mnemonic, AO2 = concept map) as instructional strategies to reduce cognitive load and to increase clinical judgment abilities of pre-licensure nursing students. Additionally, it will investigate the effects of the use of those AO during SBL on student satisfaction and self-confidence, as well as examine if students' NPS experience level would have individual or combined effects in these areas.

This investigation was conducted in the context of SBL that occurred within the nursing curricula of three pre-licensure nursing courses: Foundations in Nursing, Medical-Surgical I, and Medical-Surgical II. It addressed the following general research questions:

1) What are the independent and combined effects of NPS experience level and type of advanced organizer on clinical judgment performance of pre-licensure nursing students during SBL?
2) What are the independent and combined effects of NPS experience level and type of advanced organizer used during SBL on student's satisfaction and self-confidence?

3) What are the independent and combined effects of NPS experience level and type of advanced organizer on pre-licensure nursing student's perceptions of their cognitive load during SBL?

The general research questions for this study, the hypotheses, and expectations are discussed further in chapter III.

Importance of the Study

Critical thinking and problem-solving skills are a key aspect of clinical judgment and are necessary for nurses when providing consistent quality patient care. With major issues in healthcare revolving around quality care and patient safety, the Center for Medicare and Medicaid Services (CMS, 2016) has implemented penalties to healthcare providers. These penalties obligate healthcare practitioners to perform above the expected duties in offering high quality care to their patients, while dealing with a limited number of staffing and resources. New technological advances and the simulated patient can aid nurse educators in bridging the gap for nursing students between classroom and clinical setting to assist in improving the quality of patient outcomes.

This study may provide professional and social implications in the healthcare realm by providing a clear understanding of how the use of AO instructional strategies during SBL may affect the way a nurse educator teaches clinical judgment skills and possibly improve the transfer of learning. By reducing cognitive load, activating prior knowledge, and increasing pattern recognition with the use of AO, students may gain crucial knowledge needed to make imperative decisions during patient care situations.

Findings from this study may also contribute to the literature on SBL, as well as illuminate if AO instructional strategies used by nurse educators during SBL promote positive clinical judgment skills in pre-licensure nursing students. This research may provide evidence for best practice strategies that can be used to support the SBL process. Finally, this study may be used to bridge the existing gap between instructional design and nursing education by providing a platform for continued discussion on the development of instructional strategies to promote student outcomes in SBL.

Definition of Key Terms

Advanced organizer – Advanced organizers are relevant and inclusive introductory materials which are introduced in advance of learning and presented at a higher level of generality (Ausubel, 1968). Specific pre-discussions or visuals that begin instruction can also be considered advance organizers (Leu & Kinzer, 2003).

Clinical **–** A common term used in healthcare education to refer to a place where students perform patient care in a hospital, community, home setting or simulated environment under the supervision of an instructor (DeYoung, 2003).

Clinical judgment **–** The ways in which a nurse weighs, synthesizes and employs appropriate information when making judgments about patients and then decides when or when not to act (Lavoie, Pepin, & Cossette, 2015).

Cognitive load **–** The amount of mental effort being used by the working memory (Sweller, 1988).

Cognitive Load Theory (CLT) **–** A set of instructional principles that offer the most effective methods to design and deliver instructional contexts in ways which best use working memory (Clark., Nguyen, & Sweller, 2006).

Concept map **–** An instructional tool intended to represent meaningful relationships between concepts in the form of propositions (Novak, 2010).

Expert nurse – A nurse who has an intuitive grasp of each situation and zeros in on the accurate region of the problem without wasteful consideration of a large range of unfruitful, alternative diagnoses and solutions. The expert nurse operates from a deep understanding of the total situation. His/her performance becomes fluid, flexible and highly proficient (Benner, 2001).

Knowledge – refers to facts, information, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject (Kitson & Harvey, 2016).

Mnemonics – is a tool used to assist or intended to assist the memory (Mnemonics, n.d.).

Novice nurse – The novice or beginner nurse has no experience in the given situation in which they are expected to perform. The novice nurse lacks confidence to demonstrate safe practice and requires continual verbal and physical cues. He/she is unable to use discretionary judgment (Benner, 2001).

Nurse educators – An educator who facilitates student learning by integrating the art and science of nursing and clinical practice during the teaching-learning process (Billings & Halstead, 2016).

Nursing student – A person who is the recipient of teaching-learning processes which are delivered by nurse educators to provide training to be a nurse (personal definition).

Pre-briefing – "An information or orientation session held prior to the start of the simulation-based learning experience in which instructions or preparatory information is given to the participants. The purpose of the pre-briefing or briefing is to set the stage for a scenario and assist participants in achieving scenario objectives. Suggested activities in pre-briefing or briefing include an orientation to the equipment, environment, mannequin, roles, time allotment, objectives, and patient situation" (Meakim et al., 2013, p. S7).

Prior knowledge – knowledge the learner already has before they are met with new information (Ausubel, 1960).

Satisfaction – a happy or pleased feeling because of something that you did or something that happened to you (Lubbers & Rossman, 2016).

Schema – "a memory structure located in long-term memory that is the basis for expertise. Allows the chunking of many elements of information into a single element. Schemas are also called mental models. Schemas can be large or small and grow over time as learning progresses" (Clark et al., 2006, p. 350).

Schemata – a pattern imposed on complex reality or experience to assist in explaining it, mediate perception, or guide response (Clark et al., 2006).

Self-confidence – trusting the soundness of one's own judgment and performance (Jeffries, 2005).

Simulation based learning – is defined 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, Topping, & Wood, 2011, p. 5).

Traditional standardized debriefing – standardized information prepared by the nursing program and given to students after a simulation-based learning experience to aid with reflection and transfer of knowledge (personal definition).

Traditional standardized pre-briefing – standardized information prepared by the nursing program and given to students before a simulation-based learning experience to assist in preparing them for the simulation scenario (personal definition).

Chapter Summary and Organization

This chapter provided a background for this study along with the statement of the problem, purpose of the study, research questions and defined important terms. The focus of this study was to explore and examine if there were relationships between NPS experience level and the use of AO as an instructional strategy during SBL on the clinical judgment, student satisfaction, and self-confidence of pre-licensure nursing students.

This research study is presented in five chapters. Chapter I has been outlined above and provides the direction of this study. Chapter II is comprised of the literature review and elaborates on the areas of CLT, AO, Benner's (2001) theory on developing expertise in nursing, Tanner's Model of Clinical Judgment (2006), the NESF (Jeffries, 2005), and the pilot study. Chapter III will describe the methodology to be used in the research study including the research hypothesis and research design. It also includes information on participants, materials, procedures, data collection processes, and data analysis. Chapter IV presents and summarizes the quantitative and qualitative research findings, including participant demographics, statistics used to analyze the data, and the results. The final chapter, chapter V, will summarizes the study and elicits a discussion about the research questions, the findings and limitations of the study, and any implications for future research in SBL and AO instructional strategies in nursing education.

CHAPTER II

LITERATURE REVIEW

There are many concerns in the healthcare industry regarding nursing faculty being able to train nursing students who are ready for practice (Tanner, 2006). The purpose of this chapter is to examine the literature pertaining to improving clinical judgment and competency of nursing students through the use of AO as instructional strategies used during SBL.

In this chapter, I explored the literature on clinical judgment and competency in nursing by focusing on Benner's Novice to Expert Nurse Theory (2001) and Tanner's Clinical Judgment Model (2006). SBL and the Nursing Education Simulation Framework and how they apply to this study are discussed. Relevant literature on cognitive load theory, 4C/ID model, and AO in regard to their application to SBL are also examined. The pilot study, its conclusions, and how it impacted the way in which the study was developed is also reviewed. The literature review will then be summarized and sets the direction for chapter III.

Clinical Judgment and Competency in Nursing

The number of near misses and adverse events reported in healthcare each year indicates clinical judgment is an essential competency in nursing education (Ebright, Urden, Patterson, & Chalko, 2004). According to Kohn, Corrigan and Donaldson (2000), it is estimated between 44,000-98,000 deaths occur in hospitalized patients each year due to medical errors. It has been stipulated that patients in the care of novice nurses were more at risk for errors related to medication administration, falls, and delays in treatment (Saintsing, Gibson, & Penington, 2011). Benner et al. (2010) stated thinking like a nurse requires clinical judgment abilities. The National League for Nursing further stipulated that educational competencies for nursing students should include clinical judgment as an essential skill necessary in nursing curriculum to prepare graduates to function in a practice environment (NLN, 2011). Following the NLN suggestion for competencies, the Institute of Medicine suggested nursing curricula needs to be revised to move students from task oriented proficiencies to comprehensive competencies involving complex learning and increased levels of decision making skills (Rubenfeld & Scheffer, 2010). Thus, to think like a nurse, critical thinking and clinical judgment must be defined and understood (Tanner, 2006).

Tanner (2006) defines critical thinking as a higher order process used to identify a patient’s problem, examine the ongoing issues at hand, and to make the appropriate choices based on the information obtained in the delivery of care to the patient. Clinical judgment is the cognitive process which uses thinking strategies to gather and analyze patient information, evaluate the relevance of the information, and decide on possible nursing actions to improve the patient’s physiological and psychosocial outcomes (Tanner, 2006). Clinical judgment is often defined in practice-based disciplines, such as nursing and medicine, as applying critical thinking and problem-solving skills to clinical situations (Victor-Chmil, 2013).

This leaves the question as to how can a nurse educator develop clinical judgment and decision-making abilities in nursing students. The traditional way of educating nursing students was by lecture and clinical practice in a hospital setting. Rote memorization allowed nurses to gain a knowledge base, but moving into clinical practice assisted in the development of needed clinical skills. With the doubling of medical knowledge every year, students need to develop strategies for coping with the volume of information and skills needed to provide quality patient care (Distlehorst et al., 2000).

Educators understand that experts use metacognitive skills to monitor their own processes during decision making and as these skills grow, expertise levels increase (Cannon-Bowers & Salas, 1998; Dewey, 1997; Schön, 1983). Therefore, expertise levels are a by-product of learning over time (Schön, 1987). Furthermore, clinical judgment and critical thinking are essential skills needed for the identification of patient problems and the implementation of interventions to promote effective care outcomes (Bittencourt & Crossetti, 2012). Benner et al. (2010) describe the components of clinical reasoning to include setting priorities, developing rationales, learning how to act, clinical reasoning-in-transition, and responding to changes in the patient’s condition. These factors involve complex learning that moves beyond rote memorization and simple tasks. Nurse educators are charged with providing clinical experiences to their students that will assist in the development of skills to foster the growth of clinical judgment and decision-making abilities (Weatherspoon & Wyatt, 2012).

Rubenfeld and Scheffer (2010) conducted a landmark study in which internationally diverse expert nurses from nine countries defined ten habits of the mind (affective components) and seven skills (cognitive components) of critical thinking in nursing. The ten affective components are confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance, and reflection. The seven skills are analyzing, applying standards, discriminating, information seeking, logical-reasoning, predicting, and transforming knowledge. A study by Asselin, Schwartz-Barcott, and Osterman (2013) revealed students who reflected on new knowledge developed new insights regarding practice. Benner, Tanner, and Chesla (2009) suggested educational methods for fostering clinical judgment should focus on scientific knowledge, and attention must be given to the development of holistic and intuitive practices gained from experiential learning, which is critical for the development of clinical judgment.

I, being a nurse, believe critical thinking and clinical reasoning skills develop over time and after exposure to various patient situations. It is not something that can be learned in a classroom setting alone, and while clinical practice helps in the development of these skills, the limitation of clinical sites has become a hindrance to nursing education. What students learn from each patient learning experience is variable. Although a nurse may have two patients with the same diagnosis, their symptoms and treatment plans may differ in some way. For a nurse, having the ability to determine if your patient is stable or is having episodes of instability requires clinical judgment skills. The capability to move from the beginner level of being a student into the role of a practicing nurse, and then developing from a skilled nurse to a highly qualified and knowledgeable nurse takes time and practice, as can be seen in Benner's theory on developing expertise in nursing (2001).

Benner's Novice to Expert Nurse Theory

Expert decision making is about understanding situations and experiences through matching patterns and taking actions (Dreyfus, 1992; Gullickson & Ramser, 1993). Benner (2001) states experiential learning creates a hierarchy of practitioner levels based on their abilities to apply knowledge in a clinical setting. As a nurse, it is my opinion that expertise comes not only from a solid theoretical foundation, but also from lived experiences. Benner (2001) suggests a developmental paradigm involving nursing skill development moving from a novice to an expert level. She proposed five levels: *novice, advanced beginner, competent, proficient,* and *expert*.

As stated by Benner (2001), the novice nurse is one whose abilities are limited. They have no experience with performing skills or tasks. They do not see the big picture and must be taught rules to guide their actions. Nursing students fit appropriately into this level. They are developing a knowledge base and learning concepts; however, they may not know how to apply those concepts to the patient's situation.

The second level progresses to the advanced beginner stage, where the learner advances from being a nursing student to an entry level nurse. The advanced beginner can formulate guidelines for action based on their prior knowledge (Benner, 2001). This prior knowledge may be somewhat limited based on the entry level nurse's past clinical experiences. Due to the complexity of the healthcare environment, much of the advanced beginner's time is spent with a preceptor in their work environment to ensure patient safety.

The next stage in Benner's (2001) theory is competency. At this point the nurse has had two to three years of experience on the job. The nurse is consciously aware of his or her actions and the consequences of those actions. The nurse is capable to perform his/her job duties with limited supervision and guidance.

Proficiency is the next level and is considered the “in-between” stage where the nurse is developing beyond a degree of competency to a point of expertise. At this point, the nurse continues to gain experiences through the variability of different patient situations. New knowledge is added to the nurse’s prior knowledge to formulate new mental models of the information together (Benner, 2001).

The last phase is expert. At this stage, the nurse no longer relies solely on analytical principals to guide decisions, but moves on to making decisions based on prior knowledge, experience, and intuition (Benner, 2001). The nurse is fully capable of grasping each situation and making good judgment decisions as to how to best respond to those situations.

Gillespie and Paterson (2009) assert novice nurses tend to be methodical, task oriented and dependent upon protocols and guidelines. Simmons (2010) suggests novice nurses can miss complexities of patient problems which deviate from textbook examples. Del Bueno (2005) proposed 65% of novice nurses do not have the clinical judgment skills needed for safe practice.

Conversely, Benner (2001) states that as expertise is gained, a nurse changes their behavior by relying on concrete experienced based paradigms instead of abstract principles, views events holistically instead of as distinct parts, and moves into care as an active practitioner instead of a detached observer. Experienced nurses were found to be capable of recognizing the complexity of patient needs by being able to intervene more accurately and precisely with the use of higher order decision making skills than novice nurses (Benner et al., 2010; Ferrario, 2003).

Di Bello (1997) conducted research looking at the differences in novice and expert decision makers in a management context. Her results support Benner by demonstrating experts use their experience rather than rule based knowledge to facilitate decision making. This gives rise to the question, does simulation speed expertise development? The answer may lie within the scope of deliberate practice.

Deliberate Practice and Expertise in Nursing

Deliberate practice are those activities specifically designed to improve performance (Ericsson, Whyte, & Ward, 2007). According to Ericsson et al. (2007), it is not talent or innate abilities, but deliberate practice that best explains achievement. The expert acquires and refines cognitive mechanisms to support continued learning and performance improvement (Ericsson, et al., 2007).

Deliberate practice activities are specifically designed with the goal of improving one's current level of performance, are highly structured, require effort, and are not inherently enjoyable (Helsen, Starkes, & Hodges, 1998). Ericsson, Krampe, and Tesch-Romer (1993) found four distinguishing criteria existed in learners where practice had significantly improved their performance: (1) the learner was given a task with a well-defined goal, (2) the learner was motivated to improve, (3) the learner was provided with feedback, and (4) the learner was provided with ample opportunities for repetition to refine performance. When one engages in deliberate practice, the goal is to improve performance over time. If the four criteria are met, then the practice activity should improve the accuracy and efficiency of the performance (Ericsson et al., 1993).

SBL may be an option that can be used to create a context of deliberate practice. By allowing nursing students the opportunity to practice patient care in a simulated environment, student's performance may improve over time. Repetition of clinical scenarios in the simulation lab gives the students ample opportunity for learning to occur. If a mistake is made in the simulated environment, no harm comes to a real patient, thus allowing time for the faculty to provide guided feedback to promote leaning. Therefore, SBL may compliment the scope of deliberate practice, as well as having the potential to assist in the development of clinical judgment and expertise in nursing students.

Tanner's Model of Clinical Judgment

Tanner's Model of Clinical Judgment (2006) has four stages and assists in providing nurse educators with a framework to use during clinical and simulation activities. The model provides a standardized language and format for the development of clinical judgment in nursing. Figure 2 is an illustration of Tanner's Model of Clinical Judgment and the four stages of how clinical judgment is built: noticing, interpreting, responding, and reflecting.

The first stage of the model is noticing. This is where the nurse becomes aware of the patient and the environment, notices patient cues, and relates the cues to specific knowledge and past experiences (Dillard, et al., 2009). Interpreting is the next stage and it occurs when clinical information allows the nurse to draw conclusions based on critical thinking and clinical judgment (Modic, 2013). The third stage, responding, involves the nurse acting or choosing not to act in a given situation in response to the patient's cues (Lasater, 2007). The final stage is reflecting, it is the learning process that completes the cycle to build the nurses knowledge, critical thinking and clinical judgment abilities to improve their competency development (Lasater & Nielsen, 2009).

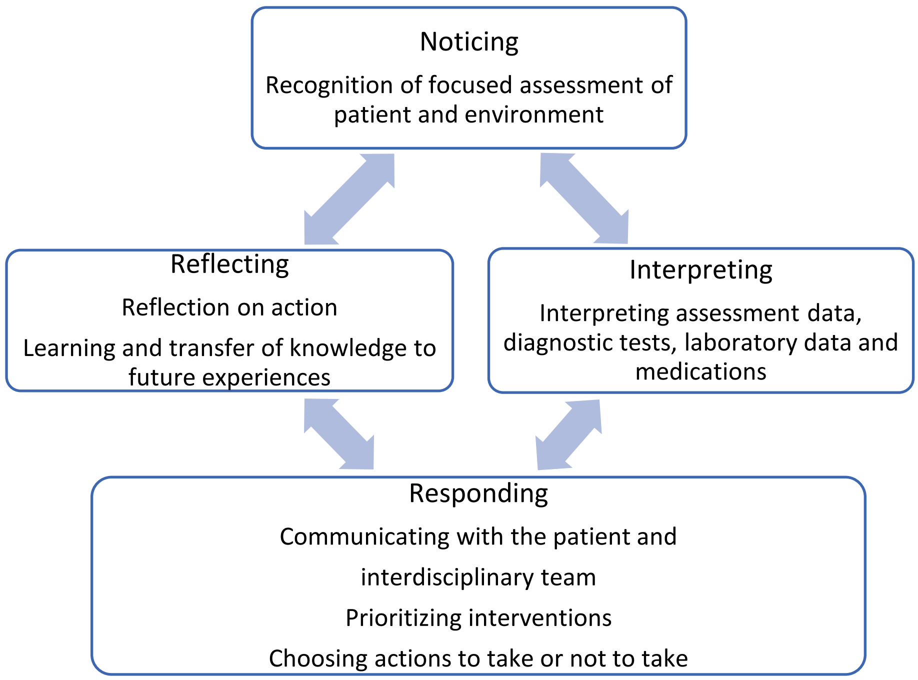

Figure 2. Tanner's Model of Clinical Judgment (Adapted from Tanner, C. A. (2006), "Clinical Judgment Model").

As a nurse, it is my view that health systems need learning institutions to create decision makers that can think fast on their feet and adapt to specific changes of patient needs. Nursing practice is based on clinical judgment and decision making ability; with expertise taking many years to develop. SBL can help to bridge this development of expertise gap by assisting students build on prior knowledge and by giving them situational experiences to practice in a safe and non-threatening environment.

Simulation

Simulation as a learning instrument has been in practice for over 30 years (Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005). The military and aviation fields have incorporated simulation into their curriculum with positive results in psychomotor skill performance, critical thinking, and confidence levels of the participants (Eaves & Flagg, 2001; Issenberg et al., 2005). Simulation provides an immersive environment for experiential learning within a real-world context. This type of learning creates necessary relationships between context, meaning, identity, and practice that result in transformative expertise (Benner, 2001; Wenger, 2000).

Simulation has been used as a teaching strategy in nursing education for many years. Many definitions have been used to describe simulation in nursing. Gaba (2004) defines simulation as an instructional technique used to amplify or substitute clinical experiences with guided experiences that replicate real world contexts in an interactive manner. The environment context of a clinical simulation room mimics that of a real clinical setting. The equipment in the simulation is exactly what one would find in a hospital or clinical setting, allowing the student time to interact with the actual apparatuses.

Simulation has also been defined as activities that mimic a clinical environment in which students can apply nursing knowledge by performing procedures, making clinical decisions, and critically think through a patient-care scenario in a safe setting (DeYoung, 2003; Bourke & Ihrke, 2012). Technological advances in the last decade have taken the simulation of a clinical environment to a new level. High-fidelity simulation mannequins use very realistic materials and equipment to represent elements of a clinical situation and life-like patient care experience (Alinier, Hunt, Gordon, & Harwood, 2006; Bearnson & Wiker, 2005; Day, 2007).

According to Dawson (2006), simulation is the creation of an educational environment in which learning occurs through the use of a device, mannequin, or team, without the presence of an actual patient (Dawson neglects to mention here the simulated patient role may also be played by an actor). There are two main types of simulation in healthcare education: procedural simulation and clinical simulation. Dawson (2006) states procedural simulations are used to teach practical skills such as basic life support, advanced cardiac life support, and medical procedures. He states at the opposite end of the continuum is clinical simulation, whereas a patient simulation can be as realistic to a real life patient with more complex and complicated scenarios (Dawson, 2006). Clinical simulation not only allows students to make decisions regarding their patient's situation, but also gives students an opportunity to learn from the secondary effects of their actions when the simulated patient responds (Dawson, 2006).

SBL produces learning opportunities for the student by placing them in a setting and cultural context such as one similar to what an experience a nurse might encounter in a real-world environment. Simulated patient cases are complex scenarios with possibilities for the application of clinical reasoning, critical thinking and decision-making skills. Simulation teaches the learner by integrating theory, psychomotor skills, clinical decision making, and emotional engagement into practice (Eaves & Flagg, 2001; Lasater, 2007). Thus, SBL should be considered a route to provide clinical experiences to learners.

Several studies on SBL in nursing suggest simulation is an effective instructional strategy for increasing knowledge, student satisfaction, and clinical judgment (Alinier, et al., 2006; Howard, 2007). Jeffries and Rizzolo (2006) published a project summary report of their findings for an eight site, three-year project on simulation design in nursing. This project studied over 400 nursing students in their first medical surgical course using three different simulation techniques (pencil/paper case study, low fidelity, and high fidelity). The results showed the use of simulation promoted learning using a high sense of realism, provided opportunities for problem solving, and allowed for experiential learning. According to Jeffries and Rizzolo (2006), students rated satisfaction with learning and confidence levels higher within the simulation context versus the traditional context.

According to Jeffries (2006), there is no particular right way to solve the problem, but there is an optimal outcome to strive for to promote patient safety and well-being. Through the experience of using critical thinking skills and problem solving, a student nurse develops valuable aptitudes from novice to expert that are transferable to a clinical practice setting (Jeffries, 2006). Means, Salas, Crandall, and Jacobs (1993) demonstrated in their study that participation in a contextually meaningful experience helped students to develop assessment skills and improve their ability to understand future simulation scenarios.

The body of research on nursing simulation has contributed significantly to learning the positive effects of high-fidelity simulation on students' perceptions such as enhanced critical thinking (Howard, 2007; Jeffries, 2007), promotion of active learning (Childs & Sepples, 2006; Jeffries & Rizzolo, 2006), and perceived value and ability to transfer learning to the clinical setting (Howard, 2007). Powell-Laney (2010) states simulation is an instructional strategy which promotes decision making skills in students. However, there is little research that explores the impact of the use of different instructional strategies within the simulation process on student performance. It is my hope to shed light on the use of AO as an instructional strategy in SBL and how it may affect student performance outcomes.

Nursing Education Simulation Framework (NESF)

According to Jeffries and Rogers (2007), the implementation of simulation in nursing education requires a framework to provide structure which allows for the opportunity to assess student outcomes adequately. The NESF (See Figure 1) was developed after thorough review of empirical and theoretical simulation literature in nursing, medicine, and other disciplines (Jeffries & Rizzolo, 2006). The most current version of the NESF consists of five components which are implemented through different variables (Jeffries & Rogers, 2007). The “five conceptual components include: (a) facilitator factors, (b) participant factors, (c) educational practices that need to be incorporated into the instruction, (d) simulation design characteristics, and (e) expected student outcomes” (Jeffries & Rogers, 2007, p.26).

The first component speaks of the facilitator as being essential for a successful SBL experience. The facilitator provides guidance, gives feedback, and evaluates the student performance (Ard, Rogers, & Vinten, 2008). Facilitators generally ask probing questions to students to promote thinking beyond rote memorization of facts, therefore encouraging critical thinking (Gaberson, Oermann, & Shellenbarger, 2015). The facilitator advises the students on objectives, rules and the purpose of the simulation.

Participants are responsible for their own learning experience and learning is intended to be self-directed (Jeffries & Rizzolo, 2006). Often students are allowed to make mistakes during the simulation experience and are provided with feedback to support the development of knowledge and mental models to prevent those same mistakes from occurring in the future.

The component of education practices represents aspects such as learning theories, diverse learning styles, feedback, collaboration, and instructional strategies (Jeffries & Rogers, 2007). These factors should be considered when designing the simulation experience to improve student satisfaction, performance, and outcomes (Chickering & Gamson, 1987). By taking these facets into consideration, nurse educators may improve effective learning practices for students during simulation experiences.

According to Jeffries and Rogers (2007), simulation design characteristics should include objectives, fidelity, problem solving, learner support, and reflection. Jeffries (2005, 2007) stated clear objectives are essential in simulation design, should provide enough details for the learner, and match the learner's knowledge and skill level. Fidelity refers to the authenticity of the SBL experience to a real-world situation. Thus, SBL should be as realistic as possible. Problem solving involves the complexity of problems the simulation exhibits. These can be vast and can be scaffold or sequenced to build on the student's prior knowledge. Student support refers to assistance the facilitator gives to the student, such as cues and hints which help to keep the scenario moving along, but does not interfere with the student's ability to make independent decisions. Lastly, reflection refers to the time frame when the students and faculty critically examine the simulation experience. This usually occurs during the debriefing phase of the simulation process, but can occur at any point during the SBL experience (Jeffries 2005, 2007).

Student outcomes should be considered when designing simulation. These outcomes should expand knowledge, performance, satisfaction, self-confidence, and critical thinking (Jeffries & Rogers, 2007). The evaluation of learning outcomes is a key element in validating the effectiveness of the simulation process by identifying if students have learned from the experience (Jeffries, 2005, 2007).

Nursing Education Simulation Process

Simulation is traditionally a three-part process: pre-briefing, the simulation scenario, and debriefing (Seropian, Brown, Gavilanes, & Driggers, 2004). All three phases have their unique features and contributions to student learning.

The pre-brief occurs prior to the simulation scenario and gets the learner ready for the simulation (Seropian et al., 2004). During the pre-brief, the faculty and students can explore the premise of the scenario prior to the actual performance. Explanation of roles being played are explained, objectives are outline, and expectations are clarified. Instructional strategies such as AO would play a role during this phase.

After the pre-brief, the students are placed into the simulation scenario. The scenario mimics a real-life clinical environment with a simulated patient in which a real-life disease process is represented (Seropian et al., 2004). Students must use their knowledge, clinical reasoning, and critical thinking skills to make decisions about the simulated patient's care.

The debriefing stage is an important stage of the simulation and immediately follows the simulation scenario. It is a reflective session in which the students and faculty examine what happened during the simulation activity and discuss what was learned (Seropian et al., 2004). Jeffries (2005) describes debriefing as an opportunity to assess student's actions, decisions, communications, and ability to deal with the simulation. Therefore, for the pilot study, the debriefing phase of the simulation process was used and is elaborated on in the pilot study section of this paper.

SBL Student Self-confidence and Satisfaction

Self-confidence is a sense one has about their ability to carry out a desired task or function (Brown & Chronister, 2009). High stress academic environments, such as SBL, may impact performance by causing unnecessary student anxiety and thus affecting the student's self confidence levels. Anecdotal evidence suggests SBL enhances student satisfaction and self-confidence levels (Bambini, Washburn, & Perkins, 2009). Multiple research studies have found students report an increase in satisfaction and self-confidence after participating in SBL (Bremner, Abuddell, Bennett, & VanGeest, 2006; Henneman & Cunningham, 2005; Scherer, Bruce, Graves, & Erdley, 2003; Smith & Roehrs, 2009).

Bremner et al. (2006) conducted a study exploring the use of human patient simulators with baccalaureate nursing students and their perceptions of how the SBL experience affected learning, self-confidence, stress, and anxiety levels. The study explored how students felt after SBL and if it helped to decrease stress and anxiety while promoting self-confidence by preparing them to take care of patients in a real-world setting. Bremner et al. (2006) found greater than 60 percent of the nursing students felt more self-confident when taking care of patients in a real world setting after they participated in SBL exercises, while almost half of the students reported a decrease in stress and anxiety levels. The researchers concluded SBL is congruent with the NESF in promoting self-confidence and student satisfaction.

Omer (2016) studied 117 nursing students' clinical decision-making abilities, self-confidence, and satisfaction in clinical simulation. Results of the study showed an overall increase in satisfaction and self-confidence with the clinical simulation experience. Omer (2016) found participants agreed they were more confident in recognizing signs and symptoms of disease processes, as well as in developing the skills necessary to recognize a deteriorating patient.

Smith and Roehrs (2009) explored the effects of high-fidelity clinical simulation experiences with baccalaureate nursing students enrolled in a medical-surgical course. The students participated in SBL experiences involving patients with deteriorating conditions. The students completed the NLN's Student Satisfaction and Self-confidence in Learning Tool after each SBL experience. The results showed the overall satisfaction and self-confidence levels increased during the SBL experience. The researchers concluded the design characteristics of the simulation, such as clear objectives, were correlated with student satisfaction and self-confidence. Thus, exploring self-confidence and satisfaction in SBL and how certain instructional strategies may impact these levels may be beneficial.

Research on SBL indicates it is an effective teaching strategy (Gaba, 2004) that promotes critical thinking and decision-making abilities in students (DeYoung, 2003). Research suggests SBL not only encourages clinical reasoning and psychomotor skill development, but promotes emotional engagement and therapeutic communication in students (Eaves & Flagg, 2001; Howard, 2007; Jeffries & Rizzolo, 2006). However, most studies focus on SBL as the instructional strategy within itself and not on instructional strategies used within the SBL context (Ard et al., 2008; Bremner et al., 2006; Jeffries & Rizzolo, 2006). The purpose of this study was to investigate which instructional strategies used within the SBL context may enhance a students' clinical judgment during simulation experiences. Yet to best understand how instructional strategies may affect learning, one must have a sense of how learning occurs. Cognitive Load Theory (CLT) and memory are key elements that give insight as to how learning occurs.

Cognitive Load Theory and Memory

CLT is one of the fundamental theories used to understand and explain cognitive activities in the learning process, especially with learning technologies (Mayer, 2001). Historically, our understanding of CLT is rooted in Sweller's (1988) work on understanding problem solving strategies of learners. Sweller (1988) asserts cognitive resources required for complex problem solving imposed during learning can interfere with learning. The cognitive work required to figure out how to solve a problem can interfere with the ability to learn the actual principles that the problem was intending to teach (Chen, Dore, Grierson, Hatala, & Normann, 2014). To better understand CLT, the exploration of the human cognitive architecture is required.

Human cognitive architecture consists of two parts: short term or working memory (WM) and long-term memory (LTM) (Atkinson & Shiffrin, 1968). WM manipulates and processes units of information and LTM is vast and builds on what has been processed through the WM (Miller, 1956). Baddeley and Hitch (1974) built on Atkinson and Shiffrin's research stating that working memory is not a unitary system.

They go further and assert information is stored based on the type of information that is being processed (Baddeley & Hitch, 1974).

Baddeley and Hitch (1974), stated working memory consists of three major components: the central executive, the visuo-spatial sketchpad, and the phonological loop. The central executive (CE) drives the entire working memory and allocates data to the other two subsystems. The CE deals with cognitive tasks, mental arithmetic, and problem solving. The visuo-spatial sketchpad (also called the inner eye) stores and processes information in a visual or spatial form. The visuo-spatial sketchpad is used for things such as navigation. The final subsystem is the phonological loop (PL). The PL deals with spoken and written information and consists of two parts: the phonological store (also called the inner ear) and the articulatory control process (also called the inner voice). The phonological store is linked to speech perception and holds speech based information. The articulatory control process is linked to speech production and is used to rehearse and store verbal information from the phonological store.

WM and LTM interact through two processes: schema formation and automation (Cooper & Sweller, 1987). A schema is formed when pieces of information operate together as one functioning unit (Sweller, van Merriënboer & Paas, 1998). According to Sweller (1999), schemas are mental processes such as recognizing concrete objects, understanding of rules and concepts, and solving problems. Skills performance develops from the combination of elements consisting of lower level schemas into higher level schemas. Schema construction categorizes the elements of information and are stored in the LTM (Sweller et al., 1998).

LTM is stored knowledge generally organized in hierarchical schematic structures (Sweller, 1999). Changes to LTM are mediated through WM. Learners process new information from WM and build on existing information that is stored in LTM. The new information is then imported into existing schema through assimilation and/or accommodation (Kirschner, 2002).

WM is limited in capacity and duration when dealing with novel information (Sweller, 1999). WM can hold approximately seven elements, and when required to process rather than hold information, it can handle two to three elements (Sweller et al., 1998; van Merriënboer & Ayres, 2005). These elements can be verbal, visual, or auditory information or schema retrieved from LTM. Just and Carpenter (1992) expand on Sweller's research by stating WM not only is limited by capacity but also by how the information is presented pragmatically or in syntax. Therefore, WM is easily overloaded when required to process too much information and cognitive load is experienced.

When the demands of instruction exceed an individual's mental capacity, cognitive overload may occur (Moreno & Mayer, 2000). To reduce the possibility of cognitive overload, instructors are encouraged to develop learning activities that do not exceed a learner's cognitive capacity. The amount of cognitive load (CL) experienced during a given learning activity is determined by the demands placed on working memory (Plass, Kalyuga, & Leutner, 2010).

There are three dimensions to cognitive load (Table 2): intrinsic, extraneous and germane (van Merriënboer & Sweller, 2005). Intrinsic cognitive load (ICL) refers to the intrinsic nature and characteristics of the materials as well as the effort associated with it (Sweller, 1999). ICL occurs within the working memory and cannot be altered (Sweller et al., 1998). For example, sentences in a paragraph of a book cannot be altered. ICL contains both low and high elements of interactivity (Sweller, Ayres, & Kalyuga, 2011). Some information may require a low WM load and others a high WM load. Some items may be easy for one student to understand, but more difficult for another.

Table 2

Cognitive Load and Causes

Cognitive Load Type	Cause
Intrinsic	Complexity of the problem/concept and structure of instruction.
Extraneous	Inappropriate instructional design - does not focus on working memory limits and fails to use resources to construct schema.
Germane	Effortful learning results in schema construction and automation.

In contrast, extraneous cognitive load (ECL) is unnecessary information that is not relevant for learning to occur (van Merriënboer & Sweller, 2005). Examples of ECL can be multiple information sources, extra sounds, or even long complex explanations. ECL can be altered with instructional interventions and should be modified to prevent unnecessary information from causing an overload in the WM; which in turn may negatively affect the learners' storage of information (van Merriënboer & Sweller, 2005).

Germane cognitive load (GCL) refers to the mental resources devoted to acquiring and automating schemata in LTM (Sweller et al., 1998). GCL increases cognitive load but contributes to learning through schema construction (van Merriënboer & Sweller, 2005). Examples of GCL may include highlighted key words in a paragraph or organizational charts.

Impacts to Extraneous Cognitive Load

It is important for instructors to reduce extraneous cognitive load so that learning can occur. Instructors can impact extraneous cognitive load by designing instruction which eliminates elements that are not necessary for learning to occur. One such element is the split-attention effect.

Split-attention effect

The split attention effect occurs when information is presented in several formats, such as text and picture, and both sets of information are needed for complex learning to occur (Chandler & Sweller, 1992). According to Fraser et al. (2015), divided attention is often a reality in the clinical education arena. There is minimal empirical evidence of how cognitive load mediates the split attention effect, especially in SBL (Chandler & Sweller, 1992).

Fraser et al. (2015) stated split attention is a real concern for clinical practitioners, and this can especially be seen in the procedural context of SBL. In SBL, learners must divide their attention between two or more sources of information, such as the patient, monitors, computer charting, other collaborating team members, and family or supportive members. This causes the working memory resources to experience an increase in mental load. Due to this increase in mental load, it has been suggested for educators to carefully examine the way they design SBL experiences (Fraser et al., 2015). Fraser et al. (2015) implied if the SBL experience is laden with split attention sources, then integrating those sources may compromise fidelity. However, they go on to state that the combining of split attention sources will decrease the extraneous load and thus promote the learning experience.

Impacts to Intrinsic Cognitive Load

Sequencing for complex instruction

There is not much one can do to impact intrinsic cognitive load, however, one method that may impact it is the sequencing of instruction and tasks from simple to complex. Complex instruction may be difficult for some learners because it requires the learner to concurrently process multiple pieces of information and the information sources may vary (Pociask, DiZazzo-Miller, & Samuel, 2013). According to Kester, Kirschner and, van Merriënboer (2005), sequencing the order of instructional information is critical. Their study found that simultaneously presenting all necessary information had no beneficial effect on learning; however, when the instructional material was sequenced, learning was enhanced. Van Merriënboer et al. (2003) have argued sequencing is important in areas of high element interactivity, such as SBL. However, according to Mayer (2001), even when material is sequenced, inexperienced learners may need more guidance than more experienced learners in any learning domain.

Impacts to Germane Cognitive Load

Instructional design and development are key components in increasing germane cognitive load. When designing instruction, various instructional strategies should be considered to improve learning. Some of these strategies include: concept maps, cueing, feedback, and mnemonics.

Concept maps

Concept maps are learning tools designed to support instructional content. The non-linear nature of these contexts allows for access to just-in-time information and provides for a high degree of freedom, which can facilitate learning (Kester et al., 2005). According to McDonald and Stevenson (1998) concept maps minimize hypertext disorientation, thus reducing cognitive overload. However, Basque and Lavoie (2006) showed the beneficial effects of concept maps were limited based on learner motivational characteristics, the quality of the concept map, task-specific activities, and if the concept map was presented in a face-to-face manner.

Cueing

Cueing is an instructional strategy used to provide hints and feedback directly to the learner (Mayer, 2001). Studies generally show a positive effect on affect and cognitive load when cueing is utilized (Mayer, 2001; Moreno & Mayer, 2000; Sweller et al., 2011). However, Paas and van Merriënboer (1994) have argued that in order for a meaningful interpretation of a certain level of cognitive load to occur, cueing can only be given in the context of its associated performance level and vice versa. During SBL, the facilitator can help to decrease cognitive load when students are baffled, by offering cues. These cues can be in the form, such as that of a simulated doctor phone call, which gives the student just enough information to solve the problem or make a decision. Thus, I would have to agree with Paas and van Merriënboer (1994) that cueing for SBL would have to be offered in the context of the performance.

Feedback

Novice learners may lack the proper schema to integrate new information with their prior knowledge (Sweller, 1999). Feedback has been suggested as a modality to assist students in developing and transferring knowledge (Sweller et al., 1998). Most research on feedback suggests that it does work, however research on feedback about cognitive load has been controversial. Some studies found different types of feedback have different influences on cognitive load and performance (Moreno & Mayer, 2000; Sweller et al., 1998). Moreno and Mayer (2000) suggest feedback and guidance decreased cognitive load, however, other studies suggest feedback may increase germane cognitive load (Paas & van Merriënboer, 1994; Leahy & Sweller, 2008).

Fyfe, DeCaro, and Rittle-Johnson (2014), conducted a research study investigating individual differences in WM capacity and feedback as a potential moderator. Their study included 64 elementary student participants. They found WM capacity moderated the effect of feedback type on procedural transfer. They also determined participants with lower working memory capacity benefitted less from strategy feedback than outcome feedback. They inferred instructors need to consider the cognitive demand of different types of feedback. They concluded that problem solving can be improved when the learner and the learner context are taken into consideration.

There is very little research regarding feedback and cognitive demands of WM in SBL or healthcare. Fyfe et al. (2014) study leads me to believe that consideration must be given to type feedback and WM capacity. Thus, the pilot study focused on feedback as an instructional modality in SBL and is discussed further in this chapter.

Mnemonics

Mnemonics are tools that help learners develop specific ways to encode information for easy and efficient storage in memory and for recall later (Mostafa & Midany, 2017). The focus of mnemonics is to enhance the recall of the components of any lesson for which memory is needed. These strategies are not comprehension strategies, but strategies to aid the recall of new information.

According to Putnam (2015), there are several types of mnemonics used to aid memory. The link method uses visual imagery to connect items in a list and make a chain. The method of loci is another method of memory enhancement that uses visual imagery to make a mental map to information so that it is easier to retrieve. The peg system is a list of concrete items in a specific order allowing memory retrieval by connecting the object with a number. Acronyms and acrostics form new words or phrases by using the initial components in a phrase or word. Songs, stories and rhymes can also act as a mnemonic by joining elements of information together so that it can be easily remembered (Putnam, 2015).

Morris and Cook (1978) researched mnemonics and their value in improving memory and recall. They concluded the use of mnemonics is controversial at best. Levin (1993) agrees with Morris and Cook by asserting that although mnemonics were a prevalent instructional strategy in the 1980’s, their success depended on the mnemonic technique being used.

Laing (2010) examined the use of mnemonic devices to enhance learning with first-year bachelor’s degree accounting students. Three groups were tested and means of the scores from pre- and post-tests were analyzed. There was no significant difference found between the groups for the pretest; however, both treatment groups performed significantly better in the post-test than the control group. Laing (2010) concluded the use of mnemonic devices can enhance the rate at which new information is acquired as well as improve formal reasoning.

Ghani and Zulkiply (2008) tested the value of different memory techniques with undergraduate science students. They concluded that first letter mnemonics were effective for memorizing processes whereas keywords were more effective at memorizing terminology. Stalder (2005) researched the use of acronyms in an introductory psychology course. His study showed students who used acronyms scored more points on an acronym related item than those who did not use acronyms. Carney and Levin (2000) showed mnemonics led to better performance on a hierarchal relationship reasoning test as compared with the control condition.

Liu, Lan, and Jenkins (2014) studied the use of mnemonics in students learning second language vocabulary. 47 sixth graders participated in the study. Their study indicated that the experimental group performed better than the control group in terms of vocabulary gain as the post-test and the vocabulary written recall reached a level of significance ($p < .05$). The researchers found the use of mnemonics can aid in the building of second language vocabulary.

Conversely, Gruneberg (1973) studied the use of mnemonics with examination preparation in psychology students and found no significant difference in examination performance between mnemonic users and non-users. Higbee (2001) also argues that mnemonics were designed to enhance recall and not to facilitate higher order thinking. Carlson, Kincaid, Lance and Hodgson (1976) found first letter mnemonics to have no significant difference on learning performance when compared to the control condition. Carney, Levin and Levin (1994) add that first letter mnemonics will not add to recall unless students are familiar with the material. However, Putnam (2015) asserts that although research has been controversial on the use of mnemonics in education, their compatibility with other learning strategies make them beneficial for learners to employ.

CLT in Nursing

According to Reedy (2015), cognitive science theories tend to focus on learning as a social or contextual experience, looking at learning as specific and limited phenomenon. In clinical training, medical students often have difficulty performing complex tasks (Prince, Boshuizen, Van Der Vleuten, & Scherpbier, 2005). An understanding of how to design effective instruction in relation with the limitations of WM and cognitive load can assist educators in developing well-prepared instruction that facilitates knowledge storage of schema in the LTM. This can be achieved by designing instructional materials that use methods to reduce mental effort and allow learners to assimilate new information with existing knowledge (Paas & van Merriënboer, 1994; Sweller et al., 2011). An example of this can be seen in the Four Component Instructional Design (4C/ID) model (van Merriënboer, Kirschner, & Kester, 2003; van Merriënboer & Sweller 2010).

Four Component Instructional Design Model (4C/ID)

Many traditional educational programs break complex skills down into separate components, which are offered to students more or less separately (Benner, 2001). The total of each separate component is assumed to provide students with a set of tools that will enable them to perform complex tasks. In many complex environments, this approach has proved to be ineffective, because performing complex skills will always require more than simply adding the necessary parts or rote memorization (Clark & Estes, 1999). Competency learning, such as in healthcare education, requires subject material to be organized in a different manner that promotes learning processes that vary from the ones we are familiar with (Janssen-Noordman, Merriënboer, van der Vleuten, & Scherpbier, 2006).

According to Reedy (2015), simulation allows learners to practice at a level appropriate for their expertise and knowledge, allowing mistakes to be made in a safe environment, rather than in a clinical setting. In a simulation scenario, an instructor can facilitate the students to take care of a patient the best way they know how grounded on their experience and based on what they have learned in the classroom setting. By allowing students to demonstrate what they would do in a normal clinical setting, it stimulates performance and improves learning by permitting students to focus on their performance as a whole rather than on a procedure (Reedy, 2015).

As a nurse for over 20 years, it appears training of nurses focuses on a succeed or succumb approach with students. According to Reedy (2015), this idea is based on the learners being forced to deal with the complex clinical practice from the infancy of their nursing education. However, Gagne (1962), states individuals learn best from a sequenced approach of mastering simple tasks before moving on to more complex ones. Therefore, designing a simulated environment appropriate for the learner’s experience is crucial.

The 4C/ID model (van Merriënboer et al., 2003; van Merriënboer & Sweller, 2010) provides a vehicle for the promotion of complex learning, and is an evidenced based instructional design model that supports the design and development process of whole-task learning environments, such as simulation. This model has already been applied in several domains for the acquisition of complex skills like business conversation skills (Vandercruysse, Vandewaetere, Cornillie, & Clarebout, 2013) and nursing education, such as theory and skills lab training (Fastré, van der Klink, & van Merriënboer, 2010). The 4C/ID model (see Figure 3) is comprised of four major components which are interrelated and contribute to the development of complex skills. The components are learning tasks, supportive information, procedural (just in time) information, and part-task practice.

As seen in Figure 3, learning tasks consist of concrete authentic whole task experiences, organized from simple to complex that build in difficulty and variability. Supportive information encourages learning and performance of learning tasks by using consistent mental models, cognitive strategies, and feedback. Procedural (just in time) information refers to the knowledge needed to solve parts of the tasks and normally requires some form of practice. Part-task practice is presented within a cognitive context and allows for repetition to strengthen the learning (van Merriënboer et al., 2003).

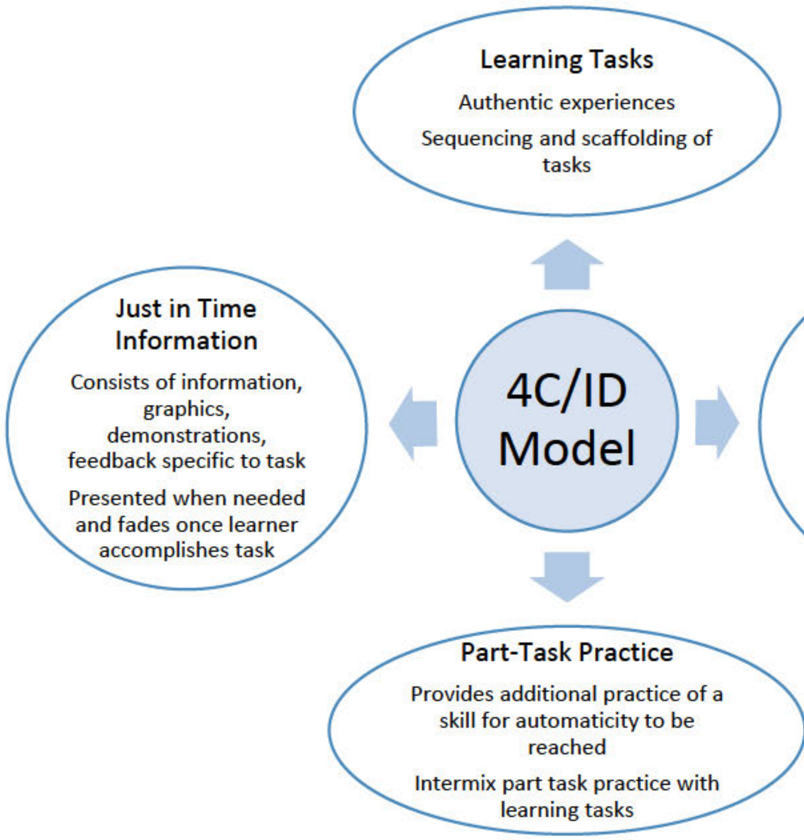

Figure 3. 4C/ID Model (adapted from van Merriënboer & Sweller (2010), "4C/ID Model").

The 4C/ID model can assist in the development of learning for simulation activities. For example, a novice nursing student is required to learn how to start an intravenous line, but as the student progresses in the program, the student will need to increase their knowledge from starting the intravenous line to learning how to administer medications through the line while monitoring the patient for any complications or adverse effects of the medication that was administered, and eventually reaching the point of knowing when or when not to administer a intravenous medication based on the patient's clinical presentation.

Using the 4C/ID model, an instructor may start the novice nursing student in the skills lab to view a demonstration and to learn how to start an intravenous line on a mannequin arm. Instructions and a demonstration are given by the instructor to the student, then the student is allowed to practice the task before attempting to perform it. The instructor is able to provide feedback and guidance to the student so the task is learned correctly.

The student then advances to the next stage, where he/she must then learn about medications that may be administered to a patient through an intravenous line for a certain diagnosis or disease process. The student is provided theory based on the disease process, pathophysiology, and medication interventions. The student is then allowed to practice administering intravenous medications on a mannequin arm in the skills lab. The instructor gives guidance and feedback to facilitate learning.

At this point the student is ready for the next level and is advanced to the clinical simulation area. Here the student is presented with a more complex scenario of a patient who is deteriorating. The student will have to use their problem-solving skills to determine whether or not to administer an intravenous medication to manage the patient's condition. The student is given supportive information such as learning objectives and expectations with their simulation pre-briefing material. This material should decrease their germane cognitive load by activating prior knowledge. The student has completed their part-task practice through repetition in the skills lab in regard to starting an intravenous line and administering medications. This should assist in decreasing their intrinsic cognitive load. Finally, in the full simulation scenario, instead of being overwhelmed with intrinsic and germane load, the student has an established schema on starting an intravenous line and administering intravenous medications. Now they can focus on the patient and how to deal with the extraneous cognitive load of the busy clinical simulation setting.

Although the 4C/ID model can work for SBL, instructors should keep in mind that the 4C/ID model can be limited and may not work for every clinically simulated scenario. For example, the instructor may wish to spontaneously incorporate a rapid response code requiring resuscitation of a simulated patient due the student in the simulation giving the simulated patient an overdose of a particular medication. The rapid response scenario would not have been built in to or designed in the scenario because it was unknown that the student would mistakenly administered too much medication during the simulation scenario activity. Therefore, the 4C/ID model should be used as a guide for SBL design and instructors should explore other methods and models based on their SBL content and context.

Since SBL is a learning environment requiring complex tasks, cognitive load can be a hindrance to the learning process. Since there is limited ability in SBL for part-task practice during the simulation scenario, the 4C/ID model suggest this limitation may impact cognitive load. AO may be one method to assist in the reduction of cognitive load during SBL experiences.

Advanced Organizers

Ausubel (1960) introduced advanced organizers as part of his cognitive learning theory. He devised the advanced organizer as a type of scaffolding for new information presented in learning to build upon a learner's prior knowledge (Ausubel, 1960). Scaffolding supports the learner by moving them from practicing the most genuine case one might encounter in the real world and progressing them to a more complex version (van Merriënboer et al., 2003). Therefore, scaffolding decreases the amount on time spent on extraneous load and reduces the overall cognitive load the student will experience (Stull & Mayer, 2007).

Advanced organizers are not overviews or simple summaries of information but are more inclusive notions that attempt to relate the generalized concepts to familiar and existing ideas in a learner's cognitive architecture (Ausubel, 1963). Deliberately introducing AO before learning material can bridge the gap between what the learner already knows and what they need to know in order to learn new material effectively and to promote meaningful learning (Ausubel, 1968).

Ausubel (1960) initially used verbal prose and text outlines as AO. Baron (1969) expanded on Ausubel's ideas and proposed the use of a graphic organizer to arrange concepts into hierarchical tree structures. Hawk, McLeod, and Jonassen (1985) further develop the idea of graphic organizers by adding pictorial elements. Other researchers have extended the advance and graphic organizer concepts to include learning from hypertext, learning in computer environments, and learning in non-text modalities (Coffey & Canas, 2002; Kang, 1996; Kenny, 1995).

Types of Advanced Organizers

According to Bulgren and Schumaker (2006), AO can be used to introduce new information and content, or can be a task planner designed to orient the learner to a specific task. Content organizers focus on giving students an overview of the content, connecting new information with prior knowledge, and illustrating how to organize the new information into already established mental models. Task planner organizers assist learners by providing cues on how to complete a task, sequencing the steps of the task, and by demonstrating the learning outcomes.

There are a variety of advanced organizers including (a) expository, (b) narrative, (c) skimming, and (d) graphic (Bulgren & Schumaker, 2006; Nesbit & Adesope, 2006). Expository AO are best used when a description of a new concept needs to be presented or to highlight important content. Narrative AO are mostly used as an anecdote that connects personal experiences or real-world events to a new concept being presented. Skimming is used as a preview of material that will occur later in the lesson. Graphic AO are tools such as flowcharts and other visual aids that assist in activating prior knowledge or imply the scope and organization of new content (Bulgren & Schumaker, 2006; Nesbit & Adesope, 2006).

AO can be simple organizers which assist the educator in providing clear instructions, introduce new material, or be a graphic explanation of content. Simple AO are instructional tools such as mnemonics and time line graphics (Bulgren & Schumaker, 2006).

Mnemonics

Mnemonics are tools used to assist or aid in memory. Mnemonics use encoding, retrieval cues, and imagery to facilitate memory storage and retrieval. Common mnemonics include first letter mnemonics, music mnemonics, and spelling mnemonics. First letter mnemonics use the first letter of what is to be learned to form an acronym for memorization, such as “HOMES” for the Great Lakes (Huron, Ontario, Michigan, Erie, and Superior). Music mnemonics are songs or jingles which help to facilitate memory storage and retrieval, such as the ABC song that is used to help children learn their alphabet. Spelling mnemonics are very common in learning correct grammar, such as “i” before “e” except after “c” (Mostafa & Midany, 2017).

Time line graphics

Time line graphics are simple tools used to represent a sequence of events or activities. These can be graphic in nature with pictures telling the sequence of events or more elaborate such as a daily planner (Gallick-Jackson, 1997).

Conversely, complex AO guide students through content which is unfamiliar to them, assists them with organizing the material into a meaningful manner, and assists them in completing complex tasks through the development of critical thinking and problem-solving skills. Complex organizers include concept maps, narrative organizers, and story boards (Bulgren & Schumaker, 2006).

Concept map

Concept maps are graphic organizers that assist in organizing complex tasks. They can assist in mapping abstract ideas to more concrete ones. These are common in healthcare fields and are used to help students organize a patient’s disease process as well as the management of that process, such as pathophysiology, symptom recognition, medication management, and interventions needed (Nesbit & Adesope, 2006).

Narrative organizers

Narrative organizers are tools used to help students learn how to improve their organization and writing skills. These are tools such as a sequenced outline for a paper, sub-topic boxes for topic development, and connection arrows to relate topics and content (Gallick-Jackson, 1997).

Story boards

Story boards use graphic and text elements to develop and sequence a story. Each story board scene builds from the previous as the action unfolds, with a resolution in the end. This type of organizer assists students to write at a higher level introducing complex concepts (Gallick-Jackson, 1997).

Organizers in Education

Early reviews of AO research stressed mixed effectiveness of the organizer. Barnes and Clawson (1975) rated 32 studies based on whether the results were statistically significant or not. Non-significant results outnumbered the significant results almost 2 to 1, leading the authors to conclude that AO do not impact meaningful learning. Ausubel (1968) criticized Barnes and Clawson’s study inclusion criteria and concluded many of the studies included in the meta-analysis did not properly construct an advance organizer. Mayer (1979) also criticized Barnes and Clawson’s methodology, and in his review of studies, concluded that AO had a small, but consistently significant impact on learning. Moore and Readence (1984) concluded organizers that required the learner to fill in an incomplete organizer had a stronger impact than organizers that were presented as complete or in final form.

Organizers in Computer-based Instruction

With the rising popularity of computer-based instruction (CBI), researchers noticed continuing issues of cognitive overload and learner disorientation in the computer-based environments (Eveland & Dunwoody, 2001; Lee & Nelson, 2005). Content that is unfamiliar or organized in an unfamiliar fashion will be learned poorly unless the individual is provided with or develops concepts or organizing principles that aid the acquisition process (Ausubel, 1963). Organizational or structural aids can help outline the structure of hypertext and be extended to organize broader hypermedia environments.

Wang and Dwyer (2004) conducted an early study on AO in CBI which compared the differences in knowledge acquisition between a college aged control group not using an organizer, a group receiving a final form concept map graphic organizer, and a group receiving a participatory concept map organizer that participants needed to complete. In the posttest measuring knowledge acquisition, the scores among the three groups did not differ. The authors believe the lack of results may be attributed to participants' lack of familiarity with concept maps and not scaffolding the use of the concept map.

Brinkerhoff, Klein, and Koroghlanian (2001) examined the effect of a structured overview graphic organizer, an unstructured overview non-advance organizer, and no organizer on learning from a hypertext computer-based instruction module. Results showed there was no significant difference in posttest scores between the organizer, the unstructured overview, and control groups. The authors believed the structure of the hypertext instructional module was so simple and well organized that the participants did not benefit from them.

Although some of the studies on AO in CBI showed little or no significant effects of various types of organizers, others show positive results. Kang (1996) studied the effect of a conceptual outline advance organizer in a simple multimedia computer simulation environment to foster metacognitive skills used by primary and middle school students. The groups were stratified by grade level, and those using the advance organizer scored significantly better on a metacognitive skills and knowledge posttest when compared to the groups who did not receive the organizer. Aslani et al. (2013) examined the effect of advanced organizers within web-based instruction on the learning and retention of concepts in chemistry courses. The results showed in terms of the level of learning, there was not a significant statistical difference between the students who received the AO (experiment group) and those who did not receive it (control group); however, the amount of retention was significantly greater in the experimental group than in the control group.

Organizers in SBL and Healthcare

The study of AO and its effectiveness in SBL and healthcare context is significantly limited. Krahn and Blanchaer (1986) investigated the efficacy of using an AO case study as a device to improve medical students' understanding of a clinical case simulation on the microcomputer and to enhance performance on a posttest. The researchers found the AO used during the treatment was effective as compared to the control group and consistent with Mayer's assimilation theory.

Mayer’s (1975) assimilation theory states for learning to occur, information must be encoded. There are two types of encoding: assimilation and addition. Assimilation is where the learner actively integrates new materials within co-existing structures. Addition is when the learner adds new material to memory so that it is isolated from other information. According to Mayer (1975), instructional strategies used before teaching lead to meaningful learning and results in a more integrated learning outcome.

Cutrer, Castro, Roy, and Turner (2011) investigated the use of a concept map as an advanced organizer to improve understanding of respiratory failure. Concept maps were used to visually represent knowledge organization. Residents were randomized by month of service to receive either a control lecture or a session using an expert concept map as an AO. Participants completed three concept maps; pre-education, immediately post-education, and one week later. Concept maps were scored using a standardized structural scoring method. The investigators concluded using an expert concept map as an AO improved knowledge organization and integration while offering a tool to enhance deeper understanding of medical knowledge among resident physicians.

These studies raise the question as to if AO and other instructional strategies, such as elaborative feedback, could be used during SBL in nursing education to enhance learning and provide a change in students' clinical judgment? There are also questions as to during which phase of the simulation process would various instructional strategies be the most effective and what type of strategy would work best? With these questions being raised, it was determined that a pilot study would need to be conducted.

Pilot Study

The use of simulation as a performance context for building clinical skills has taken on an important role in nursing education. Simulations provide a potentially meaningful context for students to learn clinical skills and critical thinking without the risk associated with live clinical performance. Encountering real-life situations in practice allows students to analyze and synthesize what they learned in theory.

Determining which phase of the simulation process would be used for the pilot study and which instructional strategy would be investigated was dictated by the population and facilities available at the time. Thus, the pilot study was limited to the debriefing phase of SBL. With using the debriefing phase of simulation, it was determined a script focusing on reflection and feedback would be the instructional strategy applied during the pilot study.

Reflection encourages a progression in thinking from lower-level activities of knowledge and comprehension to higher-level activities of analysis, synthesis, and evaluation (Bloom, 1956; Plack, Dunfee, & Rindflesch, 2008). The progression to higher level thinking for nurses is critical in the development of clinical competency and clinical judgment skills. It is an active process that requires students to analyze learning in terms of their own experiences, biases, values, beliefs, opinions, and attitudes (Boud, 1985; Mezirow, 1990). Reflection facilitates engagement in higher-order thinking (Bloom, 1956) and allows students to easily progress from the knowledge and comprehension levels to the analysis, synthesis, and evaluation levels of thinking that are so important for nursing practice (Plack et al., 2008).

Reflection-on-action

Professional practitioners acquire knowledge by gaining experience using a method of moving between reflection-on-action and reflection-in-action. Reflection-on-action (or retrospective reflection) takes place after an event occurs and is a factor in the development of practice skills (Schön, 1987). This process consists of recalling an experience that occurred for the purpose of analyzing and interpreting the experience to uncover knowledge that was gained by the experience (Schön, 1983). Knowledge bases for many fields including medicine, nursing, education, and law are developed through reflection after an action or experience has occurred (Rogers, 2001). According to Cotton (2001), reflection-on-action permits one to assess, explain, question, and evaluate the situation and action in order to gain insights for better actions in the future. Schön (1987) expands on the definition by stating reflection-on-action encourages students to develop a new understanding of themselves and the situations they have encountered.

The technique of requiring students to think about what they have experienced is used with students who are beginning to learn the reflective process. Any thinking activity that occurs after an experience encourages students to reflect-on-action (Schön, 1987). This can be seen in the nursing field during theory classes, but especially during clinical post conference and simulation debriefing activities. The pilot study examined reflection strategies used during simulation debriefing to determine if it would impact the development of clinical competency and clinical judgment in pre-licensure nursing students.

Reflection is an important concept in nursing education today (Burton, 2000; Chong, 2009; Epp, 2008). It strives to promote nursing curricula which produce nurses who are able to base their practice on critical thinking, who are good clinical decision makers, and who are lifelong learners (Chong, 2009). Reflection is seen as a method of developing nurses' knowledge to meet patients' needs and of creating nurses who are critical thinkers (Burton, 2000). By reflecting on their own practice, nursing students can start to make sense of the theory they learned in the classroom by applying it in the clinical situation (Epp, 2008). Therefore, reflection bridges the gap between theory and practice by enabling the creation of nursing knowledge from experience (Burton, 2000; Duke & Appleton, 2000).

Guided reflection allows educators to detect gaps in students' thinking, follow students' train of thought, gain insight into students' rational for judgment decisions, and identify factors to promote learning (Stokes & Kost, 2009). However, there is limited research regarding reflection in nursing simulation. Hsu (2007) reports the best practices for debriefing in simulation is still in its infancy and under investigation.

Cheng et al. (2013) studied debriefing scripts in simulation. The study was conducted over four years with 387 participants from various healthcare fields. Participants were randomized into non-scripted and scripted groups. The study demonstrated participants exposed to the scripted debrief performed better than the non-scripted groups during subsequent simulations. The researchers concluded the use of a script as a debriefing tool could increase learner outcomes. They stipulated the findings could be generalized to other groups since the participants were from a multidisciplinary healthcare sample.

From previous research, it appears reflection and feedback have a positive impact on students in theory classes. However, there is limited research available as to how reflection may influence a clinical or procedural performance. Therefore, a pilot study was conducted to research the impact of reflection by elaborate feedback on subsequent simulation performance; in other words, feedback from the prior SBL experience which can be used as an instructional strategy to promote learning and knowledge transfer to the next SBL experience.

Participants

Associate degree nursing students who were enrolled in Medical Surgical I and Medical Surgical II courses at a proprietary institution school of nursing in the southeastern United States who use simulation learning experiences were the purposive target population for the pilot study. This population was selected because they had progressed from a foundational level in the nursing program to the more advanced medical surgical courses. The participants ranged from 19-58 years of age.

The students were enrolled in existing clinical and theory courses covering acute care adult health issues. Simulation experiences were an existing component of the clinical requirements for each course, with simulation experience counting up to 50% of the students' clinical grade and authentic clinical experiences counting as the remainder of the clinical grade. The study was introduced to the students during clinical orientation, which was conducted in October 2016. The academic term was 12 weeks in duration. Participation in the pilot study was a course requirement, however participation in the study was voluntary and did not have any effect on the students' grades or status in the program. Students were not penalized if they chose not to participate or if they withdraw from the study.

Instrumentation

A demographic questionnaire was used to collect descriptive data including age, gender, term in school, healthcare experience, current GPA, and hours spent studying. Two instruments were used to measure the quantitative data in this study. The Creighton Competency Evaluation Instrument (C-CEI®) and Debriefing Assessment for Simulation in Healthcare – Student Version (DASH©SV).

Creighton Competency Evaluation Instrument (C-CEI®)

The C-CEI® (Appendix A) was developed as an instrument to gauge the effectiveness of clinical learning in a simulation environment by the faculty at the Creighton University College of Nursing. This instrument is widely used in over 190 organizations world-wide.

The C-CEI® focuses on 22 general nursing behaviors that are divided into one of four categories: (a) *Assessment*, (b) *Communication*, (c) *Clinical Judgment*, and (d) *Patient Safety*. Under the *assessment* category nursing behaviors include identifying pertinent data and objectives, follow up, and environment assessment. Communication includes collaborating with the providers, the patient and their family, documentation, and professionalism. Clinical judgment behaviors include interpreting vital signs, lab results and relevant data, prioritizing outcomes, intervention performance and evaluation, reflection, and delegation. The last category, patient safety, includes nursing behaviors involving patient identifiers, standard precautions, safe medication administration, equipment management, technical performance, and reflection on hazards or errors (Hayden, Keegan, Kardong-Edgren, & Smiley, 2014).

Five nursing programs assisted with reliability and validity testing of the C-CEI®. Using a standardized validation questionnaire, faculty rated the C-CEI® on its ability to accurately measure student performance and clinical competency. Videos scripted at three levels of performance were used to test reliability. Content validity was rated on a four-point scale Likert-like scale and ranged from 3.78 to 3.89. Cronbach's alpha was > .90 when used to score three different levels of simulation performance. According to Hayden et al. (2014), the C-CEI® is useful tool for evaluating both the simulation and traditional clinical environments.

Scores on the C-CEI® were used as a pre-treatment and post-treatment measurement of clinical competency skills. This instrument measured the student’s clinical competency skills during the simulation activity.

Debriefing Assessment for Simulation in Healthcare – Student Version (DASH©SV)

The DASH was developed at the Center for Simulation (Brett-Fleegler et al., 2012) to address the need for a debriefing instrument that may be utilized in various settings in simulation-related health-care education. The DASH©SV (Appendix B) is used for rating quality of instruction during debriefing. There are six elements of behaviors in the criterion-referenced rating scale which define how the instructor performed and they are as follows: (a) establishes an engaging learning environment, (b) maintains an engaging learning environment, (c) structures debriefing in an organized way, (d) provokes engaging discussions, (e) identifies and explores performance gaps, and (f) helps students achieve or sustain good performance. Individuals rated the elements using a 7-point scale, the scores ranged from 1 to 7. The anchors for the scale were 7-*Extremely effective/Outstanding*, 6-*Consistently effective/very good*, 5-*Most effective/good*, 4-*Somewhat effective/average*, 3-*Somewhat ineffective/poor*, 2-*Mostly ineffective/very poor*, and 1-*Extremely ineffective/abysmal* (Brett-Fleegler et al., 2012). For this study, the DASH©SV will be used to explore student responses to components of the debriefing processes.

151 international health-care educators participated in 4.5-hour interactive DASH rater training session to provide validity evidence. Only 114 trainees' ratings were analyzed from the two training sessions involving three rounds of ratings. The participants included a broad range of health professionals and educators from community-based hospitals to academic medical centers. The means for each of the videos that were rated were compared using a one-way repeated–measures analysis of

variance comparing three video types: poor, average, and superior. The differences for the ratings across the three-standardized debriefing were statistically significant with overall means of 2.18, 4.77, and 5.35 for the poor, average, and superior videos, respectively. These ratings indicate that differentiation between the quality of debriefing was effective using the DASH©SV (Brett-Fleegler et al., 2012).

Inter-rater reliability was assessed using the same 114 rater trainees' ratings at the element level and the overall mean of the six elements and intra-class correlation coefficients. The intra-class correlation coefficient for the six elements ranged from .57 to .68 with the overall coefficient of .74. Cronbach's coefficient alpha was calculated using the average video data. This video was the most difficult to rate and hence was selected for estimating internal consistency. The resulting Cronbach coefficient alpha was reported as .89, which is a strong indicator of internal consistency (Brett-Fleegler et al., 2012).

Pilot Study Research Questions

Pilot Study Research Question One

Is there a difference in clinical judgment during simulation activities, as measured by the C-CEI®, between students who receive debriefing with the reflective debriefing script (RDS) and students who receive the traditional standardized debriefing script (TSDS)?

Pilot Study Research Question Two

Do nursing students perceive a difference in the quality of debriefing, as measured by the DASH©SV, when using the RDS process during debriefing compared to the TSDS process?

Variables

Independent Variable

The independent variable was the RDS used during debriefing with two levels, control and treatment. The treatment group received RDS debriefing after each simulation experience. Faculty used the template provided (see Appendix C) to cue participants. The control group received the TSDS debriefing method that was currently used by the school of nursing, which consisted of a brief instructor led review of the simulation scenario with a limited knowledge based question and answer period.

Dependent Variables

There were two dependent variables. The first was competency levels measured by the C-CEI® using the pre-treatment measure as a covariate for a baseline treatment measure and the post-treatment measure. The second was the level of the perceived differences in the quality of debriefing as evaluated by nursing students in each group using the DASH©SV.

Procedures for the Pilot Study

Permission (Appendix D) for the pilot study from the proprietary school of nursing as well as IRB approval was obtained (Appendix E). For the pilot study, the faculty teaching simulation clinical was notified of the details of the study during the first week of the pilot study. The faculty who work in the simulation area completed training on the C-CEI® and on the RDS template. I met with the faculty members and provided them with an opportunity to ask questions about the study.

After the faculty completed training, participants were recruited and informed of the study. Participants were provided with an informed consent to the research through a participant consent form (Appendix F). Demographic data were collected. All simulation courses had a treatment and a control group. All participants were assigned a number to protect confidentiality.

Clinical schedules were preset by the department of nursing at the proprietary institution. Based on the schedule, it was deemed appropriate by the faculty and this researcher for Medical Surgical Course I and Medical Surgical Course II to participate in the study. Students had been pre-separated into groups by the school of nursing faculty for all clinical experiences as follows: Medical Surgical Course I, four groups with eight students each, Medical Surgical Course II, two groups with six students each. Because the groups were already matched by the school of nursing, the researcher gave each group in Medical Surgical Course I and Medical Surgical Course II a number. The numbers were then randomly drawn to determine which groups were going to be assigned as treatment groups and which groups were going to be assigned as control groups.

Participants in the treatment groups were given the RDS debriefing immediately after the simulation experience and the control group were given TSDS debriefing immediately after simulation activities. The faculty measured the student's competency skills using the C-CEI®. The first simulation experience was used to collect baseline data as this study's pre-treatment measurement (no intervention) with the C-CEI® being completed on each participant. All subsequent simulation experiences counted as post-treatment measurement with the C-CEI® being completed on each participant. During the last simulation debriefing experience, all participants were asked to complete the DASH©SV. A focus group was held with the faculty post data analysis to explore the faculty's experiences with using structured reflective debriefing and their thoughts on how it impacted the students' clinical competency abilities.

Due to the risk of bias by the simulation instructors scoring the C-CEI® pre- and post-treatment measures, an additional rater was obtained to blind score the simulation activities. Inter-rater reliability scores were obtained for the pilot study with pre-treatment scoring using the C-CEI® during the training of the instructors for the study and on the use of the C-CEI® instrument. The score was 90.9% with the instructors and myself rating 10 simulation exercises with the C-CEI®. During the comparison, all items on the C-CEI® had 100% agreement except for item number 6 with a 30% agreement, item number 16 with a 30% agreement, and item number 17 with a 40% agreement. Due to inconsistency in agreement on these three items, it was decided to use the "not applicable" selection on the C-CEI® for all participants on these items. Inter-rater reliability by the rater performing the blind scoring was also obtained with a score of 92%.

Data Analyses

Quantitative data analysis was performed by describing the general research questions. An analysis of covariance (ANCOVA) was used to measure the differences between the treatment and control groups on the dependent variables C-CEI® post treatment measure and post treatment blind score ratings. Independent t-tests were conducted to analyze the DASH©SV. IBM Statistical Package for the Social Sciences (SPSS) was used to conduct the statistical analysis and a p value at or less than .05 was considered to be statistically significant.

Qualitative data related to the faculty's experiences with using RDS versus TSDS debriefing was collected to provide insight to students' clinical judgment and competency. The focus group participant responses were coded to the open-ended questions using Creswell's (2013) data analysis steps. The data was analyzed for significant statements relating to the impact of clinical competency and debriefing with the instructional strategies. The meaning statements were summarized into themes. Significance was determined by the theme amount of use in the transcripts. Focus group interviews suggested using guided reflection during debriefing provoked more in-depth discussion and led to deeper reflection on student performance than the TSDS.

Quantitative Data Analysis and Results

The pilot study had a 100% participation rate. No missing data was identified. The final sample size was 44 participants.

An independent t-test was conducted to compare the perceived quality of debriefing for the control group (TSDS) and the treatment group (RDS). There were significant differences across all DASH©SV elements as can be seen in Table 3. The difference in the means (mean difference = 1.045 – 1.409, 95% *CI:* -.570 - -1.929*)* was very large (*d*=1.45).

A one-way between groups analysis of covariance was conducted to compare the effectiveness of two different interventions designed to improve students' competency scores during simulation activities. The independent variable was the type of intervention (control group = TSDS; treatment group = RDS), and the dependent variable consisted of scores on the C-CEI® after intervention was completed. Participants' scores on the pre-intervention administration of the C-CEI® were used as the covariate in this analysis.

Table 3

Means and Standard Deviations of DASH©SV Elements by Group

DASH Element	Group	*M*	*SD*
DASH E1	TSDS	5.36	0.90
DASH E1	RDS	6.41	0.79
DASH E2	TSDS	5.32	0.94
DASH E2	RDS	6.55	0.73
DASH E3	TSDS	5.05	0.99
DASH E3	RDS	6.27	0.76
DASH E4	TSDS	5.36	0.90
DASH E4	RDS	6.73	0.55
DASH E5	TSDS	5.32	1.04
DASH E5	RDS	6.45	0.80
DASH E6	TSDS	5.18	0.95
DASH E6	RDS	6.59	0.74

Note: DASH©SV represents the Debriefing Assessment for Simulation in Healthcare – Student Version.

Preliminary checks were conducted to ensure there were no violations of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression of slopes, and reliable measurement of the covariate. After adjusting for pre-intervention scores, there was a significant difference of post-intervention scores on the C-CEI®, F (1, 41) = 110.11, p = .0005, d = 2.50. There was a strong relationship between the post-intervention scores on the C-CEI®, as indicated by a partial eta squared value of 0.78 (Table 4).

Table 4

Post Intervention Scoring on C-CEI®

Source	*df*	*F*	*P* (<.001)	Partial Eta Squared
Corrected Model	2	74.54	.005	0.78
Intercept	1	33.71	.005	0.45
CCEIPRE	1	27.31	.005	0.40
Group	1	110.10	.005	0.72
Error	41			
Total	44			
Corrected Total	43			

Note: C-CEI® represents the Creighton Competency Evaluation Instrument.

To further test for biases due to raters, the blind rating scored C-CEI®, were also analyzed. As with the initial ratings, preliminary checks were conducted to ensure there were no violations of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression of slopes, and reliable measurement of the covariate. After adjusting for pre-intervention scores, there was a significant difference of post-intervention scores on the C-CEI®, F (1, 41) =94.30, p = .0005, d = 2.59. There was a strong relationship between the post intervention scores on the C-CEI®, as indicated by a partial eta squared value of .76 (Table 5).

Table 5

Post Intervention Scoring on C-CEI® - Blind Rating

Source	*df*	*F*	*P* (<.001)	Partial Eta Squared
Corrected Model	2	64.21	.005	0.75
Intercept	1	29.08	.005	0.41
CCEIPRE	1	20.27	.005	0.33
Group	1	94.30	.005	0.69
Error	41			
Total	44			
Corrected Total	43			

Note: C-CEI® represents the Creighton Competency Evaluation Instrument.

Based on the results of the pilot study, it was evident that reflective scripts used as instructional strategies during debriefing did enhance clinical competency and judgment skills in pre-licensure nursing students by helping students to organizer their schema for subsequent SBL encounters. After observing the simulation activities of the participants, I noticed some students had difficulty during the pre-briefing phase of the SBL process. I could not determine from the pilot study if these difficulties were from the students being unprepared, if there was a lack of prior knowledge or activation of prior knowledge, or if this could be related to a form of cognitive load issue. In addition, from observations during debriefing, students who were familiar with the instructors facilitating the debriefing may have been biased on some of the *DASH©SV* elements, as can be seen in Table 3 *DASH©SV* element 5.

Grounded on these discoveries, questions began to form as to if the pre-briefing phase of the simulation could impact decisions made during the simulation scenario by students which would impact their clinical judgment and ultimately affect their debriefing reflection period. Therefore, I was curious as to if the use of an AO as an instructional strategy used during the pre-briefing phase of SBL, could enhance the learning process by activating prior knowledge, increase pattern recognition, and decrease cognitive load. Additionally, consideration had to be given regarding if there were other instruments available to test for clinical judgment and student perceptions during simulation that would better suit a study concentrating on the pre-briefing phase of simulation as compared to the debriefing phase. Therefore, to answer some of these unresolved questions, this study will expand on the pilot study by examining the pre-briefing phase of the simulation process. An investigation will focus on AO used as instructional strategies during the pre-brief phase of the simulation process to see if it the AO will potentially activate prior knowledge, increase pattern recognition, decrease cognitive load, and impact students' clinical judgment during SBL.

Chapter Summary

There is a need for research that focuses on the pedagogy of learning and the development of clinical judgment and competency skills in nursing (Dreifuerst, 2015; Benner, 2001; Tanner, 2006). The results of the literature surrounding SBL in pre-licensure nursing are still unclear. More rigorous research is needed to establish the effect of instructional strategies in SBL on student outcomes.

This review was divided into four sections. The first section focused on clinical judgment and competency, Benner's (2001) theory on developing expertise in nursing, Tanner's (2006) model of clinical judgment, and their importance to nursing education. The second area described simulation learning and how these areas are critical to the production of nurses who can make appropriate decisions to promote safe patient outcomes. The next section expounded on cognitive load theory, memory, 4C/ID model, and AO. The last area explained the pilot study and how its data led to the focus of this study on AO in SBL.

This study proposes to gather an understanding of AO instructional strategies used during SBL on clinical judgment and competency. Literature supports the use of simulation in the development of clinical judgment, critical thinking and competency skills. However, research here indicates that the use of AO as an instructional strategy which could enhance learning during SBL by activating prior knowledge is unknown. Furthermore, the use of AO in SBL to increase pattern recognition and decrease cognitive load is controversial.

Some research suggested the inherent difficulty of intrinsic cognitive load is related to the interactivity elements required by the learner and not all material is intrinsically difficult for the learner (Kirschner, 2002). Learning vocabulary words for a new language may have a low interactivity level and require a low working memory load, whereas incorporating the vocabulary into sentence and paragraph structure for discussion may increase the interactivity and working memory load. For nursing, learning the fundamentals of signs and symptoms of a disease process will incorporate a low interactivity, whereas, incorporating the signs and symptoms of a disease process into the care of a simulated patient requires high interactivity and an increased cognitive processing load.

According to Sweller et al. (1998), we can cheat working memory by knowing that visual information, such as a mnemonic, and auditory information, such as a worked-out concept map with discussion, when presented simultaneously can be processed without creating an additional load on the working memory. Furthermore, intrinsic load is also reduced when individuals have a strong prior knowledge or schema. However, determining if AO can aid in decreasing cognitive load is at best controversial. Kirschner, Sweller, and Clark (2006) suggested where the intrinsic load of content may be high, presenting new information, such as an advanced organizer, may create an additional load on the working memory and decrease the learner's problem-solving ability. Conversely, Sweller et al. (1998), suggested goal free problems can avoid the issue of increasing the load of the working memory by using methods that avoid a means to an end approach, as can be seen with worked examples and concept maps.

Kester et al. (2005), stated reducing cognitive load methods, such as feedback and advanced organizers, are effective in producing high retention of material. For example, the use of an AO such as a first letter mnemonic is simple and requires a low working memory load, therefore making it a low interactivity element. The mnemonic aids memory, but because it requires little effort from the working memory, it minimally increases cognitive load. However, using a high interactivity element, such as a concept map or graphic organizer, to structure information and organize it for recall, requires more effort from the working memory, which may increase cognitive load more so than the low interactivity element. Kester et al. (2005) go further to state that high interactivity elements can become automated over time as they organize schema for recall from the long-term memory.

Bjork and Bjork (2011) argued items that make learning easy during instruction, such as a low interactivity advanced organizer, do not always lead to long term learning. They go on to state that by creating conditions which are difficult, such as using a high interactivity advanced organizer or concept map, lead to greater long-term retention and better transfer because they require immediate performance. Furthermore, Sweller et al. (1998) adds what overloads the mind of the novice may not overload the mind of the expert.

When learners can construct schema and automate those schemas, effective learning occurs. Automation then steers behaviors and actions, freeing up the working memory. As learners become familiar with content and tasks, schemas change so that information can be handled by the brain more efficiently. For instructors to be aware of which instructional strategies impact cognitive load both positively and negatively, they can design instruction that will effectively enhance learning. Therefore, this study attempts to determine if the use of two different types of AO (mnemonic, concept map) during SBL will help to free up working memory by decreasing cognitive load, and thereby increase the learning experience of the student.

Additionally, the study of the effects of AO as an instructional strategy used during SBL and whether it will impact students' clinical judgment, satisfaction and self-confidence is unknown. The impacts of the AO on novice versus more advanced or expert learners are also unknown. Therefore, this study expands on previous work and attempts to make links between learning theory, SBL, AO instructional strategies, and how those strategies effect the development of student clinical judgment, satisfaction and self-confidence, and perception of cognitive load. In chapter III, the methodology for the study design, including research design, participants, methods, and procedures are discussed.

CHAPTER III

METHODOLOGY

In this chapter, I discussed the research design and methodology for this study. It begins with the research hypothesis and questions, followed by the design and methodology. In the methodology section the participants, independent and dependent variables, instrumentation, along with treatment materials and procedures used during this study are described.

Research Questions, Hypotheses, and Expectations

The aim of my study was to test the research questions related to the learners' development of clinical judgment, satisfaction and self-confidence levels, and perceptions of cognitive load during SBL experiences. The specific research questions with their corresponding hypothesis and expectation for the results are identified as follows:

Research Question One

What are the independent and combined effects of NPS experience level and type of advanced organizer on clinical judgment performance scores of pre-licensure nursing students during SBL as measured by LCJR?

Hypothesis 1.1

NPS experienced group participants will have higher clinical judgment performance scores than NPS novice group participants during SBL as measured by the LCJR.

Hypothesis 1.2

There will be a difference in clinical judgment performance scores during SBL as measured by the LCJR, based on the type of advanced organizer used during the pre-briefing phase of SBL.

Hypothesis 1.3

NPS novice group participants will have higher clinical judgment performance scores when they use a mnemonic during the pre-briefing phase of SBL, whereas NPS experienced group participants will have higher clinical judgment performance scores when they use a concept map during the pre-briefing phase of SBL

Expectation

According to Driscoll (2004), learning depends on the cognitive processing capacity of the learner. The use of AO can assist in activating prior knowledge and would therefore decrease the cognitive load of the student to enhance learning. It was my expectation there would be a decrease in cognitive load and an increase in clinical judgment performance of NPS novice pre-licensure nursing students who participate in SBL using a mnemonic compared to a concept map. I believed the mnemonic would provide a simple way to aid in activating prior knowledge and would be beneficial to the novice learner by not overwhelming their cognitive load capacity. The concept map was expected to assist students in organizing the patient's information for the SBL experience and therefore would decrease the cognitive load required for learning. The concept map was better suited for the NPS experienced group students who would already have a knowledge base to build upon. Therefore, both the mnemonic and concept map should increase clinical judgment performance scores based on the LCJR. However, it was expected the NPS novice group students would have an increase in clinical judgment performance scores using a mnemonic and the NPS experienced group students would benefit more from the concept map during SBL.

Research Question Two

What are the independent and combined effects of NPS experience level and type of advanced organizer used during SBL on student's satisfaction and self-confidence as measured by the NLN-SSLS?

Hypothesis 2.1

NPS experienced group participants will have higher student satisfaction with SBL as compared to NPS novice group participants.

Hypothesis 2.2

NPS experienced group participants will have higher self-confidence with SBL as compared to NPS novice group participants.

Hypothesis 2.3

Participants will have higher satisfaction with a mnemonic versus a concept map.

Hypothesis 2.4

Participants will have higher self-confidence with a mnemonic versus concept map.

Hypothesis 2.5

NPS novice group participants will have higher satisfaction and self-confidence when using a mnemonic as compared to a concept map; whereas NPS experienced group participants will have higher satisfaction and self-confidence when using a concept map as compared to a mnemonic.

Expectation

Based on the pilot study, there were significant differences across all DASH©SV elements during the debriefing process with the use of a guided reflection AO versus traditional standardized debriefing in SBL. The difference in the means (mean difference = 1.045 – 1.409, 95% *CI:* -.570 - -1.929*)* was very large (eta squared = .28 - .46). It was anticipated, grounded on the pilot study, there would be an increase in student satisfaction and self-confidence during a clinical simulation scenario by students using a concept map compared to a mnemonic during the simulation pre-briefing, as measured by the NLN-SSLS (Taylor, 2017). Students in the NPS experienced group should be less overwhelmed than students in the NPS novice group when using a concept map instead of a mnemonic because they have prior knowledge on which to build schema upon. Therefore, it is anticipated the students in the NPS experienced group would have higher satisfaction and self-confidence when using the concept map and NPS novice group students would have higher satisfaction and self-confidence when using a mnemonic.

Research Question Three

What are the independent and combined effects of NPS experience level and type of advanced organizer on pre-licensure nursing student's perceptions of their cognitive load during SBL as measured by the cognitive load assessment survey?

Hypothesis 3.1

NPS experienced group participants will have lower perceived cognitive load with SBL as compared to NPS novice group participants.

Hypothesis 3.2

The perceived load with the use of a concept map will be higher than the perceived load with the use of a mnemonic.

Hypothesis 3.3

NPS novice group participants will have a higher perceived cognitive load with the use of a concept map versus a mnemonic; whereas NPS experienced group participants will have less of a perceived cognitive load with the use of a concept map.

Expectation

I believe the NPS experienced group students using a concept map compared to a mnemonic during the simulation pre-briefing would have the perception of a lower cognitive load during SBL as measured by the cognitive load assessment survey. According to Nesbit and Adesope (2006), concept maps are commonly used in the healthcare field to assist in mapping abstract ideas into more concrete ones. Therefore, it was anticipated that the NPS experienced group students would perceive the complex AO (concept map) more beneficial to learning because it may assist them to organize materials for better recall and schema formation, than the simple AO (mnemonic) which is used as a memory aid for recall. Conversely, it was anticipated the NPS novice group students would perceive the mnemonic a greater benefit to learning because it may aid their recall and memory without causing excessive cognitive load demands.

Research Design

This study used a mixed methods sequential design approach. The quantitative research was a quasi-experimental factorial comparison group design which investigated the impact of participant NPS experience level (novice versus experienced) and type of AO (a mnemonic compared to a concept map), used during the simulation pre-briefing phase, on participants' clinical judgment performance scores, perception of self-confidence and satisfaction, and perception of cognitive load. This experimental design was advantageous because the researcher was allowed to test for the effects produced by each of the two independent variables, as well as for interaction effects (Christensen, Johnson, & Turner, 2011).

The format for this design (see Table 6) included a pretest measure to set a baseline for the research study, two categorical independent variables (IV1 = NPS experience level – novice or experienced; IV2 = type of AO – mnemonic or concept map), and a posttest measure. This design allowed me to investigate the independent variables simultaneously, along with their individual and combined effects on the dependent variables (clinical judgment performance scores, satisfaction and self-confidence, and perception of cognitive load). Students were pre-assigned to clinical groups by the school of nursing based on their course level and clinical instructor. Students had a preset schedule with clinical and simulation dates and times.

Table 6

Factorial Comparison Group Research Design

Group	Pretest Measure	Treatment IV1	Treatment IV2	Posttest Measure
G1	O_1	X_{T1}	Z_{T1}	O_2
G2	O_1	X_{T1}	Z_{T2}	O_2
G3	O_1	X_{T2}	Z_{T1}	O_2
G4	O_1	X_{T2}	Z_{T2}	O_2

Satisfaction and self-confidence were tested using the NLN Student Satisfaction and Self Confidence in Learning Scale (NLN-SSLS) (Appendix G). Clinical judgment performance scores were assessed using the Lasater Clinical Judgment Rubric (LCJR) (Appendix H). After the SBL learning experience, students were given a survey to examine their perceptions regarding cognitive load in SBL (Appendices I and J). In addition to the quantitative approach, a qualitative approach was used with a short semi-structured focus group interview during the debriefing phase of the SBL experience (see Appendix K).

Participants

Associate degree nursing students at a proprietary school in the Southeastern United States enrolled in Foundations of Nursing, Medical Surgical I, and Medical Surgical II courses using simulation learning experiences were the purposive target population for this research. I chose this population to study because it encompassed a beginner level, an intermediate level, and a more experienced level of student in the nursing program. Simulation experiences were an existing component of the clinical requirements for each course, with simulation experiences counting up to 50% of the student's clinical grade and authentic clinical experiences counting as the remainder of his or her clinical grade.

The Foundations of Nursing course is the initial nursing course the pre-licensure nursing students are required to take. This course encompassed an introduction into the nursing process and nursing assessment. It is a basic course in which the novice student learns about nursing and how to become a nurse. According to Benner (2001), a novice is a beginner with no experience who are taught general rules to help them perform tasks, are rule driven, and inflexible. These students had zero to five SBL experiences within the nursing program. Participants in the Foundations of Nursing course were considered the NPS novice group for this study.

The Medical Surgical I course is a more advanced course than the novice Foundations in Nursing course. In this course, students learn about disease processes and how to care for patients with those diseases. Students learn how to apply the nursing process and their assessment skills to patient care. This was considered to be an intermediate level course. These students had six to nine SBL experiences within the nursing program. For this study the Medical Surgical I course was considered part of the NPS experienced group. Benner's (2001) concepts for the advanced beginner can be adapted to this group, which is where students demonstrate acceptable performance of tasks, have gained prior experience in patient care situations, and have formed schema from principles learned to guide their actions.

The Medical Surgical II course was the advanced level course in the program. In this course students learn additional disease processes and how to take care of patients at a more advanced level, with minimal guidance. According to Benner (2001), students in this group may be considered to be advanced beginners to competent. At the competent level students are more aware of long term goals and they gain perspectives from planning their own actions based on their problem solving and clinical judgment skills. These students had twelve to eighteen SBL experiences within the nursing program. Participants in this course were also considered under the study's NPS experienced group.

An *a priori* power analysis was conducted to determine an appropriate sample size for the study (Lipsey, 1990). The *a priori* for the study was determined by using a G-Power analysis (Faul, Erdfelder, Buchner, & Lang, 2009). A power analysis was used using Lipsey's (1990) recommendation, the alpha or significance level (α) was set at $p = .05$, a power of 0.80, and an estimated effect size *f .40*, which is a large effect size and was determined from the pilot study results. Based on the G-Power analysis, a total of 73 subjects was estimated to be needed for the study (Table 7).

Table 7

Power Analysis to Determine Sample Size for ANOVA

Measure Effect Size	a Priori (.40 Large)
Effect Size	0.40
Alpha (α) err prob	0.05
Power (1-βerr prob)	0.80
Numerator *df*	3.00
Number of groups	4.00
Number of covariates	1.00
Noncentrality parameter λ	12.00
Critical F	2.74
Denominator *df*	68.00
Total sample size	73.00
Actual power	0.80

Participants (*N*=99) in this study were enrolled in one of three nursing courses, Foundation in Nursing, Medical Surgical I, and Medical Surgical II. As seen in Table 8, participants ranged in age from 19 to 58 years of age with predominantly more women than men. Approximately 52% of participants in Medical Surgical II course had 25 or more months of healthcare experience as compared to the Medical Surgical I (40%) and Foundations in Nursing courses (28%).

As seen in Table 8, for the Foundations in Nursing course 6% of healthcare experience was students who were EMTs or paramedics, 13% were LPNs, 31% were medical/nursing assistants, 11% were military medics/corpsman, and 39% had no healthcare experience. For the Medical Surgical I course, 6% of healthcare experience was students who were EMTs or paramedics, 20% were LPNs, 40% were medical/nursing assistants, 6% were military medics/corpsman, and 28% had no healthcare experience. For the Medical Surgical II course 8% of healthcare experience was students who were EMTs or paramedics, 13% were LPNs, 56% were medical/nursing assistants, 5% were military medics/corpsman, and 18% had no healthcare experience.

As seen in Table 8, approximately 30% of the Medical Surgical II course spent 16 or more hours studying as compared to the Medical Surgical I (21%) and Foundations in Nursing courses (21%). The Medical Surgical II course participants also had more clinical and simulation experience than the Medical Surgical I and Foundations in Nursing courses (see Table 8).

Table 8

Demographic Profile of Participants

Characteristic	Characteristic Detail	Foundations in Nursing (*N*=46)	Medical Surgical I (*N*=30)	Medical Surgical II (*N*=23)
Age in years	19-28	18	10	9
	29-38	20	16	9
	39-48	8	4	4
	49-58	0	0	1
Gender	Female	41	28	20
	Male	5	2	3
	Other	0	0	0
Healthcare Experience in Months	0-6	20	10	4
	7-12	3	0	5
	13-18	6	4	1
	19-24	4	4	1
	25 or more	13	12	12
Type of Healthcare Experience	EMT/Paramedic	3	2	2
	LPN	4	4	3
	Medical/Nursing Assistant	16	14	13
	Military Medic/Corpsman	4	2	1
	None	19	8	4
Hours Spent Studying	0-5	13	5	6
	6-10	10	6	9
	11-15	13	10	3
	16 or more	10	9	5
Number of Simulation Experiences within the Nursing Program	0-5	46	0	0
	6-10	0	30	0
	11-15	0	0	1
	16 or more	0	0	22
Number of Clinical Experiences within the Nursing Program	0-5	43	0	0
	6-10	3	29	0
	11-15	0	1	1
	16 or more	0	0	22

Protection of Human Rights

Ethical issues must be addressed within the research design being used for this study. Institutional Review Board (IRB) approval (Appendix L) for the study was obtained from the University of South Alabama and as well as permission from the proprietary institution (Appendix M). The participants in the study gave their consent prior to their participation in the study. The consent process included all the potential issues related to each type of data collection, as well as any issues with participant anonymity and confidentiality, and the right to withdraw. A copy of the consent form was provided (Appendix N) to the participant. The above protocols were followed to ensure the protection of human rights.

Every effort was made to maintain participant anonymity and confidentiality. All completed data forms are kept in a locked office. All data forms were coded, and data collected was reported as aggregate data.

The participation in simulation exercises was a course requirement and students participating in the study were required to participate in the same simulation scenarios as scheduled per the program of nursing. Each participant had an equal chance of being in the comparison or treatment group. Minimal to no risks were expected for participants of the study.

Facilities and Equipment

The proprietary institution had one main building with two high-fidelity simulation laboratories. Each simulation laboratory contained a high-fidelity simulation mannequin and equipment that mimicked the hospital environment of a patient’s room including but not limited to monitors, drug carts, computers for charting, hospital bed, and intravenous pumps.

Materials

The treatment materials used in the study included a mnemonic and concept map based on the nursing assessment process, and are described below. The participants also received the traditional standardized pre-briefing material required by the school of nursing which included a brief patient history, the patient's diagnosis, medications, laboratory results, and diagnostic findings such as x-rays.

The mnemonic (see Figure 4) used in the study was a frequently used first letter mnemonic and AO in nursing. It was given to participants in the treatment group as an aid for memory recall of the nursing assessment process. The first letter mnemonic forms an analogy *"A Delicious PIE"*. The first column of the mnemonic was the first letter used to form the analogy. The second column represented the stage of the nursing assessment process. The last column represented what the student needed to look for in each stage. For example, A = Assessment = look at the patient's symptoms, key diagnostic findings (such as labs), and causes. The mnemonic was given to the individual students in the treatment group during the pre-briefing phase of the SBL experience. The students had an opportunity to review the mnemonic prior to the simulation activity. It was anticipated the mnemonic would stimulate prior knowledge and recall of the nursing assessment process to aid students during the simulation scenario, and thereby decrease their cognitive load.

MNEMONIC – NURSING ASSESSMENT

Instructions: Please use the first letter mnemonic below to assist you in remembering the steps in the nursing assessment process.

A DELICIOUS P I E

A	ASSESSMENT	Symptoms Key diagnostic tests Causes
D	DIAGNOSIS	Disease process Pathophysiology
P	PLANNING	Goals
I	IMPLEMENTATION	Medications Nursing Care and Interventions
E	EVALUATION	Outcomes

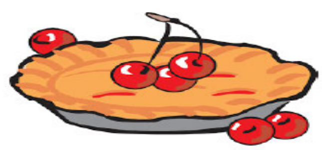

Figure 4. Mnemonic of the Nursing Assessment Process forms an analogy of the nursing process to stimulate recall.

The concept map was a frequently used AO in nursing. The concept map used for this study was given to the comparison group and focused on the nursing assessment process (see Figure 5). The concept map was more complex than the mnemonic. It was given to participants in the comparison group and required them to organize the patient's information into the corresponding circles with the diagnosis in the center to drive all the other information. For example, if the patient had a diagnosis of heart failure the student may write "shortness of breath" and "edema" in the symptoms circle and "BNP 5400" in the key diagnostic test circle. Once the information had been organized, the AO was anticipated to aid the participant with organizing schema, and thus decrease their working memory and the cognitive load.

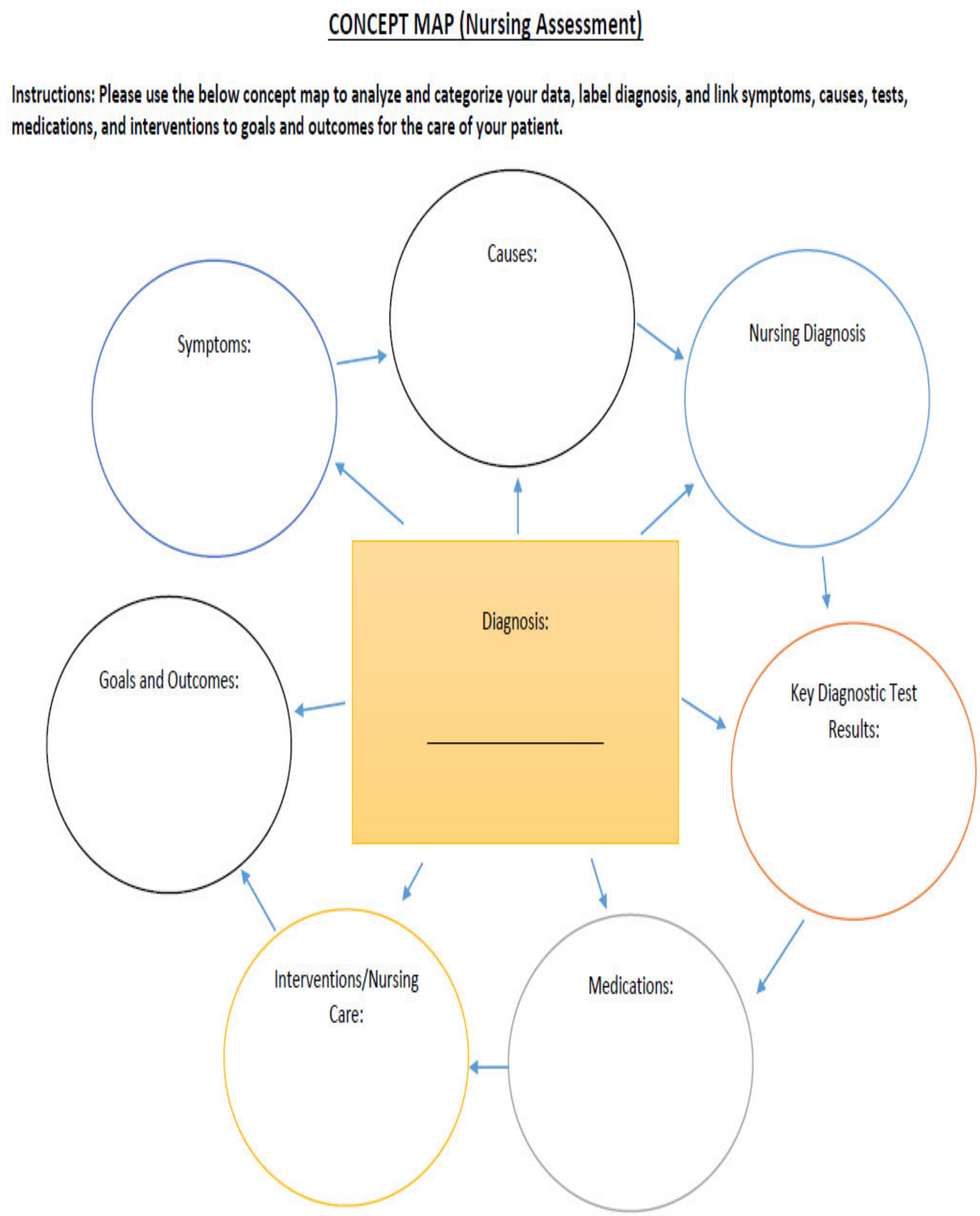

Figure 5. Concept Map of the Nursing Assessment Process provides a template to assist in information organization.

Variables of the Study

This study included two categorical independent variables, each with two levels, and three dependent variables as listed below.

Independent variables

The first independent variable was participant NPS experience level in the nursing program based on their course level. The treatment group was the NPS novice group learners, which consisted of participants enrolled in the Foundations of Nursing course. The comparison group was NPS experienced group students, which consisted of participants enrolled in Medical Surgical I and Medical Surgical II courses.

The second independent variable was the type of AO used during the SBL pre-briefing phase with two levels. The two levels were the treatment group (mnemonic) and the comparison group (concept map). The treatment group participants received the mnemonic before each simulation experience during the pre-briefing session of the simulation process. They also received the traditional standardized pre-briefing materials currently used by the school of nursing, which included a pre-briefing form with the simulated patient's condition and included but was not limited to diagnosis, age, gender, medication list, imaging reports, lab results, and physician orders. The comparison group received a concept map before each simulation experience during the pre-briefing session of the simulation process. They also received the traditional standardized pre-briefing materials currently used by the school of nursing, which included a pre-briefing form with the simulated patient's condition and included but was not limited to diagnosis, age, gender, medication list, imaging reports, lab results, and physician orders.

Dependent variables

There were three dependent variables. The first dependent variable was clinical judgment performance scores as measured by the LCJR, using the pre-treatment measure to form a baseline treatment measure, and then as a post-treatment measure during the simulation activity assessment. The second dependent variable was student satisfaction and self-confidence as measured by the NLN-SSLS. The third dependent variable was the perception of cognitive load as measured by the cognitive load assessment survey (see Appendices I and J).

Instrumentation

A demographic questionnaire was used to collect descriptive data which included age, gender, term in school, healthcare experience, current GPA, hours spent studying, number of simulation experiences within the nursing program, and number of clinical experiences within the nursing program. A semi structured focus group interview was also used during the debriefing phase to collect qualitative data. Three instruments were used to collect the quantitative data in this study: the LCJR, the NLN-SSLS, and the Cognitive Load Assessment Survey.

The Lasater Clinical Judgment Rubric (LCJR)

LCJR (Lasater, 2007) has four stages of clinical judgment ability: (a) *Noticing*, (b) *Interpreting*, (c) *Responding*, and (d) *Reflecting.* There are 11 items that fall under the four stages. The LCJR is scored using a 4-point scale based on clinical judgment ability with a 4 indicating *exemplary*, a 3 indicating *accomplished*, a 2 indicating *developing*, and a 1 indicating *beginning ability* (Lasater, 2007, p. 501). Total scores range from 11-44 with higher scores reflecting stronger clinical judgment ability than the lower scores.

For this study a total score of 36-44 indicated *exemplary,* a total score of 28-35 indicated *accomplished,* a total score of 20-27 indicated *developing, and* a total score of 11-19 indicated *beginning ability*.

The four stages of clinical judgment become four subscales with each containing specific indicators. The first stage, noticing, is defined by the nurse’s ability to conduct focused observation, recognize deviations from expected patterns and seek information. The second stage, interpreting, is defined by the nurse’s ability to set priorities and make sense of data. Responding is the third stage and is defined by the nurse’s calm, confident manner, clear communication, well-planned interventions, flexibility, and skillfulness. The last stage, reflecting, is defined by the nurse’s ability to evaluate and self-analyze a given situation, along with developing a commitment for improvement. Four levels of ability are identified as beginning, developing, accomplished and exemplary. The goal for each of the descriptors in the rubric was to identify behaviors and verbalizations indicative of a student’s understanding and ability, as well as non-understanding and inability in the clinical judgment process (Lasater, 2007).

Previous researchers have used the LCJR as a valid and reliable tool for the measurement of clinical judgment. The LCJR was found to have good internal consistency with results ranging from 0.88 to 0.97 (Adamson, Gubrud, Sideras, & Lasater, 2012; Jensen, 2012). Inter-rater reliability ranged from 0.73 to 0.89 (Adamson et al., 2012).

NLN Student Satisfaction and Self Confidence in Learning Scale (NLN-SSLS)

The NLN-SSLS is an 8-item instrument measuring how confident students feel about the skills and knowledge used during SBL. It was developed for the NLN-Laerdal study. Content validity was established by nine clinical experts in nursing, with cognitive gain being measured by comparing scores on multiple choice tests related to caring for a post-operative adult patient. Two parallel forms of the tests were developed by nurse experts to mimic NCLEX-RN® type questions. One form was given prior to student participation in simulation, the other was given after completion of the simulation. Content validity was established by three experienced faculty. During the NLN-Laerdal study, knowledge was gained as evidenced by the pretest and posttest scores ($p < 0.001$), indicating learning occurred. Reliability tested with a Cronbach's alpha 0.87 (Jeffries & Rizzolo, 2006).

Cognitive Load Assessment Scale

The Cognitive Load Assessment Scale was adapted from Leppink et al. (2013) Assessment of Cognitive Load Scale. Their scale was a ten-item inventory using a ten-point semantic rating scale designed for non-problem based learning. It was later adapted to problem based learning environments. Reliability tested with Cronbach's alpha 0.78 to 0.95, which reflected the high reliability of the measure. For this study, this tool was adapted from the problem based learning designed tool by inserting the type of AO and simulation in place of the problem based learning context. The scale for the adapted tool followed suite with the adapted problem based learning context and consisted of three factors, intrinsic cognitive load, extraneous cognitive load, and perceived learning by the participant.

Procedures for the Study

The faculty teaching simulation clinical were given details of the study during the first week of the clinical rotation. They completed training on the LCJR and were given the AO. I met with the faculty members and provided them with an opportunity to ask questions about the study.

After the faculty completed training, participants were recruited and informed of the study. Participants were provided with the study information, a consent form (Appendix N), and consented to participate in the study by completing the demographic data form (Appendix O). All simulation courses had a treatment and a comparison group. All participants were assigned an identification number to protect anonymity and confidentiality.

Clinical schedules were preset by the department of nursing at the proprietary institution. Students were pre-separated into groups by the school of nursing faculty for all clinical experiences based on course level. The treatment group and the comparison group were assigned to a particular simulation room. Simulation activities based on the same simulation scenario ran in rooms A and B simultaneously.

The participants were enrolled in one of three preexisting nursing courses. Because the classes were pre-existing, random assignment could not be used. Christensen et al. (2011) suggest searching the literature and situational factors of the study to determine the variable most relevant to the study. In review of the literature, it was found that student experience level in the nursing program had the most significant impact (Benner et al., 2010). The participants were initially grouped by the school of nursing based on their course level (Foundations of Nursing, Medical Surgical I, and Medical Surgical II). Participants were then placed into groups based on their clinical instructor.

Participants in the treatment group were given a mnemonic during the pre-briefing phase immediately before the simulation experience, as well as the traditional standardized pre-briefing material. Participants in the comparison group were given a concept map during the pre-briefing phase immediately before the simulation experience, as well as the traditional standardized pre-briefing material. The faculty measured the participants' clinical judgment performance using the LCJR. The first simulation experience was used to collect baseline data as this study's pre-treatment measurement (no intervention), with the LCJR being completed on each participant. All subsequent simulation experiences counted as post-treatment measurement with the LCJR being completed on each participant. After each simulation experience, all participants were asked to complete the NLN-SSLS as well as the cognitive assessment survey. A semi-structured focus group interview was completed during the debriefing phase of the SBL experience with participants.

The LCJR (Lasater, 2007) was used as the assessment tool to score clinical judgment. I, along with the other raters, were trained on the use of the LCJR. Inter-rater reliability scores were then obtained for the study with a pre-treatment scoring using the LCJR during the training of the instructors for the study. Each instructor rated ten simulation exercises with the LCJR. The scores were then compared to attain an inter-rater reliability score of 0.95. Once the inter-rater reliability was successfully established, the study was implemented.

Data Analyses

Quantitative data analysis was performed by describing the general research questions. A three-way repeated measure analysis of variance (ANOVA) was used to measure the differences between the treatment and comparison groups on the dependent variable LCJR (blinded pretest and blinded posttest scores) with post hoc follow-up. A two-way analysis of variance (ANOVA) was conducted to analyze the NLN-SSLS with post hoc follow-up. A multivariate analysis of variance (MANOVA) was conducted to analyze the cognitive assessment survey with post-hoc follow-up. IBM SPSS was used to conduct the statistical analysis with a *p* value at or less than 0.05 being considered statistically significant. Qualitative data analysis used a semi-structured focus group interview during the debriefing phase with participants to identify emerging themes and to gain further understanding of the quantitative data.

Chapter Summary

This study used a mixed methods approach. The quantitative research design was a factorial comparison group design. The independent variables were participant experience level in the nursing program with two levels (NPS novice and NPS experienced) and type of AO used during pre-briefing phase with two levels (mnemonic and concept map). There were three dependent variables: clinical judgment performance scores, student satisfaction and self-confidence level, and perception of cognitive load during SBL. The qualitative approach included a semi-structured focus group interview during the debriefing phase of SBL to gain further insight. This chapter discussed the study and the research used. The potential benefits of this study were to gain insight into how certain instructional strategies used during the simulation pre-briefing phase could enhance pre-licensure nursing students' clinical judgment and prepare them for real world patient care situations. The results of the study will be discussed in the chapter IV.

CHAPTER IV

RESULTS

The purpose of this study was to investigate the effects of NPS experience level and type of AO on the learners' development of clinical judgment, satisfaction and self-confidence levels, and perceptions of cognitive load during SBL experiences. In chapter IV, I provide the data analysis, including descriptive and inferential statistical analysis, with a focus on the three main research questions.

The quantitative results were organized by research question. IBM-SPSS Statistics was used to analyze the quantitative data for this study because of its multivariate capabilities. An alpha level of 0.05 was used to determine statistical significance. The qualitative results were organized by emergent themes found in the semi structured focus group interview.

Quantitative Results

Research Question One

What are the independent and combined effects of NPS experience level and type of advanced organizer on clinical judgment performance of pre-licensure nursing students during SBL as measured by LCJR?

Research question one hypotheses were tested by conducting a mixed 2 (type of AO – mnemonic, concept map) x 2 (experience level – novice, experienced) x 2 (LCJR pretest, posttest) analysis of variance (ANOVA) to test for independent and combined effects of NPS experience level and type of AO on clinical judgment performance scores as measured by the LCJR. The within subjects factor was clinical judgment performance scores with two measurement points (pretest and posttest). There were two between-subjects factors. The first factor was NPS experience level (NPS novice as one group and NPS experienced as the comparison group). The second factor was type of AO (mnemonic as one group and concept map as the comparison group). Sphericity was assumed, with the variances of the differences between all combinations of related groups being equal. However, Levene's test of equality of variance was significant for the LCJR pretest blind score $p < .001$, and the LCJR posttest blind score $p < .001$, thus homogeneity was violated. Therefore, further analysis of the results which tested the differences within the differences were conducted. The results were interpreted cautiously and found the heterogeneity to be caused by the restriction in the range of scores on the LCJR. This will be discussed further in chapter V.

Hypothesis 1.1 stated that NPS experienced group participants would have higher clinical judgment performance scores than NPS novice group participants during SBL as measured by the LCJR.

As expected, there was a there was a main effect of NPS experience level on clinical judgment performance pretest-posttest scores, F (1, 97) = 155.01, $p < .001$, eta squared = 0.01. As can be seen in Table 9, overall NPS experienced group participants scored significantly higher than NPS novice group participants on posttest.

Table 9

Clinical Judgment Performance Scores for NPS Experience Level

LCJR Measure	NPS Experience Level	N	*M*	*SD*
Pretest	Novice	46	11.63	0.71
Posttest	Novice	46	12.54	0.69
Pretest	Experienced	53	19.74	4.28
Posttest	Experienced	53	21.38	4.96

Note: NPS is the abbreviation used in this study for Nursing Program Simulation.

Hypothesis 1.2 stated that there would be a difference in clinical judgment performance scores during SBL as measured by the LCJR, based on the type of advanced organizer used during the pre-briefing phase of SBL.

The interaction effect of pretest-posttest and type of advanced organizer was not significant, F (1, 95) = 0.71, p = 0.40, eta squared = 0.01. Hypothesis 1.2 was not supported, there were no differences in pretest-posttest scores based on type of advanced organizer used during the pre-briefing phase of SBL.

Hypothesis 1.3 stated NPS novice group participants would have higher clinical judgment performance scores when they used a mnemonic during the pre-briefing phase of SBL, whereas NPS experienced group participants would have higher clinical judgment performance scores when they used a concept map during the pre-briefing phase of SBL

There was a significant interaction effect between pretest-posttest scores, type of AO, and experience level, F (1, 95) = 7.97, p = 0.01, eta squared = 0.08. As can be seen in Table 10, there were no differences in posttest scores for NPS novice group participants based on type of AO used, whereas NPS experienced group participants showed a higher posttest score with the use of a concept map versus a mnemonic.

Table 10

Clinical Judgment Performance Scores for NPS Experience Level and Type of AO

	Mnemonic		Concept Map	
Clinical Judgment Posttest Score for NPS Experience Level	*M*	*SD*	*M*	*SD*
Novice	12.70	0.77	12.39	0.58
Experienced	21.08	5.11	21.67	4.89

Note: NPS is the abbreviation used in this study for Nursing Program Simulation and AO is the abbreviation used in this study for Advanced Organizer(s).

In order to follow up on the interaction, a series of t tests were performed to determine the size of the pretest-posttest differences in NPS experience level and type of AO. Table 11 shows follow up comparisons in light of the three-way interaction. As can be seen in Table 11, NPS novice group participants showed no difference, but the NPS experienced level participants showed a greater difference with a concept map as compared to a mnemonic. Thus, the hypothesis was partially supported. The students in the NPS experienced group showed greater performance gains with the concept map. However, even though the means were in the appropriate direction, there was no difference for the NPS novice students.

Table 11

Pretest-Posttest Differences for Type of AO and NPS Experience Level

	Mnemonic		Concept Map			
LCJR Pretest-Posttest for NPS Experience Level	*M*	*SD*	*M*	*SD*	*t-value*	*p*
Novice	1.13	0.87	0.69	0.70	1.86	0.07
Experienced	1.23	0.99	2.04	1.53	-2.27	0.03

Note: NPS is the abbreviation used in this study for Nursing Program Simulation and AO is the abbreviation used in this study for Advanced Organizer(s).

Research Question Two

What are the independent and combined effects of NPS experience level and type of advanced organizer used during SBL on student's satisfaction and self-confidence as measured by the NLN-SSLS?

Hypotheses for research question two were tested by conducting a two-way ANOVA for independent and combined effects of NPS experience level and type of AO on student's satisfaction and self-confidence, as measured by the NLN-SSLS. Cronbach's alpha was done to determine the reliability of the NLN-SSLS. Cronbach's alpha for satisfaction was 0.83 and Cronbach's alpha for self-confidence was 0.79, both demonstrating an acceptable reliability level.

Hypothesis 2.1 stated NPS experienced group participants would have higher student satisfaction with SBL as compared to NPS novice group participants. The analysis yielded no significant main effect for satisfaction level with SBL based on NPS experience level, F (3, 95) = 0.16, p = 0.69.

Hypothesis 2.2 states NPS experienced group participants would have higher self-confidence with SBL as compared to NPS novice group participants. There was no significant main effect in self-confidence level with SBL based on NPS experience level, *F* (3, 95) = 0.46, *p* = 0.50.

Hypothesis 2.3 states participants would have higher satisfaction with a mnemonic versus a concept map. There was no significant main effect for satisfaction with SBL based on type of advanced organizer, *F* (3, 95) = 0.84, *p* = 0.36.

Hypothesis 2.4 stated participants would have higher self-confidence with a mnemonic versus concept map. There was no significant main effect in self-confidence with SBL based on advanced organizer type, *F* (3, 95) = 0.01, *p* = 0.92.

Hypothesis 2.5 stated NPS novice group participants would have higher satisfaction and self-confidence when using a mnemonic as compared to a concept map; whereas NPS experienced group participants would have higher satisfaction and self-confidence when using a concept map as compared to a mnemonic.

The analysis yielded a statistically significant interaction effect for NPS experience level and type of AO on both satisfaction, *F* (3, 95) = 103.18, *p* <.001, eta squared 0.72; and self-confidence, *F* (3, 95) = 68.21, *p* = <.001, eta squared 0.70. Because the interaction between NPS experience level and type of AO on satisfaction and self-confidence was statistically significant, I chose to focus on the difference among NPS experience level and type of AO on satisfaction and self-confidence separately.

Pairwise comparisons were performed for satisfaction and demonstrated NPS novice group participants were more satisfied with the use of a mnemonic (*M*= 4.68, *SD* = 0.31) than a concept map (*M*= 3.99, *SD* = 0.29), whereas NPS experienced group participants were more satisfied with the use of a concept map (*M*= 4.72, *SD* = 0.35) over a mnemonic (*M*= 3.89, *SD* = 0.49). This supported hypothesis 2.5.

Pairwise comparisons were performed for self-confidence and demonstrated NPS novice group participants had more self-confidence with the use of a mnemonic (M= 4.51, SD = 0.37) over a concept map (M= 3.95, SD = 0.19), whereas the NPS experienced group participants were more self-confident with a concept map (M= 4.56, SD = 0.39) as compared to a mnemonic (M= 3.99, SD = 0.36). This also supported hypothesis 2.5.

Research Question Three

What are the independent and combined effects of NPS experience level and type of advanced organizer on pre-licensure nursing student's perceptions of their cognitive load during SBL as measured by the cognitive load assessment survey?

Hypotheses for research question three were tested by conducting a two-way multivariate analysis of variance (MANOVA) with post-hoc follow-up to investigate the independent and combined effects of NPS experience level and type of AO on participants' perception of cognitive load as measured by the cognitive load assessment survey. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity, with no serious violations noted. Two factors of perceived cognitive load were tested: the first factor was AO perceived load, and the second factor was SBL perceived load. Cronbach's alpha for the Cognitive Load Assessment AO perceived load was 0.89, and Cronbach's alpha for the Cognitive Load Assessment SBL perceived load was 0.71. Both Cronbach's alphas are in the acceptable range for reliability.

Hypothesis 3.1 stated NPS experienced group participants would have lower perceived cognitive load with SBL as compared to NPS novice group participants. The analysis showed a main effect with the level of AO perceived load based on NPS experience level F (3, 95) = 296.08, p <.001, eta squared 0.72. As can be seen in Table 12, the NPS novice group participants had a higher perceived load regardless of AO type as compared to the NPS experienced group participants who showed no difference.

Table 12

AO Perceived Load for NPS Experience Level

NPS Experience Level	AO Type	*N*	*M*	*SD*
Novice	Mnemonic	23	7.72	0.48
Novice	Concept Map	23	8.45	0.18
Experienced	Mnemonic	26	6.26	0.77
Experienced	Concept Map	27	6.29	0.59

Note: NPS is the abbreviation used in this study for Nursing Program Simulation.

The analysis also showed a main effect of SBL perceived load based on NPS experience level F (3, 95) = 351.32, p <.001, eta squared 0.73. As can be seen in Table 13, NPS novice group participants showed a higher perceived load regardless of AO type, whereas NPS experienced group participants showed no difference.

Table 13

SBL Perceived Load for NPS Experience Level

NPS Experience Level	AO Type	*N*	*M*	*SD*
Novice	Mnemonic	23	7.55	0.29
Novice	Concept Map	23	8.42	0.22
Experienced	Mnemonic	26	6.11	0.59
Experienced	Concept Map	27	6.21	0.63

Note: NPS is the abbreviation used in this study for Nursing Program Simulation.

Hypothesis 3.2 stated the perceived load of participants would be higher with the use of a concept map as compared to a mnemonic. There was a main effect of AO perceived load based on type of AO F (3, 95) = 13.12, p <.001, eta squared 0.03. As can be seen in Table 14 participants AO perceived load was higher with a concept map than with a mnemonic. There was also a main effect of SBL perceived load based on type of AO, F (3, 95) = 24.97, p <.001, eta squared 0.05. Table 14 shows SBL perceived load was higher with a concept map as compared to a mnemonic.

Table 14

Perceived Load for Type of AO

		AO Perceived Load		SBL Perceived Load	
AO Type	***N***	*M*	*SD*	*M*	*SD*
Mnemonic	49	6.63	1.45	6.88	1.42
Concept Map	50	7.37	1.36	7.46	1.67

Note: AO is the abbreviation used in this study for Advanced Organizer(s).

As will be seen below, a significant interaction required further qualification for NPS experience level and type of AO.

Hypothesis 3.3 stated NPS novice participants would have a higher perceived cognitive load with the use of a concept map versus a mnemonic; whereas NPS experienced group participants would have less of a perceived cognitive load with the use of a concept map.

There was an interaction effect on AO perceived load based on NPS experience level and AO type, F (3, 95) = 11.32, p <.001, eta squared 0.03; as well as an interaction effect of SBL perceived load based on NPS experience level and AO type, F (3, 95) = 15.68, *p* <.001, eta squared 0.03.

Pairwise comparisons demonstrated NPS novice group participants had less of an AO perceived load when using a mnemonic (*M*= 7.72, *SD* = 0.48) than using a concept map (*M*= 8.45, *SD* = 0.18) which supported hypotheses 3.3. However, the NPS experienced group showed no difference in AO perceived load with the use of a concept map (*M*= 6.29, *SD* = 0.59) as compared to a mnemonic (*M*= 6.26, *SD* = 0.77). Hypothesis 3.3 was somewhat supported, with NPS novice group participants but not with the NPS experienced group participants as shown above.

Pairwise comparisons also showed NPS novice participants had less of a SBL perceived load when using a mnemonic (*M*= 7.55, *SD* = 0.29) than using a concept map (*M*= 8.42, *SD* = 0.22). However, the NPS experienced group showed no difference in SBL perceived load with the use of a concept map (*M*= 6.21, *SD* = 0.63) as compared to a mnemonic (*M*= 6.11, *SD* = 0.59). Again, hypothesis 3.3 was somewhat supported, with NPS novice group participants but not with the NPS experienced group participants for SBL perceived load.

Qualitative Results

Semi-structured focus group interviews were conducted during the debriefing phase of the SBL experience. The focus group included participants from both NPS novice and NPS experienced groups, with each participant having received either the mnemonic or the concept map during the SBL experience. I inductively analyzed the responses from the focus group interviews. Open coding was used to determine emergent themes through interim analysis. The responses from the focus group interviews was used to gain insight into the quantitative data results and will be discussed further in chapter V. The focus group interview questions, with emergent themes, and example responses are shown in Table 15.

Table 15

Participants' Responses to Focus Interview by Theme

Interview Question	Theme	Participant Group	Example Responses
Did you like using the pre-briefing material/AO during the pre-briefing phase? Why or why not?	Satisfaction	Novice	"I didn't like using the concept map, it took too much time to complete and was just too much to remember."
		Novice	"I like using the mnemonic, it helped me remember the nursing process a lot easier during the sim."
		Experienced	"I liked using the concept map, but wish I had more time with it."
Do you feel the use of the pre-briefing material/AO during the pre-briefing phase added to or decreased your mental effort during the simulation experience?	Self-confidence	Experienced	"I think we need more time with the material prior to the sim to help our mental effort."
		Novice	"The material is good, but sometimes it is hard to get everything completed in time during the pre-brief. If we could get the material ahead of time, maybe a few days, then we could have time to study and review it more."

(*Table 15 continued)*

Interview Question	Theme	Participant Group	Example Responses
Do you feel the use of the pre-briefing material/AO during the pre-briefing phase helped your performance during the simulation experience? Why or why not?	Satisfaction	Novice	"I think my scores went up using the mnemonic. I didn't have to think about the nursing process, it was just easier to recall."
	Self-confidence	Experienced	"The concept map helped me to get better organized before going into the simulation. I think I did much better with during the sim with the concept map than without it. It just made it easier to prioritize in the sim."
What did you like best and/or least about the use of the pre-briefing material/AO during the pre-briefing phase? Why?	Satisfaction	Experienced	"I feel like the material helps to prepare me for sim. I like the use of the concept map because it helped me to think through different areas of care such as how the labs relate to some medications."
	Self-confidence	Novice	"I don't think the material helps too much. I think the sim is just an experience and we have to make mistakes and learn from them in the sim."

(*Table 15 continued)*

Interview Question	Theme	Participant Group	Example Responses
Do you feel the use of the pre-briefing material/AO during the pre-briefing phase would benefit other phases of the simulation process (such as debriefing)? Why or why not?	Satisfaction	Novice	"I think it would. Our debriefing process varies by instructor. This could help each instructor to ask us the same questions."
		Experienced	"I am not sure how the material would work in a different phase. If it is used during debriefing it may not help us with the sim, especially if our sim is scheduled for later in the week."
Do you feel the use of an advanced organizer such as a mnemonic or concept map would help you in your studies in the future? Why or why not?	Satisfaction	Novice	"I think any type of aid would help in my studies. I like the mnemonic because it is easier to use."
		Novice	"I am not sure how a concept map would work with my studies, but I think mnemonics can help me remember things."
	Self-confidence	Experienced	"I think the concept map gave me confidence and if it could be applied to test preparation that would help tremendously."

(*Table 15 continued)*

Interview Question	Theme	Participant Group	Example Responses
Do you have anything else you would like to add about the simulation experience, the advanced organizers, and/or the pre-briefing material used?	Satisfaction	Novice	"I really liked the material and the advanced organizer. I felt like it helped me during the sim. The pre-briefing material is ok, but sometimes it does not let you know everything you need to know before going in to the sim and sometimes seems like busy work."
		Experienced	"I liked the concept map. It was nice to actually be able to get my thoughts organized and to be able to think through the process of patient care before going into the sim. The only thing I would change would be more time to prepare for the sim and to have the same instructor."

Two themes emerged, satisfaction and self-confidence. Participants mentioned in the interviews that the use of AO were beneficial in decreasing the effort it took to remember items and organize thoughts. Participants also thought AO improved scores or either thought scores would improve with the use of an AO during SBL. These findings will be discussed further in chapter V.

Chapter Summary

The purpose of this mixed methods sequential design approach study was to investigate the effects of NPS experience level and type of AO on clinical judgment performance scores, satisfaction and self-confidence, and perception of cognitive load during SBL of pre-licensure nursing students. This study was designed to answer three main research questions. This chapter summarized the results from the quantitative and qualitative data analysis.

The first research question focused on the independent and combined effects of NPS experience level and AO on clinical judgment performance scores. As expected, there was a significant difference found on NPS experience level and clinical judgment performance pretest-posttest scores. Conversely, there was not a significant difference found with AO and clinical judgment performance scores. However, there was a significant interaction effect with NPS experience level and AO on clinical judgment performance scores. The analyses supported hypotheses 1.1 showing a main effect of NPS experience level on clinical judgment performance with NPS experienced group participants scoring higher than NPS novice group participants. However, hypothesis 1.2 was not supported with the analysis showing no difference in clinical judgment performance based on type of AO. Hypothesis 1.3 was also supported and showed an interaction between NPS experience level and AO type with the NPS experienced group showing higher scores with the use of a concept map as compared to the use of a mnemonic. Of note, Levene's test of equality of variance was significant, thus homogeneity was violated. Therefore, further analysis of the analyses results was performed to test the differences within the pretest-posttest differences between type of AO and each NPS experience level. The results were interpreted cautiously and found the heterogeneity to be caused by the restriction in the range of scores on the LCJR. The results will be discussed further in chapter V.

The second research question focused on the independent and combined effects of NPS experience level and AO on satisfaction and self-confidence. There were no significant differences noted in satisfaction level with SBL based on NPS experience level nor in satisfaction with SBL based on type of AO. There were also no significant differences in self-confidence level with SBL based on NPS experience level nor in self-confidence with SBL based on AO type. Therefore hypothesis 2.1, 2.2, 2.3, and 2.4 were not supported. However, there was an interaction effect of NPS experience level and type of AO that was significant for both satisfaction and self-confidence, thereby supporting hypothesis 2.5. NPS novice group participants were more satisfied and had higher self-confidence with the use of a mnemonic as compared to a concept map; whereas NPS experienced group participants were more satisfied and self-confidence with the use of a concept map than the use of a mnemonic.

The third research question focused on the independent and combined effects of NPS experience level and AO on perception of cognitive load during SBL. Hypothesis 3.1 was supported with main effects being shown with NPS novice group participants demonstrating a higher AO perceived load and SBL perceived load than NPS experienced group participants. Hypothesis 3.2 was also supported with main effects being shown based on type of AO and perceived load with participants showing a higher AO perceived load and SBL perceived load with the use of a concept map than a mnemonic. Hypothesis 3.3 showed an interaction effect with perceived load on NPS experience level and type of AO. Both AO perceived load and SBL perceived load were higher for NPS novice participants with the use of a concept map as compared to the use of a mnemonic, however NPS experienced group participants showed no differences in AO perceived load or SBL perceived load with the type of AO used.

Qualitative analysis was conducted with a semi-structured focus group interviews during SBL debriefing. Participants from both the NPS novice group and NPS experienced group participated. Two themes emerged, satisfaction and self-confidence. These results will be discussed further in the next chapter.

The research questions, hypotheses, and data analyses results are discussed in more detail in chapter V and presented with conclusions and recommendations for future research.

CHAPTER V

DISCUSSION

In this chapter, I discuss the results of this study and present an overview of the findings. This chapter begins with a brief summary of the study. It is followed with a discussion of the findings for the research questions and a supposition of the results. This chapter separates the findings into two sections, quantitative and qualitative findings. It is followed by implications for instructional design, limitations and strengths of the study, and recommendations for future research. I concluded with the chapter summary.

Summary of the Study

The aim of this study was to investigate the independent and combined effects of NPS experience level and type of AO on pre-licensure nursing students' clinical judgment performance scores, satisfaction and self-confidence level, and perceptions of cognitive load in SBL. The study used both quantitative and qualitative methods to collect data and investigated three research questions. A discussion of the findings for the three questions follows.

Discussion of Quantitative Findings

Research Question One

What are the independent and combined effects of NPS experience level and type of advanced organizer on clinical judgment performance scores of pre-licensure nursing students during SBL as measured by LCJR?

For research question one I hypothesized participants in the NPS experienced group would score higher on clinical judgment performance scores during simulation activities than the NPS novice group. I anticipated the use of an AO would affect pretest and posttest scores. I also expected the combination of an AO offered during the pre-briefing phase of SBL, along with NPS experience level, would improve clinical judgment performance scores during the simulation scenario activity. It was anticipated participants in the NPS experienced group would do better using a high interactivity AO, such as a concept map, and the NPS novice group would benefit more with the use of a low interactivity AO, such as a mnemonic.

As mentioned in the results section of the previous chapter, there was a significant effect of NPS experience level on clinical judgment performance scores. Conversely, the effect for type of AO on clinical judgment scores was not significant. However, there was a significant interaction effect of NPS experience level and type of AO on clinical judgment performance scores. These results supported hypotheses 1.1, and 1.3, but not hypothesis 1.2.

As expected students with NPS experience did better during the simulation scenario than students who were NPS novices. According to Benner (1994), experienced nurses, who have practiced for years, are able to recognize critical changes in their patient's conditions more rapidly than a novice nurse who just stepped into clinical practice. For this study, this process is applied to students in the nursing program. NPS novice students have not encountered situations to build prior knowledge or schema, and therefore should not score as high on clinical judgment performance scores as students with NPS experience who have established prior knowledge and schema.

According to Lasater (2007) and as discussed in detail in the literature review section of this study, four stages of clinical judgment exist: (a) *Noticing*, (b) *Interpreting*, (c) *Responding*, and (d) *Reflecting.* Each of these stages include specific factors which contribute to a nurse's clinical judgment and include items such as focused observation, pattern recognition, prioritization, flexibility, well-planned interventions, and the ability to evaluate and self-analyze a situation. AOs are a way of assisting students to decrease cognitive load, and help with recall and pattern recognition which is required during each of these stages. A mnemonic requires low interactivity on cognitive load and can assist in aiding memory. Conversely, a concept map requires a high interactivity on cognitive load, which could impact pattern recognition and organization either positively by reducing cognitive load or negatively by increasing cognitive load demands (Fraser et al., 2015). However, for this study the use of an AO did not solely impact the participants' clinical judgment performance score.

However, when NPS experience level and type of AO was examined together, there was a significant interaction effect on clinical judgment performance score. The NPS experienced participants performed better with a concept map as opposed to a mnemonic, whereas the NPS novice group participants showed no differences in performance based of AO type.

Although Barnes and Clawson's (1975) study on advanced organizers, as discussed in chapter II of this study, showed no clear patterns emerged regarding the facilitative effects of advanced organizers when variables such as length of study, ability level of students, grade level of students, types of organizer used, and cognitive level of the learning task were analyzed separately; this study showed clear patterns did emerged with the combined effects of NPS experience level and type of advance organizer on clinical judgment performance scores of pre-licensure nursing students during SBL experiences.

Of note was the heterogeneity issue that arose with Levene's test of equality of variance being significant for blind pretest LCJR scores, $p < .001$, and blind posttest LCJR scores, $p < .001$. The results as noted in chapter IV were interpreted cautiously and further analyses were performed to examine the size of the pretest-posttest differences of NPS experience level and type of AO. With closer examination of post hoc testing, it was found that the heterogeneity was caused by a restriction in the range of scores by participants on the LCJR pretest and posttest measures as is discussed in the limitation section of this chapter.

With careful interpretation it was found there was an effect on clinical judgment performance based on NPS experience level and type of AO. The results showed NPS experienced group participants scored higher on posttest using a concept map during the pre-briefing phase, than using a mnemonic. The NPS novice group participants, showed no significant pretest-post difference in clinical judgment performance, which is likely due the restriction in the range of scores. While not significant, there was a difference in favor of preference (satisfaction) and cognitive load. This suggests that perhaps with a more sensitive measure, the mnemonic could end up being more helpful for the NPS novices. Thus, additional research is needed.

According to Ausubel (2000) advanced organizers contain different elements of interactivity, which impact working memory in various ways. Low interactivity elements are simple to use and primarily activate memory, whereas higher interactivity elements are more complex and used to scaffold and organize information. The results of the analyses for research question one supports Kirschner's (2002) research which was discussed in chapter II and showed that the inherent difficulty of intrinsic cognitive load is related to the interactivity elements required by the learner and not all material is intrinsically difficult for the learner. Results for research question one are in line with Fraser et al. (2015) research which stipulates although intrinsic cognitive load cannot be altered, it should be considered during content development so that knowledge may be transferred and schema formed.

Research Question Two

What are the independent and combined effects of NPS experience level and type of advanced organizer used during SBL on student's satisfaction and self-confidence as measured by the NLN-SSLS?

For the hypotheses for research question two, I expected the students with more NPS experience would have higher satisfaction and self-confidence during SBL when using the concept map and NPS novice participants would have higher satisfaction and self-confidence during SBL when using a mnemonic.

According to Brown and Chronister (2009), self-confidence is a sense one has about their ability to carry out a desired task. High stress academic situations, such as

SBL, can impact student performance by causing unnecessary student anxiety. This in turn can affect the student's self-confidence and satisfaction levels. Bambini, Washburn, and Perkins (2009) found anecdotal evidence suggesting SBL enhanced student satisfaction and self-confidence levels. Smith and Roehrs (2009) suggested design characteristics of the simulation, such as clear objectives, were correlated with student satisfaction and self-confidence.

For this study, there were no significant differences noted in satisfaction level with SBL based on NPS experience level nor in satisfaction with SBL based on type of AO. There were also no significant differences in self-confidence level with SBL based on NPS experience level nor in self-confidence with SBL based on AO type. However, there was an interaction effect for satisfaction as well as for self-confidence with NPS experience level and type of AO. As can be seen in Table 16, NPS novice group participants had higher satisfaction and self-confidence when using a mnemonic than when using a concept map. Conversely, NPS experienced group participants had higher satisfaction and self-confidence when using a concept map than using a mnemonic. Thus, self-confidence and satisfaction in SBL, for this study, was influenced not only by NPS experience level, but also by type of AO used as an instructional strategy during SBL.

Table 16

Satisfaction and Self-confidence by NPS Experience Level and Type of AO

Condition	NPS Experience Level	AO Type	*N*	*M*	*SD*
Satisfaction	Novice	Mnemonic	23	4.68	0.31
Satisfaction	Novice	Concept Map	23	3.99	0.29
Self-confidence	Novice	Mnemonic	23	4.51	0.37
Self-confidence	Novice	Concept Map	23	3.95	0.19
Satisfaction	Experienced	Mnemonic	26	3.89	0.49
Satisfaction	Experienced	Concept Map	27	4.72	0.35
Self-confidence	Experienced	Mnemonic	26	3.99	0.36
Self-confidence	Experienced	Concept Map	27	4.56	0.39

Note: NPS is the abbreviation used in this study for Nursing Program Simulation and AO is the abbreviation used in this study for Advanced Organizer(s).

The results for research question two coincided with anecdotal research that suggests SBL enhances student satisfaction and self-confidence levels (Bambini et al., 2009). Although most research on satisfaction and self-confidence within SBL showed a positive outcome (Ard et al., 2008; Bremner et al., 2006; Jeffries & Rizzolo, 2006), they focused on the SBL experience itself and not on the instructional strategies used with SBL. The results from this study showed a positive outcome with satisfaction and self-confidence with the combined effects of NPS experience level and type of AO used. These results are beneficial to nursing faculty when designing SBL activities. If research can show which instructional strategies work better during each phase of SBL, student outcomes can be promoted and the transfer of learning can be enhanced. It is worth the pursuit of future research to examine these concepts to determine if certain instructional strategies, such as AO, will promote student satisfaction self-confidence with the SBL context.

Research Question Three

What are the independent and combined effects of NPS experience level and type of advanced organizer on pre-licensure nursing student's perceptions of their cognitive load during SBL as measured by the cognitive load assessment survey?

For research question three, I hypothesized participants with more NPS experienced would have the perception of a lower cognitive load during SBL using a concept map compared to a mnemonic. Conversely, I anticipated the NPS novice students would perceive the mnemonic more beneficial to learning because it contributed to recall without causing excessive demands on cognitive load.

According to Mayer (2001), CLT is one of the fundamental theories used to understand and explain cognitive activities in the learning process. It has been shown cognitive work required to figure out how to solve a problem can interfere with the ability to learn the principles that was intended to be taught (Chen et al., 2014). Just and Carpenter (1992) found WM not only is limited by capacity but also by how the information is presented pragmatically. Moreno and Mayer (2000) suggested, when the demands of instruction exceeded an individual's mental capacity, increased demands on cognitive load occurred. However, in clinical training, students often have difficulty performing complex tasks (Prince et al., 2005). To reduce the possibility of cognitive overload, instructors attempt to develop learning activities and instructional strategies, such as AO, to help decrease the load on a learner's cognitive capacity.

For this study, a concept map and mnemonic were used to investigate the impacts of perception of cognitive load during SBL. According to Mostafa and Midany (2017), mnemonics are tools that help learners develop specific ways to encode information for storage in memory and for recall. This study used a first letter mnemonic to enhance the participants' recall of the nursing process.

Nesbit and Adesope (2006) described concept maps as graphic organizers that assist in organizing complex tasks by mapping abstract ideas to more concrete ones. Kester, Kirschner, and van Merriënboer (2005), found concept maps allowed access to just-in-time information, which facilitated learning. This study used the concept map to assist participants' in organizing information related to the pre-briefing material given prior to the simulation scenario activity.

In this study, the perception of cognitive load was measured by the Cognitive Load Assessment Survey and was divided into two sections: AO perceived load and SBL perceived load. The results of the study showed there were main effects of AO perceived load and SBL perceived load on NPS experience level and on AO type independently. NPS novice group participants showed a higher AO and SBL perceived load than NPS experienced group participants. Participants also showed a higher AO ad SBL perceived load with a concept map than a mnemonic. There was also an interaction effect for AO perceived load, NPS experience level, and AO type; as well as an interaction effect of SBL perceived load, NPS experience level, and type of AO. NPS novice participants had a higher AO and perceived load with the use of a concept map as compared to a mnemonic, however then NPS experienced group participants showed no differences in perceived load with type of AO. Its important to note that the concept map was helpful but did not add to the cognitive load of the experienced student. With that being said, this does have practical implications in a cognitively challenging environment of SBL.

Although many studies, as discussed in chapter II of this study, showed limited significance with the use of AO to decrease cognitive load, this study showed that AO when paired appropriately with the NPS experience level of students were beneficial in reducing mental effort. By reducing mental effort, students had the availability of cognitive structures to enhance the transfer of learning. For nursing students' this ability is imperative for the transferability of what is learned in a classroom into a performance context, such as SBL and clinical.

Discussion of Qualitative Findings

When participants responded to the semi-structured focus group interview questions two themes emerged, satisfaction and self-confidence. For satisfaction, participants mentioned in the interviews that the use of AO were beneficial during the simulation experience in reducing the effort it took to remember items and organize thoughts. This finding is consistent with Ausubel's (2000) philosophy of an advanced organizers which stated advanced organizers with a low interactivity element, such as a mnemonic, is simple and used primarily to activate memory; whereas an advanced organizer with a high interactivity element, such as a concept map, is more complex and is used to scaffold and organize information to decrease the load of the working memory.

The qualitative data also showed a theme for self-confidence, which is a sense one has about their ability to perform a desired function (Brown & Chronister, 2009). Participants mentioned improved scores or felt that scores would improve with the use of an AO. This was in line with Laing (2010), who concluded the use of mnemonic devices can enhance the rate at which new information is acquired, and improved formal reasoning; as well as with McDonald and Stevenson (1998) who stated concept maps assist with cognitive load reduction.

Both themes were consistent with Novak's (2010) thoughts that prior knowledge is a key factor for influencing learning. It corresponds with Gagne's (1962) theory that individuals learn best from a sequenced approach to mastering simple tasks before moving to more complex ones. In addition, the 4C/ID model (van Merriënboer et al., 2003; van Merriënboer & Sweller, 2010) provides a vehicle for the promotion of complex learning. It is an evidenced based instructional design model that uses supportive information to encourage learning and performance of tasks. The 4C/ID model uses consistent mental models, cognitive strategies, and feedback which leads to concrete authentic whole task experiences, organized from simple to complex that build in difficulty and variability. Thus, it can be concluded that people learn from their experiences.

Implications for Instructional Design

Critical thinking and problem-solving skills are an important aspect of clinical judgment and are necessary for nurses when providing consistent quality patient care. Nurse educators are typically not trained in the design and development of instruction, they are trained to be nurses. Nursing educators often lack an understanding of instructional concepts, such as how to develop curriculum and lesson plans to enhance learning. This gap is significant in the SBL field of nursing.

The instructional design process of analyzing, designing, developing, implementing, and evaluating are key components which need to be incorporated into nursing education. By giving nursing faculty a guide, such as the 4C/ID model to follow, they can be lead through the instructional design process. Instructional design models can then assist the nurse educator in the development of instruction that promotes critical thinking and problem-solving skills in student nurses.

Providing a clear understanding of how to use instructional strategies during SBL may affect the way a nurse educator teaches clinical judgment and possibly improve the transfer of learning for the student. By reducing cognitive load and activating prior knowledge through instructional strategies, such as a mnemonic or concept map, recall and pattern recognition can be enhanced, allowing students to gain crucial knowledge needed to make imperative decisions during patient care situations. Examining how these approaches influence cognitive load during simulation is an important factor when adding any kind of additional activity to the already high level of intrinsic cognitive load associated with simulation performance. Thus, the investigation of instructional design practices during SBL may provide a platform for continued discussion on the development of instructional models and strategies to promote student outcomes in SBL.

Limitations of the Study

There are several limitations to this study. The limitations of this study included a convenience sample without random assignment, generalizability of the study context, time constraint, and a limitation in the range of pretest-posttest result scores on the LCJR.

First, the participants were pre-assigned to their clinical simulation group by the school of nursing, thus random assignment was not possible, and a factorial comparison group design was used. Equating the groups was also difficult due to their pre-assignment. Thus groups were demarcated by their course level and assigned clinical instructor. This limitation may affect how some students responded, and it could not be determined if a student in one group would perform better if they were assigned to a different group or be randomized individually.

The next limitation was the school being used for the study had certain characteristics which may limit generalizability of the study to the population. The school was a proprietary institution and student numbers were limited by the institutions school admission policy. The number of students in the school of nursing were limited by the institution and the school of nursing's admission policy. The nursing program's clinical requirement consisted of up to 50% in a designated clinical environment and up to 50% in a SBL context.

Time constraint was also a limitation. This study was conducted over one term, which was a 12-week period. The generalizability of this study may have benefited if it expanded over several terms to examine if repeated measures would give the same or different results.

Another limitation was the restriction in the range of the pretest and posttest scores on the LCJR. The NPS novice group participants who were enrolled in the Foundations in Nursing course had a range from 11-13 for pretest score and 11-14 with posttest scores. The NPS experienced group participant scores for the Medical Surgical I course ranged from 14-19 pretest scores and 15-22 with posttest scores. The NPS experienced group participant scores for the Medical Surgical II course ranged from 21-28 pretest scores and 21-32 with posttest scores. Because of the limitation in range of these scores amongst the groups on the pretest and posttest LCJR, heterogeneity occurred, and results had to be cautiously interpreted for research question one.

Strengths of the Study

The strengths of the study included a relatively large sample size, varied NPS experience level of students, and strong support from the institution’s school of nursing faculty and students. The *a priori* performed suggested a sample size of 73 participants. This study used a convenience sample of students who were enrolled in one of the following courses: Foundations in Nursing, Medical Surgical I, or Medical Surgical II. A total of 99 students participated in the study.

The faculty of the nursing program, as well as the faculty who worked in the simulation environment were very supportive of the study. They designated time for initiating the study, as well as dealt with the additional documentation required for this study to be completed, such as LCJR, mnemonic, and concept map. The nursing students were cooperative as well, demonstrating a desire to learn. The students took an active role in responding to the study instruments and focus group interview questions.

Recommendations for Future Research

SBL is a relatively new field to nursing. Although there have been many studies to investigate the benefits of SBL to enhance student learning, there are limited studies related to NPS experience level and the use of instructional strategies; as well as how these strategies when used during the different phases of SBL can enhance learning by reducing cognitive load and improving student outcomes.

Therefore, one recommendation for future research includes investigating which instructional strategies may work best during each phase of SBL (pre-briefing, scenario, and debriefing) in reducing cognitive load, improving the transfer of learning, and improving student outcomes. As seen in this study, the use of advanced organizers had some degree of impact on clinical judgment performance when used during the pre-briefing phase of SBL and based on the participant's NPS experience level. Also, as seen in the pilot study, the use of reflection during the debriefing phase of simulation impacted performance. Questions are then raised as to which instructional strategy would work best during each phase of SBL and if the use of different instructional strategies are impacted based on the participant's NPS experience level. Thus, this study could be repeated on a larger scale with multiple facilities and over a longer time frame to explore if different instructional strategies, such as advanced organizers or reflection, would impact student outcomes when used during the different phases of SBL. Further research could also revisit how NPS experience level may impact the student outcomes with the use of various instructional strategies in SBL.

Another recommendation is to initiate research which will lead to new collaborative theories between nursing and instructional design to support the use of instructional strategies in nursing, and to promote the development of instructional models that may assist in reducing cognitive load during SBL experiences. This recommendation could also be developed in other contexts, such as didactic and clinical areas. As seen in this study, the 4C/ID model was used as an example of an instructional design model that could help nursing educators develop SBL experiences. Other instructional design models could also be used to impact the design of SBL; however it would be interesting to research the development of an SBL instructional design model that was a collaboration of nursing educator and instructional design experts, and how the model could impact SBL and student outcomes.

Future research could include the development of a more sensitive instrument to provide immediate individual level results in SBL based on participant's NPS experience level. An instrument that is sensitive to participant's NPS experience level could provide immediate evaluation and assist faculty in designing SBL that encourages student learning, promotes student outcomes, and assists in aiding students to transfer learning to a real-world environment.

It is my hope that future research aimed at SBL, instructional design, and cognitive load will continue to develop to frame new collaborative theories for nursing and instructional design. The research provided here should help advance the research and practice literature on instructional design, AO, CL, and SBL in nursing.

Chapter Summary

This chapter provided a discussion of the results of this study and presented an overview of the findings. This chapter included a brief summary the study, followed by a discussion of the findings for the research questions with a supposition of the results, implications for instructional design, limitations and strengths of the study, and recommendations for future research.

The results for both the quantitative and qualitative data analyses for the three research questions were presented. The results of the quantitative data analyses were mostly supportive of the hypotheses. The information presented in this study was valuable in gaining an understanding of learning in the performance context of SBL.

Quantitative analyses found there was a statistical difference in NPS experience level on clinical judgment performance with NPS experienced group participants scoring higher than NPS novice group participants. There was not a difference in type of AO on clinical judgement performance scores. There was an interaction effect with clinical judgment performance scores, NPS experience level, and type of AO with NPS experienced group participants performing better with the use of a concept map than the use of a mnemonic; however, no notable differences were noted with the NPS novice group participants. These findings are supportive of other research which suggest instructional strategies and cognitive load should be considered during content development so that schema can be developed and transfer of knowledge occur (Ausubel, 2000; Fraser et al, 2015; and Kirschner, 2002).

Although there were no independent differences noted in satisfaction or self-confidence with NPS experience level or type of AO, there was an interaction with both satisfaction and self-confidence with NPS experience level and type of AO. NPS novice group students seemed to be more satisfied and self-confidence with the use of a mnemonic than a concept map, as compared to NPS experienced group participants who were more satisfied and self-confident with a concept map than a mnemonic. These results coincide with other research on satisfaction and self-confidence with SBL (Ard et al., 2008; Jeffries & Rizzolo, 2006).

There were differences noted with AO perceived load and SBL perceived load on NPS experience level and on AO type independently. There were also combined effects of AO perceived load with NPS experience level and AO type; as well as with SBL perceived load with NPS experience level and type of AO. NPS novice group participants had a higher AO perceived load and higher SBL perceived load with the use of a concept map as compared to the use of a mnemonic, whereas NPS experienced group participants showed no notable differences. These results showed that AO when paired appropriately with student NPS experience level can be beneficial in reducing perceived cognitive load.

Qualitative data found two themes, self-confidence and satisfaction. Participants liked the option of using an AO during SBL pre-briefing. Some felt the AO helped with learning, although some felt it required more mental effort. Another key factor in the qualitative data analyses were the students were generally satisfied with the SBL experience, but would like additional time to learn. These findings are consistent with Novak's (2010) notion of prior knowledge influencing learning, as well as Gagne's (1962) theory that sequencing learning from simple to more complex ones improves learning, as well as satisfaction and self-confidence.

Implications for this study included results that could facilitate a discussion between instructional design cohorts and nursing faculty in regard to designing and using instructional strategies during performance based learning. Other implications include the use of instructional design models, such as the 4C/ID model, in assisting in the design and development of performance based learning contexts, such as SBL.

The limitations and strengths of the study were included. Limitations of this study included a convenience sample without random assignment, generalizability of the study context, time constraint, and limitation in the range of pretest posttest scores on the LCJR. The strengths of the study included a relatively large sample size, varied NPS experience level of students, and strong support from the institution's school of nursing faculty and students.

Several recommendations for future research were made, which included a repeat of this study during different phases of SBL. It also included the recommendation of the use of different instructional strategies during the different phases of SBL to assist in building evidenced based practice as to which instructional strategies may work best for each phase of the SBL experience.

The findings from this study add to the current, but small body of knowledge on SBL, AO, and cognitive load. Understanding cognitive load and the way it effects student outcomes in SBL is important in guiding nurse educators to design SBL experiences that will enhance critical thinking and clinical judgment performance skills in their students. The results from this study suggested the use of certain instructional strategies, such as mnemonics and concept maps, can be beneficial in reducing cognitive load when used during the pre-briefing phase of SBL experiences, when student NPS experience level is taken into consideration.

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APPENDICES

Appendix A

C-CEI®

Creighton Competency Evaluation Instrument (CCEI)

Student Name: ______________________

Staff Nurse Instructor Name: ______________________

0= Does not demonstrate competency
1= Demonstrates competency
NA= Not applicable

Date: ____/____/____
MM / DD / YYYY

	Circle Appropriate Score for all Applicable Criteria - If not applicable, circle NA		
ASSESSMENT			
1. Obtains Pertinent Data	0	1	NA
2. Performs Follow-Up Assessments as Needed	0	1	NA
3. Assesses the Environment in an Orderly Manner	0	1	NA
COMMUNICATION			
4. Communicates Effectively with Intra/Interprofessional Team (TeamSTEPPS, SBAR, Written Read Back Order)	0	1	NA
5. Communicates Effectively with Patient and Significant Other (verbal, nonverbal, teaching)	0	1	NA
6. Documents Clearly, Concisely, & Accurately	0	1	NA
7. Responds to Abnormal Findings Appropriately	0	1	NA
8. Promotes Professionalism	0	1	NA
CLINICAL JUDGMENT			
9. Interprets Vital Signs (T, P, R, BP, Pain)	0	1	NA
10. Interprets Lab Results	0	1	NA
11. Interprets Subjective/Objective Data (recognizes relevant from irrelevant data)	0	1	NA
12. Prioritizes Appropriately	0	1	NA
13. Performs Evidence Based Interventions	0	1	NA
14. Provides Evidence Based Rationale for Interventions	0	1	NA
15. Evaluates Evidence Based Interventions and Outcomes	0	1	NA
16. Reflects on Clinical Experience	0	1	NA
17. Delegates Appropriately	0	1	NA
PATIENT SAFETY			
18. Uses Patient Identifiers	0	1	NA
19. Utilizes Standardized Practices and Precautions Including Hand Washing	0	1	NA
20. Administers Medications Safely	0	1	NA
21. Manages Technology and Equipment	0	1	NA
22. Performs Procedures Correctly	0	1	NA
23. Reflects on Potential Hazards and Errors	0	1	NA

COMMENTS:

COMMENTS

Total: __________

Total Applicable Items: __________

Earned Score __________

Revised for DEU use 8/20/2013

Appendix B

DASH©SV

CENTER FOR MEDICAL SIMULATION

Debriefing Assessment for Simulation in Healthcare (DASH) Student Version©

Directions: Please summarize your impression of the introduction and debriefing in this simulation-based exercise. Use the following scale to rate each of six "Elements." Each Element comprises specific instructor behaviors, described below. If a listed behavior is impossible to assess (e.g., how the instructor(s) handled upset people if no one got upset), don't let that influence your evaluation. The instructor(s) may do some things well and some things not so well within each Element. Do your best to rate the ***overall effectiveness*** **for the whole Element** guided by your observation of the individual behaviors that define it.

Rating Scale

Rating	1	2	3	4	5	6	7
Descriptor	**Extremely Ineffective / Detrimental**	Consistently Ineffective / Very Poor	Mostly Ineffective / Poor	Somewhat Effective / Average	Mostly Effective / Good	Consistently Effective / Very Good	**Extremely Effective / Outstanding**

Element 1 assesses the introduction at the beginning of a simulation-based exercise.

Skip this element if you did not participate in the introduction.

If there was no introduction and you felt one was needed to orient you, your rating should reflect this.

Element 1 **The instructor set the stage for an engaging learning experience.**	**Overall Rating Element 1** ________

- The instructor introduced him/herself, described the simulation environment, what would be expected during the activity, and introduced the learning objectives.
- The instructor explained the strengths and weaknesses of the simulation and what I could do to get the most out of simulated clinical experiences.
- The instructor attended to logistical details as necessary such as toilet location, food availability, schedule.
- The instructor made me feel stimulated to share my thoughts and questions about the upcoming simulation and debriefing and reassured me that I wouldn't be shamed or humiliated in the process.

Elements 2 through 6 assess a debriefing.

Element 2 **The instructor maintained an engaging context for learning.**	**Overall Rating Element 2** ________

- The instructor clarified the purpose of the debriefing, what was expected of me, and the instructor's role in the debriefing.
- The instructor acknowledged concerns about realism and helped me learn even though the case(s) were simulated.
- I felt that the instructor respected participants.
- The focus was on learning and not on making people feel bad about making mistakes.
- Participants could share thoughts and emotions without fear of being shamed or humiliated.

Appendix B continued

Element 3 **The instructor structured the debriefing in an organized way.**	Overall Rating Element 3 _______

- The conversation progressed logically rather than jumping around from point to point.
- Near the beginning of the debriefing, I was encouraged to share my genuine reactions to the case(s) and the instructor seemed to take my remarks seriously.
- In the middle, the instructor helped me analyze actions and thought processes as we reviewed the case(s).
- At the end of the debriefing, there was a summary phase where the instructor helped tie observations together and relate the case(s) to ways I can improve my future clinical practice.

Element 4 **The instructor provoked in-depth discussions that led me to reflect on my performance.**	Overall Rating Element 4 _______

- The instructor used concrete examples—not just abstract or generalized comments—to get me to think about my performance.
- The instructor's point of view was clear; I didn't have to guess what the instructor was thinking.
- The instructor listened and made people feel heard by trying to include everyone, paraphrasing, and using non verbal actions like eye contact and nodding, etc.
- The instructor used video or recorded data to support analysis and learning.
- If someone got upset during the debriefing, the instructor was respectful and constructive in trying to help them deal with it.

Element 5 **The instructor identified what I did well or poorly – and why.**	Overall Rating Element 5 _______

- I received concrete feedback on my performance or that of my team based on the instructor's honest and accurate view.
- The instructor helped explore what I was thinking or trying to accomplish at key moments.

Element 6 **The instructor helped me see how to improve or how to sustain good performance**	Overall Rating Element 6 _______

- The instructor helped me learn how to improve weak areas or how to repeat good performance.
- The instructor was knowledgeable and used that knowledge to help me see how to perform well in the future.
- The instructor made sure we covered important topics.

Appendix C

Reflective Debriefing Script

Reflective Debriefing Script Template

Adapted from GIBBS' REFLECTIVE CYCLE MODEL (1998)

Simulation Title:

Description:

What was the simulation exercise about?

What happened during the simulation exercise?

Feelings:

What were you thinking during the simulation exercise?

How were you feeling during the simulation exercise?

Evaluation:

What was good about the simulation exercise experience?

What was bad about the simulation exercise experience?

Analysis:

What sense can you make of the simulation exercise experience?

Conclusion:

What else could you have done?

Action Plan:

If the situation arose again, what would you do?

Appendix D

Pilot Study Permission Letter

FORTIS INSTITUTE

Your Life. Powered By Learning

4081 East Olive Road • Suite B • Pensacola, Florida 32514
850-476-7607 *Telephone* • 850-462-1130 *Fax* • www.fortis.edu

September 6, 2016

Dear Ms. Taylor,

You are approved to conduct research at the Nursing Program at Fortis Institute in Pensacola, Florida on The Effect of Clinical Simulation with Structured Debriefing on Student Clinical Judgment and Perception of Instruction. We look forward to having you.

Kind Regards,

Kathaleen L. Cole
Campus President

Appendix E

Pilot Study IRB Approval

irb@southalabama.edu

UNIVERSITY OF SOUTH ALABAMA

TELEPHONE: (251) 460-6308
CSAB 138 · MOBILE, AL. 36688-0002

INSTITUTIONAL REVIEW BOARD
October 11, 2016

Principal Investigator:	Tina Taylor		
IRB # and Title:	IRB PROTOCOL: 16-283		
	[957319-2] The Effect of Clinical Simulation with Structured Debriefing on Student Clinical Judgment and Perception of Instruction		
Status:	APPROVED	Review Type:	Expedited Review
Approval Date:	October 6, 2016	Submission Type:	New Project
Initial Approval:	October 6, 2016	Expiration Date:	October 5, 2017
Review Category:	Category: 45 CFR 46.110 (7): Research on individual or group characteristics or behavior		

This panel, operating under the authority of the DHHS Office for Human Research and Protection, assurance number FWA 00001602, and IRB Database #00000286, has reviewed the submitted materials for the following:

1. *Protection of the rights and the welfare of human subjects involved.*
2. *The methods used to secure and the appropriateness of informed consent.*
3. *The risk and potential benefits to the subject.*

The regulations require that the investigator not initiate any changes in the research without prior IRB approval, except where necessary to eliminate immediate hazards to the human subjects, and that **all problems involving risks and adverse events be reported to the IRB immediately!**

Subsequent supporting documents that have been approved will be stamped with an IRB approval and expiration date (if applicable) on every page. Copies of the supporting documents must be utilized with the current IRB approval stamp unless consent has been waived.

Notes:

Appendix F

Pilot Study Consent Form

INFORMED CONSENT STATEMENT FOR

The Effect of Clinical Simulation with Structured Debriefing on Student Clinical Judgment and Perception of Instruction

You are invited to participate in a research study of the use of simulation in nursing education. You were selected as a possible subject because you are a student in nursing at Fortis Institute School of Nursing, Pensacola, Florida Campus. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by Tina Taylor, MSN, RN, doctoral student at the University Of South Alabama College Of Education, Professional Studies Department with James Van Haneghan, Ph.D. as faculty advisor at the University Of South Alabama College Of Education, Professional Studies Department.

STUDY PURPOSE:

The purpose of this study is to look at how simulation is being used in nursing education and to discover if there are teaching strategies in simulation that impact student learning.

NUMBER OF PEOPLE TAKING PART IN THE STUDY:

If you agree to participate, you will be one of forty (40) to one hundred (100) subjects who will be participating in this research.

PROCEDURES FOR THE STUDY:

If you agree to be in the study, you will need to know the following:

1. Students will be assigned to an experimental or control group. The simulation experience is the same for both groups. Different teaching and debriefing strategies may be used in each group.
2. You agree to have your pre-simulation and post-simulation assessment scores included in the database for this study.
    a. Every student in the course, regardless if they agree to study participation will complete the standardized paperwork assigned by Fortis Institute School of Nursing for each simulation scenario.
    b. Every student in the course, regardless if they agree to study participation will complete the Debriefing Assessment for Simulation in Healthcare (DASH) Student Version (short form) ©. Copyright, Center for Medical Simulation, www.harvardmedsim.org, 2010 during debriefing.
3. All pre-simulation and post simulation assessments, the Creighton Competency Evaluation Instrument and DASH surveys will be coded by the principal investigator with an assigned 10 digit I.D. number that will replace your name. These will be used for data analysis.
    a. At all times the data will be kept secure and the principal investigator will maintain student confidentiality.
4. Prior to your scheduled simulation, you will receive preparation materials and notifications about the simulation including objectives and information about when to come and how to participate.

USA Institutional Review Board	
Approved:	10/6/2016
Expires:	10/5/2017
IRB number:	16-203/957319-2

   a. All students in the course whether they are study participants or not receive this information. Per the traditional standardized simulation instructions in this school of nursing, once you arrive for simulation, students will be assigned roles to play.
   b. For example, one student will play the role of the primary nurse, another student will have a role of a secondary nurse (one who will be delegated to), and the third role will be a family member with a scripted role. Other students may be asked to be recorders and/or observers.
5. All students in the course whether they are in the study or not will participate in the simulation experience, based on your assigned role by the faculty.
   a. The faculty will complete their traditional standardized assessment paperwork and the Creighton Competency Evaluation Instrument for simulation activities.
6. Once the simulation has ended, you will go to a specified place to participate in the debriefing.
   a. You will be asked to participate in debriefing as an expectation of the course.
   b. During the debriefing, you may be asked to complete paperwork that corresponds to the debriefing.
7. Student grades will not be negatively impacted whether you are study participants or not. To ensure this the course faculty will be blinded to the identity of consenting students in both the experimental and control groups throughout the semester/term.

RISKS/BENEFITS OF TAKING PART IN THE STUDY:

While on the study, there are no identified risks to you as a participant. The benefits to participation which you might expect include the experience of participating in nursing care of (simulated) patients with particular diagnosis that might positively impact how you care for other patients you encounter in clinical situations or how you respond to questions about caring for patients.

ALTERNATIVE TO TAKING PART IN THE STUDY:

Instead of being in the study, you can choose not to have your assessment scores included in the data collection. You will still take all assessments, assignments, and participate in simulation experiences to meet the requirements of the course but your information will not be used in the research project.

CONFIDENTIALITY:

Efforts will be made to keep your personal information confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Your identity will be held in confidence in reports in which the study may be published and databased in which results may be stored.

COSTS/PAYMENT:

Taking part in this study will not result in any costs to you as a participant. You will not receive payment for taking part in this study.

PUBLICATION:

Data obtained during this pilot study may be submitted for publication or at a professional conference. Confidentiality and design integrity will be maintained in all information submitted for publication.

USA Institutional Review Board	
Approved:	10/6/2016
Expires:	10/5/2017
IRB number	16-203/957319-2

Appendix F continued

VOLUNTARY NATURE OF STUDY

Taking part in this study is voluntary. You may choose not to take part or may leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled. Your decision whether or not to participate in this study will not affect your current or future relations with Fortis Institute College of Nursing, Pensacola, Florida Campus. Your participation may be termination by the investigator without regard to your consent in the following circumstances:

a. You do not complete the pre or post assessment before and after the simulation.
b. You do not complete the DASH student version during debriefing.
c. You do not participate in the simulation experience or an alternative assignment that has been prearranged by the course faculty.
d. You withdraw from the course.

CONTACTS FOR QUESTIONS OR PROBLEMS:

For questions about the study or a research-related injury, contact the Principal investigator: Tina Taylor, MSN, RN at or Dr. James Van Haneghan, faculty advisor at

For questions about your rights as a research participant or to discuss problems, complaints, or concerns about a research study, or to obtain information, or offer input, contact the University of South Alabama Office of Research Compliance and Assurance at 251-460-6308.

Agreement to Participate in Research

You have read or someone has read to you the details of the study listed above and you have been provided the opportunity to ask questions or voice concerns. You have received a satisfactory response to all of your questions or concerns and you voluntarily agree to serve as a participant in the described study.

______________________________	____________________
Participant's Name	Date
______________________________	____________________
Signature of Participant/Consenting Party	Signature of Investigator

USA Institutional Review Board	
Approved:	10/6/2016
Expires:	10/5/2017
IRB number:	16-203/957319-2

Appendix G

NLN-SSLS and Permission

Student Satisfaction and Self-Confidence in Learning

Instructions: This questionnaire is a series of statements about your personal attitudes about the instruction you receive during your simulation activity. Each item represents a statement about your attitude toward your satisfaction with learning and self-confidence in obtaining the instruction you need. There are no right or wrong answers. You will probably agree with some of the statements and disagree with others. Please indicate your own personal feelings about each statement below by marking the numbers that best describe your attitude or beliefs. Please be truthful and describe your attitude as it really is, not what you would like for it to be. This is anonymous with the results being compiled as a group, not individually.

Mark:
1 = STRONGLY DISAGREE with the statement
2 = DISAGREE with the statement
3 = UNDECIDED - you neither agree or disagree with the statement
4 = AGREE with the statement
5 = STRONGLY AGREE with the statement

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

 Revised December 22, 2004

Appendix G continued

Obtained from http://www.nln.org/professional-development-programs/research/tools-and-instruments

Tools and Instruments

Use of NLN Surveys and Research Instruments

The NLN's copyrighted surveys and research instruments are an important part of its research activities.

Permission for non-commercial use of surveys and research instruments (includes, theses, dissertations, and DNP projects) is granted free of charge. Available instruments may be downloaded and used by individual researchers for non-commercial use only with the retention of the NLN copyright statement. The researcher does not need to contact the NLN for specific permission. In granting permission for non-commercial use, it is understood that the following caveats will be respected by the researcher:

1. It is the sole responsibility of the researcher to determine whether the NLN research instrument is appropriate to her or his particular study.
2. Modifications to a survey/instrument may affect the reliability and/or validity of results. Any modifications made to a survey/instrument are the sole responsibility of the researcher.
3. When published or printed, any research findings produced using an NLN survey/instrument must be properly cited. If the content of the NLN survey/instrument was modified in any way, this must also be clearly indicated in the text, footnotes and endnotes of all materials where findings are published or printed.

Appendix H

LCJR Permission, Rubric, and Scoring Scale

LCJR use for dissertation study

Tina Taylor
to lasaterk,
October12, 2016

Hi Dr. Lasater,

My name is Tina Taylor and I am a student in the Instructional Design and Development department at the University of South Alabama. I am currently working on my PhD (at the ABD stage).

My background is nursing. I am a RN with a MSN in nursing education and administration. I would like to see if it would be possible to use the LCJR in my dissertation study.

My research is in simulation education for nurses. I am looking at using different instructional strategies during simulation based learning to determine if they have an impact on the clinical judgment of students during simulation experiences. I have looked at several different rubrics and the LCJR appears to be a good fit for my study.

Please let me know if it would be possible to have your permission to use the LCJR for my study.

I look forward to hearing from you.

Warmest regards,
Tina

Kathie Lasater
to me
October12, 2016

Hi Tina,

Thank you for your interest in the Lasater Clinical Judgment Rubric (LCJR). You have my permission to use the tool for your project. I ask that you (1) cite it correctly, and (2) send me a paragraph or two to let me know a bit about your project when you've completed it, including how you used the LCJR. In this way, I can help guide others who may wish to use it. Please let me know if it would be helpful to have an electronic copy.
You should also be aware that the LCJR describes four aspects of the Tanner Model of Clinical Judgment—Noticing, Interpreting, Responding, and Reflecting—and as such, does not measure clinical judgment because clinical judgment involves much of what the individual student/nurse brings to the unique patient situation (see Tanner, 2006 article). We know there are many other factors that impact clinical judment in the moment, many of which are impacted by the context of care and the needs of the particular patient.
The LCJR was designed as an instrument to describe the trajectory of students' clinical judgment development over the length of their program. The purposes were to offer a common language between students, faculty, and preceptors in order to talk about students' thinking and to serve as a help for offering formative guidance and feedback (See Lasater, 2007; Lasater, 2011). For measurement purposes, the rubric appears to be most useful with multiple opportunities for clinical judgment vs. one point/patient in time.
Please let me know if I can be of help,
Kathie

Kathie Lasater, EdD, RN, ANEF, FAAN
Professor
OHSU School of Nursing, SN-4S
3455 SW Veterans' Hospital Rd.
Portland, OR 97239

Appendix H continued

LASATER CLINICAL JUDGMENT RUBRIC

Noticing and Interpreting

Effective NOTICING involves:	Exemplary	Accomplished	Developing	Beginning
Focused Observation	Focuses observation appropriately; regularly observes and monitors a wide variety of objective and subjective data to uncover any useful information	Regularly observes/monitors a variety of data, including both subjective and objective; most useful information is noticed, may miss the most subtle signs	Attempts to monitor a variety of subjective and objective data, but is overwhelmed by the array of data; focuses on the most obvious data, missing some important information	Confused by the clinical situation and the amount/type of data; observation is not organized and important data is missed, and/or assessment errors are made
Recognizing Deviations from Expected Patterns	Recognizes subtle patterns and deviations from expected patterns in data and uses these to guide the assessment	Recognizes most obvious patterns and deviations in data and uses these to continually assess	Identifies obvious patterns and deviations, missing some important information; unsure how to continue the assessment	Focuses on one thing at a time and misses most patterns/deviations from expectations; misses opportunities to refine the assessment
Information Seeking	Assertively seeks information to plan intervention: carefully collects useful subjective data from observing the client and from interacting with the client and family	Actively seeks subjective information about the client's situation from the client and family to support planning interventions; occasionally does not pursue important leads	Makes limited efforts to seek additional information from the client/family; often seems not to know what information to seek and/or pursues unrelated information	Is ineffective in seeking information; relies mostly on objective data; has difficulty interacting with the client and family and fails to collect important subjective data
Effective INTERPRETING involves:	**Exemplary**	**Accomplished**	**Developing**	**Beginning**
Prioritizing Data	Focuses on the most relevant and important data useful for explaining the client's condition	Generally focuses on the most important data and seeks further relevant information, but also may try to attend to less pertinent data	Makes an effort to prioritize data and focus on the most important, but also attends to less relevant/useful data	Has difficulty focusing and appears not to know which data are most important to the diagnosis; attempts to attend to all available data
Making Sense of Data	Even when facing complex, conflicting or confusing data, is able to (1) note and make sense of patterns in the client's data, (2) compare these with known patterns (from the nursing knowledge base, research, personal experience, and intuition), and (3) develop plans for interventions that can be justified in terms of their likelihood of success	In most situations, interprets the client's data patterns and compares with known patterns to develop an intervention plan and accompanying rationale; the exceptions are rare or complicated cases where it is appropriate to seek the guidance of a specialist or more experienced nurse	In simple or common/familiar situations, is able to compare the client's data patterns with those known and to develop/explain intervention plans; has difficulty, however, with even moderately difficult data/situations that are within the expectations for students, inappropriately requires advice or assistance	Even in simple of familiar/common situations has difficulty interpreting or making sense of data; has trouble distinguishing among competing explanations and appropriate interventions, requiring assistance both in diagnosing the problem and in developing an intervention

Appendix H continued

LASATER CLINICAL JUDGMENT RUBRIC
Responding and Reflecting

Effective RESPONDING involves:	Exemplary	Accomplished	Developing	Beginning
Calm, Confident Manner	Assumes responsibility: delegates team assignments, assess the client and reassures them and their families	Generally displays leadership and confidence, and is able to control/calm most situations; may show stress in particularly difficult or complex situations	Is tentative in the leader's role; reassures clients/families in routine and relatively simple situations, but becomes stressed and disorganized easily	Except in simple and routine situations, is stressed and disorganized, lacks control, making clients and families anxious/less able to cooperate
Clear Communication	Communicates effectively; explains interventions; calms/reassures clients and families; directs and involves team members, explaining and giving directions; checks for understanding	Generally communicates well; explains carefully to clients, gives clear directions to team; could be more effective in establishing rapport	Shows some communication ability (e.g., giving directions); communication with clients/families/team members is only partly successful; displays caring but not competence	Has difficulty communicating; explanations are confusing, directions are unclear or contradictory, and clients/families are made confused/anxious, not reassured
Well-Planned Intervention/Flexibility	Interventions are tailored for the individual client; monitors client progress closely and is able to adjust treatment as indicated by the client response	Develops interventions based on relevant patient data; monitors progress regularly but does not expect to have to change treatments	Develops interventions based on the most obvious data; monitors progress, but is unable to make adjustments based on the patient response	Focuses on developing a single intervention addressing a likely solution, but it may be vague, confusing, and/or incomplete; some monitoring may occur
Being Skillful	Shows mastery of necessary nursing skills	Displays proficiency in the use of most nursing skills; could improve speed or accuracy	Is hesitant or ineffective in utilizing nursing skills	Is unable to select and/or perform the nursing skills
Effective REFLECTING involves:	**Exemplary**	**Accomplished**	**Developing**	**Beginning**
Evaluation/Self-Analysis	Independently evaluates/ analyzes personal clinical performance, noting decision points, elaborating alternatives and accurately evaluating choices against alternatives	Evaluates/analyzes personal clinical performance with minimal prompting, primarily major events/decisions; key decision points are identified and alternatives are considered	Even when prompted, briefly verbalizes the most obvious evaluations; has difficulty imagining alternative choices; is self-protective in evaluating personal choices	Even prompted evaluations are brief, cursory, and not used to improve performance; justifies personal decisions/choices without evaluating them
Commitment to Improvement	Demonstrates commitment to ongoing improvement: reflects on and critically evaluates nursing experiences; accurately identifies strengths/weaknesses and develops specific plans to eliminate weaknesses	Demonstrates a desire to improve nursing performance: reflects on and evaluates experiences; identifies strengths/weaknesses; could be more systematic in evaluating weaknesses	Demonstrates awareness of the need for ongoing improvement and makes some effort to learn from experience and improve performance but tends to state the obvious, and needs external evaluation	Appears uninterested in improving performance or unable to do so; rarely reflects; is uncritical of him/herself, or overly critical (given level of development); is unable to see flaws or need for improvement

 January 2007

Appendix H continued

Lasater Clinical Judgment Rubric Scoring Sheet

Participant Name____________________ Instructor_________________

Clinical Judgment Component	Exemplary 4	Accomplished 3	Developing 2	Beginning 1
Noticing				
Focused Observation				
Recognized Deviations from Expected patterns				
Information Seeking				
Interpreting				
Prioritizing Data				
Making Sense of Data				
Responding				
Calm, Confident Manner				
Clear Communication				
Well Planned Intervention/Flexibility				
Being Skillful/Able to Perform Interventions Correctly				
Reflecting				
Evaluation/Self Analysis				
Commitment to Improvement				
Score				

Scoring Rubric
Total Score 36-44 = exemplary
Total Score 28-35 = accomplished
Total Score 20-27 = developing
Total Score 11-19 = beginning

Total Score______________

(Tool adapted from Cato, M.., Lasater, K., & Peeples, A. (2009). Nursing students' self-assessment of their simulation experience. Nursing Education Perspectives, 30 (2), 105-108. Copy permission obtained from Lasater).

Appendix I

Cognitive Load Assessment Survey – Mnemonic

Cognitive Load Assessment Survey (Mnemonic)

Name:

Please respond to each of the following questions by placing a "X" in the appropriate scale box.

	1 Very, very low mental effort	2 Very low mental effort	3 Low mental effort	4 Rather low mental effort	5 Neither low nor high mental effort	6 Rather high mental effort	7 High mental effort	8 Very high mental effort	9 Very, very high mental effort
The patient situation covered in the simulation required ______ mental effort									
The simulation covered concepts and definitions that required ______ mental effort									
The instructions and/or explanations given during the pre-briefing required ______ mental effort									
The use of the mnemonic in the simulation required ______ mental effort									
The use of the mnemonic during the simulation to enhance my knowledge and understanding required ______ mental effort									
By using the mnemonic , I required ______ mental effort in the simulation experience									

	1 Very, very little	2 Very little	3 Little	4 Rather little	5 Neither little nor much	6 Rather much	7 Much	8 Very much	9 Very, very much
How much concentration was required during the simulation experience?									
How much concentration was required during the simulation experience with the use of the mnemonic?									
	1 Very, very easy	2 Very easy	3 Easy	4 Rather easy	5 Neither easy nor difficult	6 Rather difficult	7 Difficult	8 Very difficult	9 Very, very difficult
The simulation experience was...									
The use of the mnemonic made the simulation experience.....									

(Tool adapted from: Leppink, Jimmie; Paas, Fred; Van der Vleuten, Cees P. M.; Van Gog, Tamara; Van Merriënboer, Jeroen J. G. Behavior Research Methods. Dec2013, Vol. 45 Issue 4, p1058-1072).

Appendix J

Cognitive Load Assessment Survey – Concept Map

Cognitive Load Assessment Survey (Concept Map)

Name:

Please respond to each of the following questions by placing a "X" in the appropriate scale box.

	1 Very, very low mental effort	2 Very low mental effort	3 Low mental effort	4 Rather low mental effort	5 Neither low nor high mental effort	6 Rather high mental effort	7 High mental effort	8 Very high mental effort	9 Very, very high mental effort
The patient situation covered in the simulation required ______ mental effort									
The simulation covered concepts and definitions that required ______ mental effort									
The instructions and/or explanations given during the pre-briefing required ______ mental effort									
The use of the concept map in the simulation required ______ mental effort									
The use of the concept map during the simulation to enhance my knowledge and understanding required ______ mental effort									
By using the concept map, I required ______ mental effort in the simulation experience									

	1 Very, very little	2 Very little	3 Little	4 Rather little	5 Neither little nor much	6 Rather much	7 Much	8 Very much	9 Very, very much
How much concentration was required during the simulation experience?									
How much concentration was required during the simulation experience with the use of the concept map?									
	1 Very, very easy	2 Very easy	3 Easy	4 Rather easy	5 Neither easy nor difficult	6 Rather difficult	7 Difficult	8 Very difficult	9 Very, very difficult
The simulation experience was...									
The use of the concept map made the simulation experience.....									

(Tool adapted from: Leppink, Jimmie; Paas, Fred; Van der Vleuten, Cees P. M.; Van Gog, Tamara; Van Merriënboer, Jeroen J. G. Behavior Research Methods. Dec2013, Vol. 45 Issue 4, p1058-1072).

Appendix K

Debrief Session Interview Questions

Debrief Session – Interview Questions

1.) Did you like using the (pre-briefing material/mnemonic/concept map) during the pre-brief phase? Why or why not?

2.) Do you feel the use of the (pre-briefing material/mnemonic/concept map) during the pre-brief phase added to or decreased your mental effort during the simulation experience? Why or why not?

3.) Do you feel the use of the (pre-briefing material/mnemonic/concept map) during the pre-brief phase helped your performance during the simulation experience? Why or why not?

4.) What did you like best and/or least about the use of the (pre-briefing material/mnemonic/concept map) during the pre-brief phase? Why?

5.) Do you feel the use of the (pre-briefing material/mnemonic/concept map) would benefit other phases of the simulation process (such as debriefing)? Why or why not?

6.) Do you feel the use of an advanced organizer such as a mnemonic or concept map would help you in your studies in the future? Why or why not?

7.) Do you have anything else you would like to add about the simulation experience, the advanced organizers, and/or the pre-briefing material used?

Appendix L

Study IRB Approval

irb@southalabama.edu

UNIVERSITY OF SOUTH ALABAMA

TELEPHONE: (251) 460-6308
CSAB 138 · MOBILE, AL. 36688-0002

INSTITUTIONAL REVIEW BOARD
September 7, 2017

Principal Investigator:	Tina Taylor		
IRB # and Title:	IRB PROTOCOL: 17-348 [1123500-1] THE EFFECTS OF ADVANCED ORGANIZERS AND COGNITIVE LOAD ON CLINICAL JUDGMENT OF PRE-LICENSURE NURSING STUDENTS IN SIMULATION BASED LEARNING		
Status:	APPROVED	Review Type:	Exempt Review
Approval Date:	September 7, 2017	Submission Type:	New Project
Initial Approval:	September 7, 2017	Expiration Date:	
Review Category:	Category: 45 CFR 46.101 (2): Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior		

This panel, operating under the authority of the DHHS Office for Human Research and Protection, assurance number FWA 00001602, and IRB Database #00000286, has reviewed the submitted materials for the following:

1. *Protection of the rights and the welfare of human subjects involved.*
2. *The methods used to secure and the appropriateness of informed consent.*
3. *The risk and potential benefits to the subject.*

The regulations require that the investigator not initiate any changes in the research without prior IRB approval, except where necessary to eliminate immediate hazards to the human subjects, and that **all problems involving risks and adverse events be reported to the IRB immediately!**

Subsequent supporting documents that have been approved will be stamped with an IRB approval and expiration date (if applicable) on every page. Copies of the supporting documents must be utilized with the current IRB approval stamp unless consent has been waived.

Notes:

Appendix M

Study Permission Letter

FORTIS INSTITUTE

Your Life. Powered By Learning

4081 East Olive Road • Suite B • Pensacola, Florida 32514

850-476-7607 *Telephone* • 850-462-1130 *Fax* • www.fortis.edu

September 5, 2017

Dear Ms. Taylor

You are approved to conduct research at the Nursing Program at Fortis Institute in Pensacola, Florida on The Effects of Advanced Organizers and Cognitive Load on Clinical Judgment of Pre-Licensure Nursing Students in Simulation Based Learning. We look forward to having you.

Kind Regards,

Kathleen L. Cole
Campus President

Appendix N

Study Consent Form

USA Institutional Review Board	
Approved:	9/7/2017
Expires:	9/6/2018
IRB number:	17-348/1123500-1

Consent Form

Project Title: The Effects of Advanced Organizers and Cognitive Load on Clinical Judgment of Pre-Licensure Nursing Students in Simulation Based Learning
Principal Investigator: Tina Taylor, doctoral student, University of South Alabama College of Education, Professional Studies Department.
Advisor: James Van Haneghan, Ph. D. University of South Alabama College of Education

You are invited to voluntarily participate in a research study on the use of simulation in nursing education. You were selected as a possible participant because you are a student in the nursing program at Fortis Institute School of Nursing, Pensacola, Florida Campus and at least 19 years of age.

The purpose of this study is to investigate how simulation is being used in nursing education and to discover if certain teaching strategies along with participant experience level impact student learning.

If you agree to be in the study, you will be asked to participate in a demographics questionnaire, pretest and posttest assessments, NLN-SLSS survey, a cognitive load assessment survey, and a debriefing interview. You will be given an advanced organizer to review and/or complete in addition to your standardized pre-brief material required by the school of nursing and participate in the simulation activities as required by the school of nursing. The benefits to participation which you might expect include the experience of participating in the nursing care of (simulated) patients with particular diagnosis that might positively impact how you care for other patients you encounter in clinical situations or how you respond to questions about caring for patients.

While in the study, there are no identified risks to you as a participant. Participation in the study will remain anonymous and no identifying data will be collected. Taking part in this study will not result in any costs to you as a participant. You will not receive payment for taking part in this study. All data will be kept a minimum of three years. Data obtained during this study may be submitted for publication or at a professional conference. Confidentiality and design integrity will be maintained in all information submitted for publication.

Taking part in this study is voluntary. You may choose not to take part or may leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled. Your decision whether or not to participate in this study will not affect your current or future relations with Fortis Institute College of Nursing, Pensacola, Florida Campus.

If you agree to participate, please complete the demographic questionnaire. You can withdraw from this research at any time without consequence.

CONTACTS FOR QUESTIONS OR PROBLEMS:
For questions about the study, contact the principal investigator: Tina Taylor, MSN, RN at
or or Dr. James Van Haneghan, faculty advisor at

For questions about your rights as a research participant or to discuss problems, complaints, or concerns about a research study, or to obtain information, or offer input, contact the University of South Alabama Office of Research Compliance and Assurance at 251-460-6308.

Thank you for your time.

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Appendix O

Study Demographic Survey

USA Institutional Review Board	
Approved:	9/7/2017
Expires:	9/6/2018
IRB number:	17-348/1123500-1

DEMOGRAPHIC QUESTONNAIRE

Date ID#

Age

□ 19-28 □ 29-38 □ 39-48 □ 49-58 □ 58-62

Gender

□ Male □ Female □ Other

Which term are you currently enrolled in?

□ First □ Second □ Third □ Fourth □ Fifth □ Sixth

How much experience do you have working in a healthcare setting (such as a physician's office, clinic, hospital, nursing home, home health, etc.)?

□ 0-6 months

□ 7-12 months

□ 13-18 months

□ 19-24 months

□ 25 months or more

What is your current GPA?

□ 1.0-1.9 □ 2.0-2.9 □ 3.0-3.9 □ 4.0

BIOGRAPHICAL SKETCH

BIOGRAPHICAL SKETCH

Name of Author: Tina D. Taylor

Place of Birth: Pascagoula, Mississippi

Date of Birth: February 7, 1969

Graduate and Undergraduate School Attended

University of Mobile, Mobile, Alabama
Bishop State Community College, Mobile, Alabama

Degrees Awarded:

Master of Science in Nursing Administration/Education, 2008, Mobile, Alabama
Bachelor of Science in Nursing, 2004, Mobile, Alabama
Associate of Science in Nursing, 1995, Mobile, Alabama

Professional Organizations:

Kappa Delta Pi Honor Society
Sigma Theta Tau Nursing Honor Society

Publications:

Anderson, D. A., Ching, D. F, Noland, S. & Taylor, T. D. (2014). Mobile County Health Needs Assessment: A collaboration between the University of South Alabama Medical Center and University of South Alabama Children's and Women's hospital FY 2012-2013. University of South Alabama Publications Press, Mobile, Alabama.