

IMPROVING CLINICAL REASONING  
SKILLS BY IMPLEMENTING  
THE OPT MODEL

by

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## **ABSTRACT**

Clinical reasoning is the cognitive process and strategies used to understand the significant patient data to identify and diagnose actual or potential problems in order to make competent clinical decisions that will affect patient outcomes (Fonteyn & Ritter, 2000). The purpose of the study was to determine if implementing the Outcome-Present State Test Model of Clinical Reasoning with guided reflection activities was an effective method to improve clinical reasoning skills in senior nursing students at a large southeastern university. The overall research questions involve comparing participants Health Sciences Reasoning Test scores before and after implementation of the OPT Model as clinical paperwork, secondly the experimental group was given a guided reflection activity to complete in conjunction with use of the OPT Model during clinical experience.

Kolb's Experiential Learning Theory is the theoretical framework used throughout this study. Nursing education has historically blended didactic learning with clinical experiences to transfer knowledge. The OPT offers a frame to organize thoughts and guides the learner to decide what data is important to each patient situation.

This study reports the findings for 62 senior nursing students that completed the HSRT prior to implementation of the OPT Model and a guided reflection activity. Clinical instructor's scored participants using the Lasater's Clinical Judgment Rubric each week. There were no statistically significant differences between the experimental group and the control group. The

only statistically significant difference that was identified was in the Lasater's Clinical Judgment Rubric scores between week one and week 2, and week 3 and week 4.

**Key words:** Clinical Reasoning, Kolb's Experiential Learning Theory, OPT Model of Clinical Reasoning, Health Sciences Reasoning Test, Lasater's Clinical Judgment Rubric

## **DEDICATION**

This dissertation is dedicated to my family. My husband, David Junkin, for his tireless support and encouragement, my children, Tori, Katie and Allie for being my constant cheerleaders! My brother, Chris, for his endless support in all aspects of my life. My parents for always supporting me in my educational endeavours no matter how long it took. I'm glad I make you all proud. I could not have done this without your support. IMM.

## LIST OF ABBREVIATIONS AND SYMBOLS

ANOVA	Analysis of Variance
CWID	Campus Wide Identification
df	Degrees of Freedom
F	Means of the within group variances
LCJR	Lasater's Clinical Judgment Rubric
M	Mean, sum of all scores divided by the number of scores
n	number in the sample
p	significance
r	correlation
SD	Standard deviation
t	Computed t test statistic value
%	percentage
=	equal to
$\alpha$	Level of significance
<	Less than
>	Greater than
*	The mean difference is significant at the .05 level

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## CHAPTER I – INTRODUCTION

There is mounting stress on nursing programs to produce new graduates who are fully prepared to successfully manage the complexities of patient care in a dynamic, oftentimes chaotic health care environment. To meet the rising expectations nursing programs must align curriculum and teaching strategies to not only meet minimal expectations of licensure but to also provide competent, safe, and effective care to an increasingly complex patient population, in a wide variety of health care settings (Benner, Surphen, Leonard & Day, 2010). New graduate nurses are expected to make sound clinical decisions and to meet or exceed agreed upon core competencies at the time of employment. Core competencies are not limited to factual data and practical knowledge but are more importantly, concerned with the application and integration of these competencies into real-world practice situations (Benner, Tanner, & Chesla, 2009).

The Institute of Medicine's (IOM), *The Future of Nursing Report* supports the recommendation of the Association of American Colleges of Nursing's (AACN) core competencies as outlined in the Essentials of Baccalaureate Education and include core competencies that address patient-centered care, inter-professional teams, evidence-based practice, quality improvement, patient safety, informatics, clinical reasoning/critical thinking skills, genetics and genomics, cultural sensitivity, professionalism, practice across the lifespan, and end of life care (AACN, 2008). Nursing curriculum should be responsive and fluid enough to adapt to change in response to rapidly changing developments in evidence and technology while maintaining a strong foundation that continually supports the development of clinical

reasoning. Nursing education programs should implement formative learning assignments that promote and foster the development and refinement of clinical reasoning throughout the curriculum. Students should be given relevant knowledge and the supportive framework to evaluate care plans, anticipate the needs of patients, and to collaborate with other members of the health care team. Promoting the development of clinical reasoning early in the curriculum will improve patient outcomes and promote the advancement of health care in today's complicated environment.

## **Background**

Nursing education programs have historically used a blended methodology that incorporates both didactic and clinical experiences to educate nursing students. Due to the variability and inconsistencies in predicting clinical experiences for students they are provided with a structured methodology to collect and analyze data, and to develop organized plans of care for their assigned patients. Many schools use 'care plans' that utilize the ADPIE (assess, diagnose, plan, implement, and evaluate) model of care. Care plans help students organize and process the large amounts of information that must be collected in order to comprehend the clinical experience.

The Outcome-Present State Test (OPT) Model of Clinical Reasoning is an outcome driven third-generation reasoning model that builds on past generations of nursing process models (Pesut & Herman, 1998). The OPT provides a framework for nurses to assess and analyze patient data while identifying the current clinical problem and desired outcomes (Harmon & Thompson, 2015). The nursing process was originally introduced in the 1950's as a four-step method to address nursing specific problems. The four-steps were assessment, planning, intervention, and evaluation. In the 1970's nursing evolved to include nursing

diagnosis as a second step in an updated five-step nursing process. In today's health care environment nurses are required to be anticipatory and forward thinking in their care; they must always consider patient outcomes. The OPT Model supports this type of forward thinking and allows the nurse to engage in clinical reasoning to improve patient outcomes in the process (Pesut & Herman, 1998).

For a student to develop the required skill set to make safe clinical decisions, it is essential that they first recognize and then comprehend the salient pieces of information collected from the clinical setting. A plan of care focused on anticipated patient outcomes is then developed to improve the patient's overall state of health. This research study will apply Kolb's Experiential Learning Theory to determine the aims of the study: a) to determine if reasoning scores improve after utilizing the OPT model as the teaching strategy during the clinical experience, b) to determine if clinical reasoning scores improve after completing a guided reflection activity in conjunction with utilization of the OPT model as a teaching strategy during the clinical experience, and c) to determine if clinical judgment scores improve after completing a guided reflection activity in conjunction with utilization of the OPT model as a teaching strategy during the clinical experience.

### **Statement of the Problem**

New graduate nurses are expected to be "practice ready" at the time of employment (Wolff, Pesut, & Regan, 2010) and are allowed to take the licensure exam (NCLEX-RN) within a month of graduation. Oftentimes students are not given real opportunities to make clinical decisions for patients in authentic patient care situations. For example, nursing students who are paired with staff nurses during clinical experiences are the first to be pushed aside during intense situations, relegated to a clinical observer role rather than an active participant in providing care.

This type of experience diminishes the clinical experience and causes the student to feel ill prepared for practice upon completion of the nursing program (Heslop, McIntyre, & Ives, 2001). To help new graduate nurses develop sound clinical reasoning, it is necessary to provide the framework and support required to develop the essential skills required in clinical reasoning. This study will implement a learning intervention, the Outcome-Present State Test Model of Clinical Reasoning, to provide a structure that supports the senior level-nursing students as they learn to collect and organize relevant data and develop sound care plans with the intent to improve patient outcomes.

### **The Purpose of the Study**

The purpose of this study was: a) to determine if reasoning scores improve after utilizing the OPT model as the teaching strategy during the clinical experience, b) to determine if clinical reasoning scores improve after completing a guided reflection activity in conjunction with utilization of the OPT model as a teaching strategy during the clinical experience, and c) to determine if clinical judgment scores improve after completing a guided reflection activity in conjunction with utilization of the OPT model as a teaching strategy during the clinical experience.

### **The Research Questions**

This research study addressed three research questions:

- 1) Do students show improvement in clinical reasoning scores, using the Health Science Reasoning Test, after implementation of a nursing process model during in-hospital clinical experience?
- 2) Do clinical reasoning scores, using the Health Sciences Reasoning Test, improve when students participate or do not participate in a guided reflection activity in

- conjunction with the Outcome-Present State Test Model of Clinical Reasoning during clinical experiences?
- 3) Do clinical judgment scores, using Lasater' Clinical Judgment Rubric, improve when students participate or do not participate in a guided reflection activity in conjunction with the Outcome-Present State Test Model of Clinical Reasoning during clinical experiences?

### **Theoretical Framework**

Kolb's Experiential Learning Theory was utilized as the theoretical framework for this study. The Experiential Learning Theory as present by David Kolb asserts that the learning process has six main characteristics.

- First, learning is best conceived as a process, not in terms of outcomes.
- Second, learning is a continuous process grounded in experience.
- Third, learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world. Learning is by its very nature full of tension as old ideas are challenged and replaced by new understandings.
- Fourth, learning is a holistic process of adaptation to the world.
- Fifth, learning involves transaction between the person and the environment.
- Sixth, learning is the process of creating knowledge that is the result of the transaction between social knowledge and personal knowledge (Kolb, 1984).

The clinical components within nursing curriculum are synergistic with principles two, five, and six. The theory of experiential learning is based on two continuums. The two continuums are described in Figure 1. The horizontal axis is the processing continuum, it describes 'how we approach a task', the vertical axis is the perception continuum and describes

the emotional response that a learner has to a given task or experience. According to Kolb, experiences are grasped through apprehension or comprehension. Apprehension is viewed as participation in the actual experience, whereas comprehension occurs outside the experience through reflection (Lisko & O'Dell, 2010). Kolb hypothesized that learners would fall into one of four learning style categories based on where they fell on each continuum. Kolb identified the four learning style categories as: accommodating, diverging, converging, and assimilating. Accommodating learners prefer to learn by hands on experience, diverging learners internalize experience by reflection, converging learners consider abstract ideas separate from the actual experience, and assimilating learners learn by comprehension but internalize the learning. On the end of each continuum are four modes of learning; the closer to the end of the continuum indicates the learners dominate learning preference.

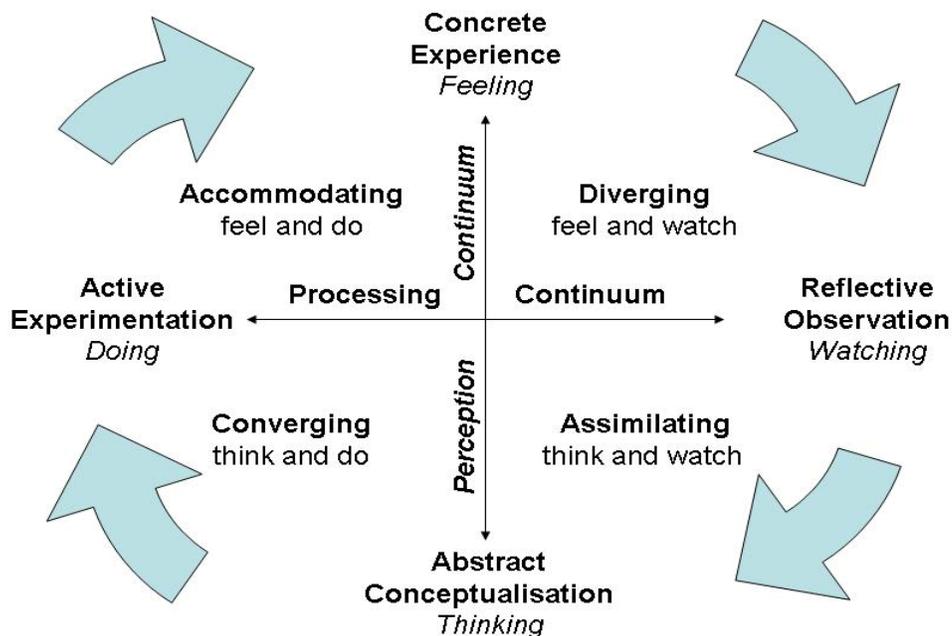


Figure 1. Kolb's Experimental Learning Theory

Concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE) are the abilities required in order for a learner to be effective.

Kolb (1984) explained:

“Learners must be able to involve themselves fully, openly, and without bias in new experiences (CE). They must be able to reflect on and observe their experiences from many perspectives (RO). They must be able to create concepts that integrate their observations into logically sound theories (AC), and they must be able to use these theories to make decisions and solve problems (AE).”

Kolb postulated that learning style may dictate where learners begin in the learning process and where learners enter the learning process can change the context of the experience (Kolb, 2015).

### **Implementation of Kolb’s ELT into Nursing Curriculum**

Experiential Learning Theory (ELT) can be utilized in nursing education and can provide a platform for students to continue these patterns of learning throughout their careers. Since the inception of formal nursing education clinical experience has been interwoven throughout nursing curriculum. Clinical practicum hours vary by nursing program, however every nursing program must complete a predetermined number of clinical practice hours. The clinical practice hours can be used as the concrete experience portion of ELT. Reflective observation occurs when the nursing student completes their assigned clinical paperwork, abstract conceptualization occurs when the nursing student connects the theory they have learned in the classroom setting with the practice they have seen in the clinical setting. The final phase (active experimentation) can be identified as the student engages in decision making for the patient. This active experimentation can be realized in many learning activities, clinical practicum, or simulation activities. Utilizing Kolb’s Experiential Learning Theory in nursing education allows for

maximization of the meaning of clinical experiences by encouraging engagement of the learner, followed up by reflection of the experience, allowing the learner to make the most of each clinical experience.

**Outcome-Present State Test Model of Clinical Reasoning**

The Outcome-Present State Test (OPT) Model of Clinical Reasoning provides a framework for nurses to assess and analyze patient data and identify the current clinical problem and the desired outcome (Harmon & Thompson, 2015). In today’s healthcare environment nurses are required to think ahead and to consider potential outcomes. The OPT model supports this type of forward thinking and allows nurses to engage in clinical reasoning to improve patient outcomes (Pesut & Herman, 1998). The OPT model worksheets and reasoning web can be used in simulation exercises, in class case studies, and in collaborative case studies.

The OPT model is made up of two components: the OPT worksheet and a clinical reasoning web. The OPT worksheet (see Appendix A) is made up of eight parts: a) client story, b) cue logic, c) keystone issue, d) reflective journaling, e) framing, f) testing, g) decision-making, and h) judgments. The second component of the OPT model is the clinical reasoning web (Harmon & Thompson, 2015). See Appendix B.

ELT supports the concepts of the OPT model. Each phase of the ELT can be identified within the OPT worksheet. The concepts of the OPT worksheet are integrated in the ELT model in Table 1.

Table 1 Integration of ELT and OPT Worksheets/Web

ELT Concept	OPT model
Concrete Experience (CE)	Clinical experience, simulation, case studies, client story
Reflective Observation (RO)	Framing, reflective journaling, cue logic
Abstract Conceptualization (AC)	Clinical reasoning web, testing
Active Experimentation (AE)	Decision-making, judgments

The learning cycle is repeated with each clinical experience, using the OPT worksheets and clinical reasoning web students begin to form the habits of mind to make sound decisions for their patients. Students will internalize the process as they advance from student nurse into novice nurse allowing the ELT cycle to continue ensuring that all experience leads to increased knowledge. Use of the OPT worksheets encourage reflection on experience supporting knowledge development based on Kolb's ELT. It also allows students to organize data that is collected and begins the habit of anticipating the needs of patients.

This study sought to determine if the implementation of the OPT Model of Clinical Reasoning will help students better organize their thoughts and data gathered in the clinical setting to improve clinical reasoning. Combined with purposeful reflection the use of the OPT Model of Clinical Reasoning worksheets will increase clinical judgment and therefore improve clinical reasoning during future clinical practice. Implementation of the OPT worksheets allow students to combine theoretical knowledge with the practical knowledge of the clinical setting.

### **Assumptions of the Study**

The assumptions of the study were:

1. Students enrolled in this senior level nursing class have successfully completed courses in the nursing curriculum and are preparing for entry level practice in nursing with a basic knowledge of nursing, pharmacology, and general pathophysiology.
2. Students have basic understanding of clinical practice based on successful completion of core baccalaureate nursing courses that they can draw on during their clinical experience associated with this course.

3. Experiential learning is a process that improves learning as an integrated process that is continuously modified by experience and is increasingly being used in undergraduate education.

### **Defintion of Terms**

The terms significant to the study were defined for the purpose of the study. Theoretical and Operational definitions are defined.

**Clinical Judgment.** Theoretical definition: Clinical judgment is often used interchangeably with clinical reasoning. Clinical judgment can be defined as an interpretation or conclusion about a patient's needs, concerns, or health problems and/or the decision to take action (or not), use or modify standard approaches, or improvise new ones as deemed appropriate by the patient's response. Operational Definition: Clinical judgment uses logical reasoning and contextual cues to reach conclusions about outcome achievements. Each judgment requires four elements, 1) contrast between a present and desired state, 2) criteria associated with a desired outcome, 3) concurrent consideration of the effects and influence of nursing interventions, and 4) a conclusion about outcome achievement and intervention effectiveness (Kuiper, Pesut, & Kautz, 2009). For the purpose of this study clinical judgment will be measured by using Lasater's Clinical Judgment Rubric.

**Clinical Reasoning.** Theoretical definitions: A specific term that is defined as the combination of theoretical knowledge and technical skills by using the nursing process to provide effective patient care (Alfaro-Lefevre, 2011; Paul & Elder, 2006). Clinical reasoning is a precursor to a decision and action (Simmons, 2010).

Operational definition: For the purpose of this study, clinical reasoning is defined as the cognitive process and strategies that nurses use to understand the significance of patient data, to

identify and diagnose actual or potential patient problems, to make clinical decisions to assist in problem resolution, and to achieve positive patient outcomes (Fonteyn & Ritter, 2000). Clinical reasoning will be measured using the Health Sciences Reasoning Test.

### **Significance of the Study**

There is a significant gap in the literature in regard to Experiential Learning Theory in baccalaureate nursing programs. This study utilized The Outcome-Present State Test Model of Clinical Reasoning to improve undergraduate nursing student's clinical judgment skills based on Experiential Learning concepts. This study illustrates how Kolb's ELT can be integrated in nursing education by utilizing the OPT Model worksheets in the clinical setting. Students are provided with a method to collect, analyze, and evaluate information gathered in the clinical setting while learning to anticipate the needs of their patients. The OPT model worksheet and clinical reasoning web provides a pathway for students to include many aspects of patient care that are important when developing and executing a plan of care that promotes positive patient outcomes.

## **CHAPTER II – LITERATURE REVIEW**

While there is a large amount of research done on reasoning in many disciplines, little has been reported on the use of the Outcome-Present State Test Model of Clinical Reasoning as an intervention to improve clinical reasoning in novice nurses. The review of literature will provide an overview of reasoning, cognitive development of reasoning, measures of clinical reasoning, and ways of teaching clinical reasoning.

### **Reasoning**

Reasoning is “a process that pertains to the thought processes, organization of ideas and exploration of experiences to reach conclusions” (Banning, 2007). There are many types of reasoning identified in the literature including problematic reasoning, theoretical reasoning, practical reasoning, operational reasoning, inductive reasoning, dialectic reasoning, and clinical reasoning (Banning, 2007). Of all these types of reasoning, this literature review will focus on clinical reasoning. Clinical reasoning is used in a variety of clinical disciplines such as nursing, physical therapy, occupational therapy, medicine, sports medicine, and most recently pre-service education (Huhn & Deutsch, 2011, Isik & Kuzudisli, 2015, and Kriewaldt & Turnidge, 2013). While reasoning is a concept that can be found in every decision making process, adding the descriptor “clinical” implies a health related aspect (Cerullo & Cruz, 2010).

Clinical reasoning (CR) can be broken down into critical thinking and reflective problem solving (Facione and Facione, 2008, p1). Pesut and Herman define as “the reflective, creative, and critical systems thinking process nurses use to frame the meaning and facts associated with a

client story, juxtapose and test the differences between a patient's present story and make judgments about outcome achievements derived from reflection and self-regulation of thinking" (Pesut & Herman, 1998, p 4). Alternately stated, CR is the "cognitive processes and strategies that nurses use to understand the significance of patient data, to identify and diagnose actual or potential patient problems, to make clinical decisions to assist in problem resolution, and to achieve positive patient outcomes (Fonteyn and Ritter, 2000, p. 107). Clinical reasoning is widely studied in nursing because it is a core competency as laid out by the American Association of Colleges of Nursing in the 2008 *Essentials for Baccalaureate Education* and can directly affect patient outcomes to deliver safe and effective nursing care (Kuiper & Pesut, 2004; Murphy, 2004).

Clinical reasoning, clinical judgment, decision-making, problem solving, and diagnostic reasoning are often used interchangeably (Simmons, 2010). Critical thinking is frequently used in the quest to understand matters of thought within the nursing discipline, it is the ability to use skillful thinking to analyze, assess, and apply information to make purposeful, logical judgments in and out of the clinical setting (Alfaro-Lefevre, 2011). Critical thinking is important to discuss because it is an integral measurable component of clinical reasoning (Scheffer & Rubenfeld, 2000). Critical thinking in recent years is referred to as the 'habits of the mind' because there are observable attributes that are required to engage in critical thinking such as confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance, and reflection (Rubenfeld & Scheffer, 2006, p 16-24). Whereas clinical judgment is deciding what is wrong with a patient compared to clinical reasoning being action that occurs to change the patient's outcome (Levett-Jones et al., 2010). While some literature continues to use these term interchangeably, critical thinking and clinical judgment are

integral components of end product that is clinical reasoning. Clinical reasoning includes data analysis, metacognition, heuristics, inference, deliberation, logic, cognition, information processing, and intuition (Simmons, 2010).

### **Cognitive Development of Clinical Reasoning**

Clinical reasoning is the product of theoretical knowledge and technical skills using the nursing products to provide effective nursing care (Murphy, 2004). In order to understand how the brain is capable of these complex matters it is important to understand the structure of the brain. The brain is divided into two hemispheres, the left controlling the right side of the body and the right controlling the left side of the body. Each hemisphere is then divided into four lobes, occipital, temporal, parietal, and frontal lobes. The occipital lobe interprets vision, the parietal lobe interprets signals from the senses, the temporal lobe is the memory center, sequencing and organization also occurs in the temporal lobe. The frontal lobe is where judgment, planning and problem solving occurs (Hines, 2016).

Neuroplasticity is the process by which the brain and nervous system produce structural changes in the brain in response to environmental stimuli (Vance, Roberson, McGuinness, & Fazeli, 2010). Mackey, Singley, Wendelken, and Bunge (2015) hypothesized that practice with complex reasoning problems could alter the patterns through the brain, and lead to changes in the interactions between different lobes of the brain (Mackey et al. 2015). In order to determine if brain training can effect reasoning ability they examined twenty-three participants enrolled in a Law School Admission Test (LSAT) preparation course. They found improved test scores, likely due to the 100 hours of instruction and practice, but they also compared magnetic resonance imaging (MRI) scans of the participants and discovered increased connectivity between the frontal and parietal regions at rest (Mackey et al. 2015). They concluded that

practicing reasoning problems led to improved performance in a previously unpracticed task and caused shifts in neural recruitment during reasoning tasks, supporting neuroplasticity and its role in creating structural patterns within the brain to improve clinical reasoning skills (Mackey et al. 2015).

### **Measurement of Clinical Reasoning**

Multiple instruments have been developed that measure clinical reasoning such as Lasater's Clinical Judgment Rubric, Health Sciences Reasoning Test, and concept map scores. Due to the lack of measurement tools specifically for clinical reasoning, clinical judgment and critical thinking will be the assumed predictor of clinical reasoning. Psychometric information on each instrument can be found in Chapter 3.

**Lasater's Clinical Judgment Rubric.** Lasater's Clinical Judgment Rubric (LCJR) was designed as an evaluative tool to measure clinical judgment in nursing students (Lasater, 2007). Based on Tanner's Clinical Judgment Model (2006) the rubric provides formative evaluation to students and facilitates the student's progress toward competence (Nielson, Stragnell, & Jester, 2007). Tanner's Clinical Judgment Model is a research-based model of clinical judgment that is relevant in clinical settings that require reasoning and continuous reappraisal (Tanner, 2006). The overall process mimics clinical judgment in the experienced nurse and consists of four nursing actions: noticing, interpreting, responding, and reflecting (Tanner, 2006). The LCJR is organized to rate each action as a developmental phase starting with beginning, moving on to developing, then accomplished, and finally exemplary (Lasater, 2007).

Stuedemann and Dreifuerst (2017) used the LCJR in a pilot study to investigate nursing students clinical judgment during a simulation exercise and to determine if LCJR scores correlated with the demonstration of nursing action in the simulation exercise (Stuedemann &

Dreifuerst, 2017). Twenty-two students participated in the study. Students were asked to participate in a simulation exercise and were observed by faculty; faculty then noted if students initiated pre-defined nursing actions during the simulation. Each student was scored using the LCJR. The researchers found statistically significant ( $p = .04$ ) moderate correlation ( $r = 0.36$ ) between students LCJR score and performance of indicated nursing actions. Showing higher total LCJR scores were associated with higher completion rate of indicated nursing action (Stuedemann & Dreifuerst, 2017).

In another quantitative experimental design study, Coram (2016), used the LCJR to determine the effect of a specific prebriefing strategy of expert role modeling on novice nursing students' clinical judgment scores. Forty-three students were randomly assigned to be in the experimental group and control group. The experimental group received the intervention, which was a video of an expert nurse role modeling care of a standardized patient with a writing think aloud document following report for the simulation exercise. Both groups were scored using the LCJR during the simulation exercise, and students scored themselves. The self-assessment scores indicated that students performed at the accomplished level, supporting Benner's paradigm that students don't know what they don't know. The nurse educators scored the control group as 'novice' and the experimental group as 'developing'. They reported a significant difference ( $p = .000$ ) for both total and subscale scores of the LCJR, and attributed the difference to the use of the intervention (Coram, 2016).

Inter-rater reliability varies from .73, in a study where all eleven dimensions were evaluated on forty-six junior and senior baccalaureate nursing students and (Guburd-Howe & Sideras, 2011) and .984 where critical thinking and clinical reasoning was measured in an undisclosed number of baccalaureate nursing students (Victor-Chmil & Larew, 2013). Ashcroft

and Opton (2009) performed a quantitative analysis using an expert panel review and post hoc factor analysis of the rubric, construct validity was supported, however they suggested including two additional dimensions to include patient safety and sentinel events (Ashcroft & Opton, 2009).

**Health Science Reasoning Test.** The Health Science Reasoning Test (HSRT) was developed to assess critical thinking skills of allied health students (Facione & Facione, 2006). It requires students to draw inferences, make interpretations, analyze information, identify claims and reasons and evaluate the quality of arguments, which are all required activities within many health related disciplines (Insight Assessment, 2017).

Sullivan-Mann, Perron, and Fellner (2009) used simulation to improve nursing students' critical thinking scores, measuring critical thinking using the HSRT (Sullivan-Mann, Perron, & Fellner, 2009). Using a 2 (groups) x 2 (times) mixed model design, fifty-six participants took the HSRT prior to being sorted into experimental and control groups. The experimental group was given three additional scenarios during the semester to evaluate if simulation exercises do affect critical thinking scores. The researchers reported significant main effect for time ( $F(1,51.0) = 8.78, p < .01$ ), indicating more correct answers in both groups. One-factor analysis of variance was conducted and found the experimental group answered significantly more questions correctly on the posttest than they did the pretest ( $F(1,26) = 6.74, p < .05$ ). The researchers were able to conclude that simulation is an important active learning strategy in nursing curricula (Sullivan-Mann et al., 2009).

In 2011 Huhn et al. administered the HSRT to physical therapy students to determine the construct validity of the test and reported that the HSRT was able to discriminate between expert and novice practitioners (Huhn, Black, Jensen, & Deutsch, 2011). In another study by Huhn and

Deutsch (2011), the HSRT was administered to determine if a web-based patient simulation program improved clinical reasoning skills between second year physical therapy students participating in multiple interventions geared to improve clinical reasoning compared to traditional methods of improving clinical reasoning. The results of this study found there was a statistically significant improvement in HSRT scores in the experimental group compared to the control group (Huhn & Deutsch, 2011). Pitt, Powis, Levett-Jones, and Hunter (2015) reported using the HSRT to examine how clinical reasoning skills progress through a three-year baccalaureate program in Australia (Pitt et al. 2015). This study analyzed 134 students upon entry into the program and again at the completion of the program, they found total critical thinking scores significantly increased between entry and exit (Pitt, Powis, Levett-Jones, & Hunter, 2015). In 2015, Forneris et al., reported use of the HSRT to determine if a specific type of debriefing (Debriefing for Meaningful Learning also referred to as DML) was useful in improving a student's clinical reasoning skills. They found statistically significant improvement in HSRT scores when the debriefing was modeled in a specific manner (Forneris et al. 2015).

In a 2017 Dutch study of Occupational Therapy students the HSRT was administered prior to a newly developed evidence-based decision making intervention, and again after five two-hour sessions in a simulated authentic situation. The researchers found no improvement of HSRT scores when the pretest was compared to the posttest. The researchers concluded after analyzing student feedback on the intervention that the intervention was too short; this was likely the reason for no improvement in HSRT scores (Baarends & Van der Klink, 2017). Reliability of the HSRT was established using the Kuder-Richardson-20, and found to range from .77 to .84 (Facione & Facione, 2006).

**Concept map scores.** Concept mapping as a measure of clinical reasoning requires formative feedback as the student begins to connect new information to existing knowledge and integrate interdisciplinary knowledge (Yue, Zhang, Zhang & Jin, 2017). Jaafarpour, Aazami, and Mozafari (2015) examined concept maps in a quasi-experimental study to evaluate the usefulness of concept map construction as a teaching strategy on learning outcomes for nursing students (Jaafarpour, Aazami, & Mozafari, 2015). They found mean scores for cumulative tests to be statistically significantly higher in the group that engaged in the map construction compared to the group that did not (Jaafarpour et al. 2015). They also found that the scores on the concept maps improved throughout the course of the study.

Lee, Chiang, Liao, Lee, Chen, and Liang (2012) reported a positive effect of concept maps on clinical thinking scores over time (Lee et al. 2012). The purpose of their study was to investigate the growth and influencing factors in the development of critical thinking in response to use of concept mapping as in intervention in a two-year baccalaureate program. The researchers utilized a quasi-experimental, longitudinal follow-up design to analyze the outcome. There were forty-seven students in the experimental group and forty-eight in the control group. Both groups participated in the Critical Thinking Scale and the Approaches to Learning and Studying (ASI) to analyze critical thinking and how students studied. The experimental group participated in a concept mapping exercise throughout the two-year program; the control group did not participate in the exercise. The study reported the experimental group had a statistically significantly higher score of inference ( $t = -2.55, p = .05$ ) and deduction ( $t = -2.56, p = .05$ ) than that of the control group. These were the only findings that were statistically significant. They concluded that concept mapping exercises could improve critical thinking over time in

conjunction with faculty encouraging deep learning rather than superficial memorization (Lee et al., 2013).

This is not an exhaustive list of methods to measure critical thinking, clinical judgment, and clinical reasoning however these are the methods that pertain to this study. Nursing research accepts the use of the LCJR as a method to assess measurable components of clinical reasoning as evidenced by multiple studies using the instruments when reporting undergraduate, pre-licensure, nursing students (Victor-Chmil & Larew, 2013). The HSRT is accepted in multiple disciplines such as physical therapy (Huhn et al. 2011) nursing (Paans, Sermeus, Nieweg, Krijnen, & van der Schans, 2012), and occupational therapy (Baarends and Van der Klink, 2017).

### **Ways of Teaching Clinical Reasoning**

The literature reveals a wide array of methods to teach clinical reasoning. Active learning, based on experiential learning theory, requires student participation, interaction, problem-solving, and learning that promotes student engagement while promoting students' responsibilities for learning and instructors' coaching role (Shin, Sok, Hyan, & Kim, 2014 and Waltz, Jenkins, & Han, 2014). Some examples of active learning strategies include simulation, debriefing, reflection, and concept mapping. The literature does not designate any one method as best.

**Debriefing.** Debriefing is a guided reflection discussion that attempts to bridge the gap between experiencing an event and making sense of it (Fanning & Gaba, 2007). Debriefing can occur after simulation exercises, clinical experiences, or any other event that occurs where the participant may need to connect what they have seen with prior knowledge. In a national study by Fey and Jenkins (2015) a sampling of 502 nursing schools throughout the United States report

that 47% participated in a structure debriefing after simulation exercises, with approximately 31% of programs using a specific theory or model to guide debriefing (Fey & Jenkins, 2015).

Forneris et al. (2015) investigated if debriefing using Dreifuerst's Debriefing for Meaningful Learning (DML) had a positive effect on clinical reasoning skills and if students perceived a difference in the quality of debriefing when the DML method was used compared to customary debriefing. In this pretest/posttest, repeated measure research design study seventy-eight participants were randomly assigned to the experimental group and seventy-five were the control group. The experimental group debriefed using DML after a simulation exercise using a standardized patient. Each participant took the HSRT prior to the simulation exercise, and then again three weeks later. Using a paired sample t-test, the experimental group showed statistically significant improvement in the HSRT score at the .05 significance level. The control group did not show significant improvement. The researchers determined that DML had a positive impact on the development of clinical reasoning skills in undergraduate nursing students when compared to usual and customary debriefing (Forneris et al. 2015).

**Reflection.** Reflection is the process of looking back on an experience. Murphy (2004) explored the effects of instructing students to use focused reflection and articulation to enhance the development of clinical reasoning skills. The sample size was thirty-three students and four instructors. Participants were randomly assigned to the treatment and control groups. Instructors used a researcher-developed assessment tool to assess students' written patient assessments. Using a qualitative research design, interviews were conducted to explore differences between high and low scores of the researcher-designed assessment tool. When scores of the assessment tool were analyzed no significant difference was found when comparing the two groups however the researcher noted that students that scored higher on the assessment described significant

learning events more fully, implying the value of focused reflection on clinical experiences (Murphy, 2004).

Ip et al. (2012) developed and evaluated a structured education program based on Johns' Self-Reflective Model (SRM) to improve the student's level of reflection during clinical practice (Ip et al. 2012). This pretest/posttest design examined thirty-eight second year undergraduate baccalaureate students in Hong Kong after participating in a three hour workshop on the application of Johns' SRM. Participants were asked to complete the Student Opinion Scale related to the reflective practices, and the clinical instructors were asked to score the students' reflections using a three-point reflection scale, rating them as non-reflectors, reflectors or critical reflectors. The researchers concluded that students had a positive opinion of the exercise; their biggest complaint was the time commitment required to effectively reflect on their clinical experiences. Secondly, there was significant statistical difference between the students' level of reflection rated over the course of the study. The pretest showed 92.1% of participants were rated as non-reflectors, by the posttest 63.2% were rated as reflectors, no students were rated as critical reflector (Ip et al. 2012).

**Concept mapping.** Concept maps have been used in nursing education since the mid 1980's. First developed by Novak and Gowin (1984), concept maps were developed as "schematic devices for representing a set of concept meanings embedded in a framework of propositions" (p. 15). The purpose of the concept map is fourfold:

1. to introduce and stimulate critical thinking
2. to enhance students' understanding of many interrelated factors involving a single patient
3. to identify and clarify concepts and health/situation influences and

#### 4. to visually and logically link concepts

Concept maps allow clinical instructors to see what each student is thinking as they process the patient and the illness affecting them (Ellermann, Kataoka-Yahiro, & Wong, 2005). In a qualitative study, Chan (2017) explored the use of concept maps in conjunction with problem based learning in a case study approach (Chan, 2017). The thirty-eight participants were divided into groups of four or five and were asked to collaborate and develop a concept map after they were given a case scenario. The participants were encouraged to be creative with the development of their group concept map, two raters graded the concept maps with points given for creativity and inclusion of case specific disease related information. The themes that emerged with analysis of the learning exercise showed that concept maps could combine information and creativity. Images can tell a story and concept maps can be three dimensional and moveable (Chan, 2017). Yue et al. (2017) provided a systematic review and meta-analysis that provides evidence supporting the effectiveness of concept mapping in nursing education as it affects critical thinking (Yue et al. 2017).

**The Outcome-Present State Test Model of Clinical Reasoning.** The Outcome-Present State Test (OPT) Model of Clinical Reasoning is an active learning strategy that builds on prior knowledge and guides students through the process of data collection, data analysis and decision-making (Pesut & Herman, 1998). The OPT Model of Clinical Reasoning incorporates concept mapping, reflection, and debriefing. The OPT Model is made up of a worksheet and a reasoning web, see Appendix A and B.

Kautz, Kuiper, Pesut, Knight-Brown, and Daneker (2005) aimed to evaluate clinical reasoning through use of the OPT Model of Clinical Reasoning. Using a quasi-experimental design, twenty-three junior baccalaureate nursing students enrolled in a medical-surgical course

completed the OPT worksheet, clinical reasoning web and completed a reflective journaling assignment after each clinical experience. The reflective journals were guided by self-reflective learning prompts but were not analyzed until after all data collection had been completed. The clinical instructor rated and provided feedback on the worksheet and the reasoning web each week. The researchers found a statistically significant difference in students' ability to frame the situation over time ( $\chi^2 = 6.84, p=0.033$ ), and the students' ability to make decisions about appropriateness of interventions ( $\chi^2 = 9.882, p=0.007$ ) (Kautz et al. 2005).

Bland, Rossen, Bartlett, Kautz, Carnevale, and Benfield (2009) implemented the OPT model as a teaching tool for clinical reasoning in an undergraduate psychiatric nursing course (Bland et al. 2009). The researchers used a pre-test/post-test design, where forty-three students participated in the study. The purpose of the study was to determine if students were able to identify the keystone issue using the model. Participants were all instructed during class time how to complete the worksheets and the reasoning web, and then asked to complete the same worksheets during clinical time. Faculty provided feedback on the worksheets. The McNemar test found statistical difference between pretest and posttest ability of students in identifying the correct keystone nursing diagnosis ( $p < .05$ ) (Bland, Rossen, Bartlett, Kautz, Carnevale, & Benfield, 2009).

## **Summary**

Clinical reasoning is a required component of nursing and therefore the transfer of clinical reasoning must be integrated into nursing education. With many instructional methods that have found statistical improvement in reasoning scores it is imperative to continue in the quest to find the best method of improving this core competency. In a student-centered

education, it is imperative to instill habits of mind and equip learners with methods that encourage continual growth and reassessment to create a positive impact on patient outcomes.

## **CHAPTER III – METHODOLOGY**

The purpose of this chapter is to describe the methodological process that the investigator utilized to answer the research questions. The following components will be addressed: a) design of the study, b) methods, c) sample and setting, d) instruments, e) procedure, f) human subjects g) data collection, h) data analysis, and i) study limitations.

### **Design of the Study**

The current study utilized a quasi-experimental design. Clinical reasoning was the independent/predictor variables in this study. Health Science Reasoning Test (HSRT) was utilized to measure the independent/predictor variables. The dependent variable was clinical judgment measured by the Lasater's Clinical Judgment Rubric (LCJR). The participants utilized the Outcome Present-State Test Model of Clinical Reasoning (OPT) worksheet and clinical reasoning web as their standardized clinical assignment during their clinical experience. See Appendix A and B.

### **Methods**

Arrangements for data collection was established and coordinated with the course leader of the senior level complex client course. Clinical instructors were trained by the principle investigator on use of the OPT model worksheets as clinical paperwork prior to the start of the semester. The OPT model worksheets were used by all students enrolled in the course as clinical paperwork associated with each in-hospital clinical experience during the course. While each clinical instructor had prior experience in teaching within the clinical setting they received initial

training on the application and use of the OPT model prior to the beginning of the semester, clinical instructors were also given access to the PowerPoint presentation that the students used to become familiar with the OPT Model worksheets.

### **Sample and Setting**

This study utilized a convenience population of approximately 120 senior baccalaureate-nursing students attending a large southeastern university who were enrolled in a complex client/critical care course where one course objective is to “demonstrate clinical reasoning through the integration of information from nursing, humanities, and the behavioral, biological, and natural sciences”. The course used was Professional Nursing Practice: Complex Client. This course had a didactic portion and a clinical portion. The didactic portion of the course meets weekly for the first seven weeks of the semester. The clinical portion of the course students were assigned to clinical groups one day a week, they typically are on their assigned clinical unit twelve hours once per week for the first seven weeks of the semester. Each clinical instructor had two groups of students. Inclusion criteria for participation in this study were senior nursing students aged nineteen and above who are enrolled in Professional Nursing Practice: Complex Client for the first time. Exclusion criteria include age younger than nineteen and those attempting the course for the second time.

A power analysis to determine statistical significance for effect of the independent variable was performed and determined that a sample size of  $N=70$  would provide 80% power for a large effect size at a significance level of .05. There are approximately 120 students enrolled in course. The calculations for the dependent variable required a smaller sample size.

## Instruments

Demographic data was collected. Reasoning was measured using the Health Sciences Reasoning Test. The clinical instructors, using Lasater’s Clinical Judgment Rubric, measured clinical judgment. Instruments used in this study can be viewed for number of items, range, score possibility, and coefficient alpha for reliability in Table 2. References for reliabilities are cited in the discussion of instruments following the table.

Table 2 Description and Psychometrics Properties of Instruments

<b>Instrument</b>	<b>No. of items</b>	<b>Scale</b>	<b>Possible score</b>	<b>Coefficient alpha</b>
<b>HSRT</b>	33	1-4	0-33	.81
<b>LCJR</b>	44	1-4	0-44	.88

**Demographic Data Questionnaire.** The Demographic Data Questionnaire was comprised of eight questions, to include the participants’ age, gender, race, ethnicity, current overall grade point average, prior education, previous healthcare experience, and prior work experience. The questionnaire was developed by the principle investigator based on relevant supporting research and literature using a common survey tool (See Appendix D).

**Health Sciences Reasoning Test.** Reasoning was measured using the Health Sciences Reasoning Test (HSRT). The HSRT measures high-stakes reasoning and decision-making processes. It addressed the application of one’s reasoning skills for the purpose of forming reflective judgments defining perception and behavior in a given context or problematic situation. The HSRT provides a measure of overall critical thinking as well as five critical thinking ability scores. The five sub scores measured on the HSRT include analysis and interpretation, inference, evaluation and explanation, inductive reasoning, and deductive

reasoning. This instrument consists of thirty-three multiple-choice items with a range from 0 to a maximum score of thirty-three. Total scores above twenty-six indicate superior critical thinking skills, 21-25 suggest strong critical thinking skills, and scores 15-20 indicate moderate skill level suitable for learning. Scores between of 0-14 denote critical thinking skills that are not manifested and is typically consistent with minimal test taker effort, cognitive fatigue, or possible reading and comprehension issues. Sub scores are rated zero to five, a score of five in a sub category shows strong ability in that category. For the purpose of this study, the overall score was analyzed (Insight Assessment, 2017).

Reliability of the HSRT was established at .78-.82 using the Kuder-Richardson-20 (KR-20); overall internal consistency was .81. Kuder-Richardson-20s for the scales consistently ranged from .52-.77. Scale reliability coefficients were reported as Inductive = .76; Deductive = .71, Analysis = .54, Inference = .52, and Evaluation = .77 (HSRT Test Manual. 2013). Validity was determined based on the definition of critical thinking as developed by the APA Delphi research study (APA, 1990). Permission to use this instrument was granted by Insight Assessment.

**Lasater's Clinical Judgment Rubric.** Lasater's Clinical Judgment Rubric (LCJR) was designed to measure nursing student's clinical judgment during simulated patient care scenarios. The rubric contains forty-four items in four areas described by Tanner's (2006) Model of Clinical Judgment, and includes Noticing, Interpreting, Responding, and Reflecting. The rubric was designed to illustrate the developmental level of students at each of the four developmental levels in clinical practice and were defined as the beginning, developing, accomplished, or exemplary phases. Each phase was assigned a score from 1 to 4 respectively (See Appendix E). When the four dimensions are scored and totaled a score of 34-44 would be indicative of the

exemplary phase, 23-33 would be indicative of the accomplished phase, 12-22 would be indicative of the developing phase, and eleven or below would be the beginning phase. Inter-rater reliability was established at .889 (Adamson et al. 2012). Jenson (2010) reported the overall internal consistency of 0.95, and internal consistency for each section (noticing, interpreting, responding and reflecting) was .86-.88 (Jenson, 2010). For the purpose of this study, the overall score was analyzed. Validity was established using interclass correlations (z score) in each of the eleven behavioral categories (Gubrud-Howe & Sideras, 2011). Inter-rater reliability has been shown to have a range of 0.73-0.889 (Adamson et al. 2012; Gubrud-Howe, 2008). Permission to use the instrument was granted by Dr. Kathie Lasater, PhD.

## **Procedure**

Students were introduced to the study on the first day of class, the principle investigator was introduced by the course leader, the study was explained, and written informed consent was obtained. A cover letter was given to each participant explaining the study. Consent forms were provided to each participant prior to data collection. Table 3.1 illustrates the timeline of data collection. The OPT Model has been adopted for use during the clinical experience of the course starting fall 2017 by the course leader.

**Clinical Instructors.** The Clinical Instructors (CI) were introduced to the study during the course meeting that occurs prior to the semester beginning. All CI agreed to collect data for the purpose of this study without coercion. Each CI completed the learning modules that were required by the IRB prior to assisting with data collection. During the course meeting they were introduced to use of the OPT Model of Clinical Reasoning. During the pre-semester course meeting the clinical instructors were reviewed and instructed on the use of the LCJR. The principle investigator answered any questions the clinical instructors had and shared contact

information for to answer any questions that came up over the course of the semester. CI had two opportunities to learn the use of the OPT Model of Clinical Reasoning, once during the course meeting and the second time during the first class when the participants are introduced to the model. Students were asked to turn in their clinical paperwork twenty-four hours after the end of their clinical experience. The OPT worksheet and reasoning web were reviewed by the CI and returned to the student with comments as needed. The guided reflection activity was not analyzed for this study. Each week after the participant's clinical experience the clinical instructors completed a LCJR.

**Participants.** The participants were introduced to the study during the first meeting of the semester. Informed consent was collected at that time. After informed consent was obtained the principle investigator determined students that meet inclusion criteria. All students in the course, participants and non-participants, utilized the OPT Model of Clinical Reasoning as their assigned clinical paperwork. The OPT Model of Clinical Reasoning was to be introduced during the second course meeting, but there was severe weather and the class was canceled due to inclement weather. The principle investigator provided a PowerPoint presentation with voice over that explained the use of the OPT Model of Clinical Reasoning. Demonstration and explanation of the OPT Model typically takes thirty minutes. Students were not given an opportunity to ask questions for clarification due to the inclement weather closing the school.

The HSRT takes no more than fifty minutes to complete. The instruments were completed online during class time. There were a few participants that were unable to make the test work on their laptops, those students came to the computer lab to complete the pretest. All results were identified by the last four digits of the student's campus wide identification number and sent to the principle investigator by Insight Assessments.

The clinical instructors assessed the students using the LCJR each week during the clinical experience. The LCJR was collected on a weekly basis after the clinical experience and entered into a spreadsheet to allow for analysis at the end of the clinical experience. Completed LCJR forms were stored in a secure and locked cabinet until after the study was completed, after that time they were shredded. Only the last four digits of the participant's campus wide identification number was be used to ensure anonymity.

Participants randomly drew a card out of a hat on the first day of data collection to determine if they are in the experimental group or the control group. When the participants drew their card they wrote their email address and the last four digits of their student number on the card and the principle investigator collected the cards. The participants in the experimental group were emailed the guided reflection activity before each clinical day. The participants that drew a blue were the experimental group and the participants that drew a yellow card were the control group. The participants did not know which group they were assigned to. The participants that sorted themselves into the experimental group were to complete the guided reflection activity on the OPT (See Appendix C); the control group did not complete the guided reflection activity. For the purpose of this study, the guided reflection was not analyzed, however the LCJR scores were compared to determine if guided reflection on clinical experience had an effect on clinical judgment skills.

Table 3 Timeline of Data Collection

	<b>Week 1/Pre-Clinical</b>	<b>Week 2</b>	<b>Week 3</b>	<b>Week 4</b>	<b>Week 5</b>	<b>Week 6</b>
Demographics	x					
HSRT	x					x
Guided Reflection		x	x	x	x	
LCJR		x	x	x	x	

### **Human Subjects**

Protection of human subjects was ensured. Prior to data collection, approval was obtained from the Institutional Review Board. Once approval was granted, students were notified of the study during the first meeting. The study’s purpose and procedural protocol was explained at that time. Additionally, they were invited to participate on a voluntary basis and notified that a decision whether to participate or not would in no way affect their grade for the course.

In the event that a participant had questions related to the research study the principle investigators contact name, address, email address, and telephone number for the investigator and contact person for the IRB at the University of Alabama was included on the consent form. Participants were asked to identify themselves by the last four digits of their campus wide identification number to allow for confidentiality during the data collection process. Data was maintained in a locked cabinet in a locked room the principle investigator’s home office for a period of five years after such time the data will be destroyed.

The consent form was administered to all eligible participants. The consent form explained the purpose, benefits, and risks of participating in this study. Participants were reminded that participation is strictly voluntary. Participants were informed of their right to withdraw from the study at any time without ramifications. Data was stored on a secured password protected laptop owned by and in the secure possession of the principle investigator and the password was known only by the principle investigator. The demographic data was collected using a common online survey tool, which was also password protected.

### **Data Collection**

Data collection began during the first class of the semester. All conditions of the Family Educational Rights and Privacy Act of 1974 (FERPA) were strictly enforced at all times. Demographic data was collected first, the principle investigator determined if those participants that agreed to participate meet the eligibility requirements. Data collection times were arranged with the course leader and all instruments were completed during class or submitted in the computer lab at the school. See Figure 2 for Research Design.

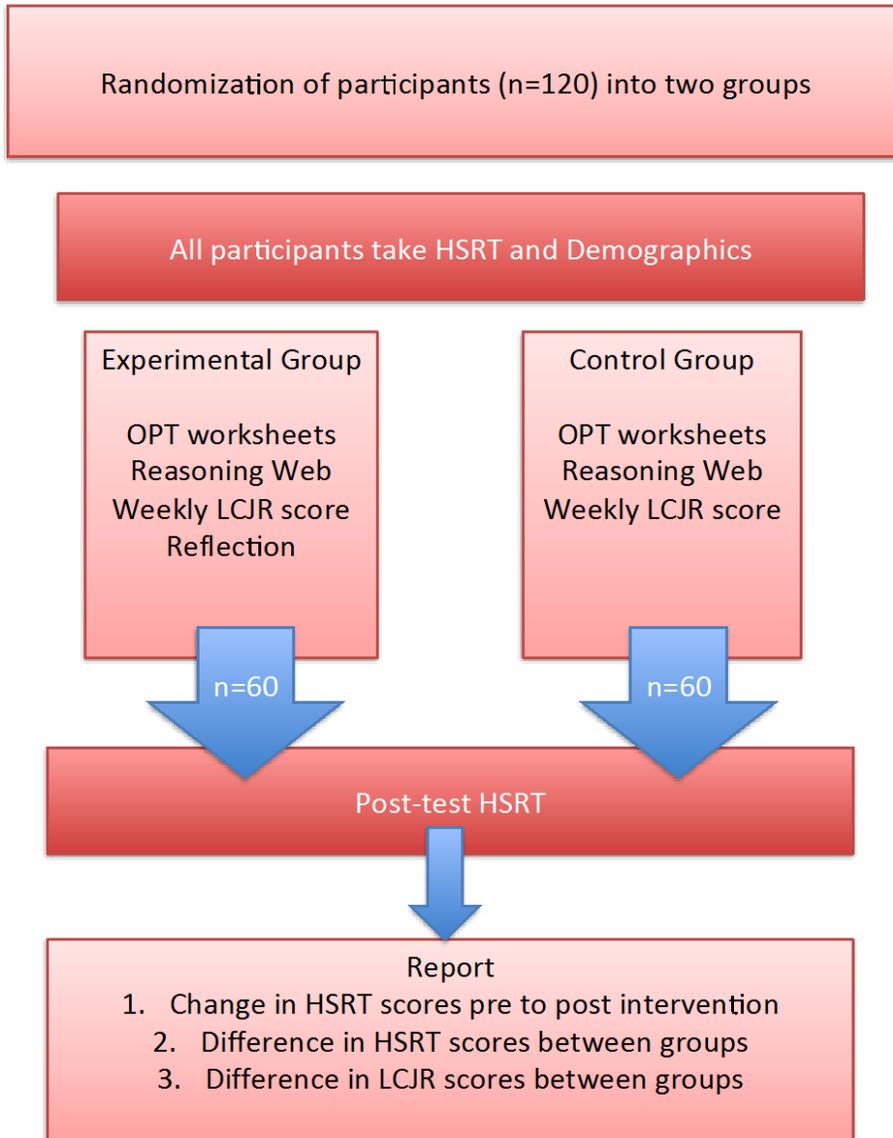


Figure 2. Research Design

### Data Analysis

After data was collected, it was loaded into SPSS v24.0 and frequencies were run in order to identify any missing or invalid data, outliers, or man-made errors. Data cleaning and any necessary data transformations, computations, and or recoding was also be performed at that time. A multiple linear regression was then run to fit the model. Overall model and independent

variable inclusion used  $\alpha = .05$ . Prior to interpreting the results, regression assumptions (linearity, independence, normality, and a homogeneity) were checked for violation using Q-Q plot to assess normality, and a scatterplot of residuals and fitted values to assess linearity and homogeneity.

The purpose of this study was to determine if there is a relationship between clinical reasoning skills as measured by HSRT, and clinical judgment skilled measured by LCJR. As well as to determine if guided reflection activities had an effect on clinical judgment scores. The study addressed the following three questions:

- 1) Do students show improvement in clinical reasoning scores, when measured using the Health Science Reasoning Test, after implementation of the Outcome-Present State Test Model of Clinical Reasoning during in-hospital clinical experience?
- 2) Do clinical reasoning scores, when measured using the Health Sciences Reasoning Test, improve when students participate in a guided reflection activity in conjunction with the Outcome-Present State Test Model of Clinical Reasoning during clinical experience?
- 3) Do clinical judgment scores, when measured using Lasater' Clinical Judgment Rubric, improve when students participate in an assigned reflective journaling activity in conjunction with the Outcome Present State Test Model of Clinical Reasoning versus those that do not participate in the reflective journaling activity?

Research question one was analyzed using a paired t-test to determine if there is a difference in clinical reasoning scores after the OPT Model of Clinical Reasoning had been implemented during the clinical experience for four weeks. Research question two was analyzed using a two-sample t-test. The two samples, the control group and the experimental group, were

compared to determine if there was a difference in scores, measured using the Health Sciences Reasoning Test, when the control group did not perform the guided reflection activity, and the experimental group does perform the guided reflection activity. Research question three was analyzed using a repeated measures analysis of variance. The two samples, the control group and the experimental group was compared to determine if there is a difference in scores, when measured using Lasater’s Clinical Judgment Rubric, the control group did not perform the guided reflection activity and the experimental group does perform the guided reflection activity. The calculations were performed using SPSS v. 24.0.

Table 4 Statistics for Analysis

	<b>Analysis to be used</b>
<b>Research Question 1</b>	Paired t-test
<b>Research Question 2</b>	Two –way Anova
<b>Research Question 3</b>	Three-way Mixed Design Anova

### **Study Limitations**

Limitations of this study include use of convenience sample limiting generalizability. Threats to internal validity include self-reported demographic data and GPA values. Threats to external validity include variable clinical experience between clinical groups, extenuating circumstances that effect overall study habits. Clinical experiences vary greatly day to day, as well as clinical site to clinical site. It is impossible to control what patients that are in the clinical area on a given day. However, through use of the OPT Model of Clinical Reasoning the student can work through the complex clinical situation.

## CHAPTER IV – RESULTS

The purpose of this study was to determine if: a) reasoning scores improved after utilizing the OPT model as the teaching strategy during the clinical experience, b) clinical reasoning scores improved after completing a guided reflection activity in conjunction with utilization of the OPT model as a teaching strategy during the clinical experience, and c) clinical judgment scores improved after completing a guided reflection activity in conjunction with utilization of the OPT model as a teaching strategy during the clinical experience. This chapter describes the statistical findings from the study.

### **The Sample**

The sample for this study was a convenience sample of fifth semester baccalaureate nursing students enrolled in their final upper division baccalaureate-nursing course. Total enrollment in this course was 120 students. All students were invited to participate on a voluntary basis. Seventy-five completed the pretest and sixty-six completed the post-test. Nine participants did not complete the posttest, creating a 12% dropout rate. Four tests were excluded, because they were completed in less than fifteen minutes, as recommended by instrument developers. A post hoc power analysis was done to determine statistical significance for effect of the independent variable was performed and determined that a sample size of  $n=61$  at  $\alpha = 0.05$  had a power of 0.986.

Demographics are presented in Table 5. The sample consisted of 66 females (90%) and 7 males (10%). Forty-two students (57%) were between 20 and 21 years old, twenty-six students

(36%) were between 22 and 23 years old, and five (7%) were between 24 and 26 years old. Sixty-eight students (93%) were Caucasian, three Black (4%), one Asian (1.4%), and one Native American (1.4%). Twenty two students (33%) reported to have work experience in the childcare area (e.g. babysitting), seventeen (23%) reported healthcare experience (e.g. patient care assistant, laboratory technician) twenty (27%) reported restaurant/hospitality experience (e.g. waitress, cook, hostess), eight (11%) reported retail work experience (e.g. sales associate), and six (9%) reported no work experience. Twenty-six (35%) reported to have internship/externship experience within a hospital. twenty-one (29%) reported having a paid position in a hospital. twenty-one (29%) reported having volunteered in a hospital. and five (7%) reported no hospital experience. Only one participant reported (1%) having a previous bachelor's degree, seventy-two (99%) participants reports some college but no degree. The demographic questions were chosen to investigate if prior work, prior hospital experience, or prior education plays a role in development of clinical reasoning skills. Analysis of co-variance was performed and no significant variables were identified.

There were nine (12%) participants that did not complete the posttest, eight females and one male. All had reported GPAs of 3.1-3.5. The overall pretest scores ranged from 19 to 30. Three had childcare experience, two had retail experience, one had healthcare experience, one had restaurant/hospitality experience, and one had no experience. Of the nine participants that did not complete the posttest three had no hospital experience, three had volunteer experience, two had internship/externship experience, and one had a paid position. There were no patterns observed in those that did not complete the posttest.

Table 5 Pretest Demographic Characteristics of Participants (n=73)

Descriptor	N (%)
<b>Gender</b>	
Male	7 (10%)
Female	66 (90%)
<b>Age</b>	
20-21	42 (57%)
22-23	26 (36%)
24-26	5 (7%)
<b>Ethnicity</b>	
American Indian/Native American	1 (1.4%)
Asian/Asian American/Pacific Islander	1 (1.4%)
Black/African American	3 (4.1%)
White/Caucasian/Anglo American	68 (93.1%)
<b>Employment History</b>	
Childcare	22 (30%)
Healthcare	17 (23%)
Retail	8 (11%)
Restaurant/Hospitality	20 (27%)
None	6 (9%)
<b>Hospital Experience</b>	
Internship/Externship	26 (35%)
Paid Position	21 (29%)

Volunteer	21 (29%)
None	5 (7%)
Level of Education	
Some college	72 (99%)
Bachelors	1 (1%)

### Research Question 1

**Do students show improvement in clinical reasoning scores, using the Health Science Reasoning Test, after implementation of the Outcome-Present State Test Model of Clinical Reasoning during in-hospital clinical experience?** A paired t-test for pretest scores and posttest scores was used for all students to compare Health Sciences Reasoning Test scores. Participants scored a mean of 23.30 (SD=3.05) on the pretest and a mean of 22.20 (SD=4.21) on the posttest. See Table 6. As shown in Table 7 a significant difference was found between pretest and posttest,  $t = 2.431$ ,  $df = 60$ ,  $p = .018$ , pretest scores were higher.

Table 6 Clinical Reasoning Scores Using the Health Sciences Reasoning Test (HSRT)

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	23.30	61	3.046	.390
	Posttest	22.20	61	4.210	.539

Table 7 Paired Samples T-test HSRT

	t	df	Sig (2-tailed)
Pair 1			
Pretest-Posttest	2.431	60	.018

## Research Question 2

**Do clinical reasoning scores, using the Health Sciences Reasoning Test, improve when students participate or do not participate in a guided reflection activity in conjunction with the Outcome-Present State Test Model of Clinical Reasoning during clinical experiences?** Two-way analysis of variance (ANOVA) was used to determine if students that participated in guided reflection improved more than students that did not participate in guided reflective activities. The independent variables for the two-way ANOVA were the Health Sciences Reasoning Test score (pretest and posttest) and group assignment (experimental or control). The experimental group participated in a guided reflection activity in addition to using the OPT Model during clinical experience. The control group only used the OPT Model during clinical experience and did not participate in the guided reflection activity. There was no significant effect of reflective practice on Health Sciences Reasoning Test scores at the  $p < .05$  level for two conditions [ $F(3,1) = 1.772, p = .156$ ]. There were no significant differences between groups  $F = 2.371, df = 1, 124, p = .126$ . There was no significant differences in interaction with group and time of test,  $F = 2.79, df = 1, 124, p = .10$ . See Table 9.

Table 8 Tests Between-Subjects Effects HSRT Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	68.768	3	22.922	1.772	.156	.041
Intercept	66640.513	1	66640.513	5151.509	.000	
Group	30.670	1	30.670	2.371	.126	.019
Test	35.565	1	35.565	2.749	.100	.022
Group*Test	1.971	1	1.971	.152	.697	.001
Error	1604.109	124	12.936			
Total	68468.00	128				

Table 9 HSRT Scores Experimental and Control Groups

Group	Test	Mean	Std. Deviation	N
Experimental	Pretest	22.74	2.708	31
	Posttest	21.94	4.538	31
	Total	22.34	3.728	62
Control	Pretest	23.97	3.107	33
	Posttest	22.67	3.780	33
	Total	23.32	3.496	66
Total	Pretest	23.38	2.963	64
	Posttest	22.31	4.148	64
	Total	22.84	3.629	128

### Research Question 3

**Do clinical judgment scores, using Lasater's Clinical Judgment Rubric, improve when students participate or do not participate in a guided reflection activity in conjunction with the Outcome-Present State Test Model of Clinical Reasoning during clinical experiences?** Lasater's Clinical Judgment Rubric (LCJR) was completed on all participants at four times using a repeated measures time series design. The omnibus F test showed there was a significant difference with F value for Wilks' Lambda at 52.809,  $df = 3, 33$ , and  $p = .000$ . The Mauchly Test of Sphericity showed significance, assuming sphericity. See Table 10 below.

Table 10 Mauchly's Test of Sphericity

Within Subjects Effect	Mauchly's W	Approx. Chi Square	df	Sig.	Epsilon Greenhouse-Geisser
Time	.922	2.737	5	.741	.947

The test of within subjects' effects showed an F value of 61.537 with  $df = 3, 105$ , and a p-value of .000. Significant differences were found between times of the Lasater's Clinical Judgment Rubric scores. See Table 11.

Table 11 Test of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Time	Sphericity	1843.932	3.000	614.644	61.537	.000
	Assumed					
	Greenhouse-Geisser	1843.932	2.840	649.343	61.537	.000
	Huynh-Feldt	1843.932	3.000	614.644	61.537	.000
Time *	Lower-bound	1843.932	1.000	1843.932	61.537	.000
	Sphericity	27.203	3.000	9.068	.908	.440
	Assumed					
	Greenhouse-Geisser	27.203	2.840	9.579	.908	.436
Group	Huynh-Feldt	27.203	3.000	9.068	.908	.440
	Lower-bound	27.203	1.000	27.203	.908	.347
	Sphericity	1048.757	105.000	9.988		
	Assumed					
Error (time)	Greenhouse-Geisser	1048.757	99.389	10.552		
	Huynh-Feldt	1048.757	105.000	9.988		
	Lower-bound	1048.757	35.000	29.964		
	Sphericity	1048.757	105.000	9.988		

Table 12 Levene's Test of Equality of Error Variances

	F	df1	df2	Sig.
W1	1.204	1	35	.280
W2	.095	1	35	.760
W3	.643	1	35	.428
W4	4.571	1	35	.040

No significant effects were found between subjects by groups for time  $F = 1.044$ ,  $df = 1$ , 35, and  $p = .314$ . The experimental group and the control group showed no difference in performance when measured using the Lasater's Clinical Judgment Rubric. See Table 13.

Table 13 Tests of Between-Subjects Effect - LCJR Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	29442.074	1	29442.074	4730.220	.000	.993
Group	6.499	1	6.499	1.044	.314	.029
Error	217.849	35	6.224			

There were no differences in means of Lasater's Clinical Judgment Rubric score when comparing the experimental group with the control group. Confidence intervals were computed using  $\alpha = 0.05$ . See Table 14.

Table 14 Estimated Marginal Means: Experimental LCJR Score and Control LCJR Score

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	28.047	.624	26.781	29.313
Control	28.893	.544	27.788	29.998

The average Lasater’s Clinical Judgment Rubric scores are reported over time, as shown in table 15 below. There was significant improvement from week 1 to week 2 and week 3 to week 4 but no significant increase from week 2 to week 3. Confidence intervals were computed using  $\alpha = 0.05$ . See Table 15.

Table 15 Estimated Marginal Means: LCJR Score Over Time

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
W1	23.196	.596	21.987	24.406
W2	28.033	.717	26.578	29.488
W3	29.528	.598	28.314	30.743
W4	33.122	.533	32.041	34.203

All comparisons between times were statistically significant except between week two and week three. There were statistically significant differences in the Lasater’s Clinical Judgment Rubric scores between week one and two, and three and four, but there were no

changes between week two and week three. There was no significant change in scores from week two to week 3. See table 16.

Table 16 Pairwise Comparisons: LCJR Scores Over Time

Time	Time	Mean Difference	Std. Error	Sig.
1	2	-4.836	.649	.000
	3	-6.332	.747	.000
	4	-9.926	.785	.000
2	1	4.836	.649	.000
	3	-1.496	.747	.053
	4	-5.089	.797	.000
3	1	6.332	.747	.000
	2	1.496	.747	.053
	4	-3.594	.715	.000
4	1	9.926	.785	.000
	2	5.089	.797	.000
	3	3.594	.715	.000

## **CHAPTER V – DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS**

This chapter places the significant findings from the study within the context of existing literature. The purpose of the study was twofold; a) to compare clinical reasoning scores of senior level baccalaureate nursing students before and after use of the Outcome Present State Test Model of Clinical Reasoning (OPT) in the clinical setting, and b) to determine if guided reflective activities would have any effect on clinical reasoning scores. Based on study findings conclusions and implications for nursing education and nursing practice are presented. Limitations of the study and recommendations for further research are also presented.

### **Significant Findings**

This study was implemented to determine if there would be an improvement in the clinical reasoning scores of senior level baccalaureate nursing students when a specific method of clinical paperwork is used during the clinical experience to provide structure and guidance as they work through the clinical reasoning process. The Outcome Present State Test Model of Clinical Reasoning was implemented in an advanced adult health complex client clinical course as the student's assigned course paperwork for the clinical experience. Each student within the clinical course was expected to complete the OPT at the end of the clinical day and submit the completed forms to their clinical instructor for review. The OPT forms themselves were not scored. They were solely used to guide and promote the development of the student's clinical reasoning and reflection skills.

According to the literature multiple studies have demonstrated the implementation of the

OPT Model as a clinical instructional assignment to support the development of clinical reasoning skills in pre-licensure nursing students. However, there is no evidence within the literature to support the efficacy of the OPT Model in promoting clinical reasoning skills. There are no studies that document the effectiveness of the OPT Model using an outside independent measurement to determine the effect of the OPT on the student's clinical reasoning skill.

For the purposes of this study the researcher chose to measure the senior nursing student's clinical reasoning ability by administering the Health Sciences Reasoning Test prior to and after the implementation of the OPT Model during the clinical experience. Comparing the pre and post test results of the Health Sciences reasoning Test would determine if the student's clinical reasoning ability had improved after implementation of the OPT Model during their clinical experiences. A paired sample t test was conducted to determine any statistically significant difference in clinical reasoning scores between the pretest and posttest. Findings showed that there were statistically significant differences between the overall pretest scores for the Health Science Reasoning Test and the overall posttest scores. While the differences in the pre and posttest scores were statistically significant, they did not increase as expected. The Health Science Reasoning Test scores demonstrated a decrease in post OPT implementation scores.

To better understand the significance of this finding pre and posttest data were analyzed to determine why scores decreased. Testing times examined. The time that it took students to complete the pretest was analyzed and compared to the length of time it took students to complete the posttest. The average pretest took 30.5 minutes to complete whereas the posttest took an average of 26.7 minutes to complete.

There were nine participants that withdrew from the study and did not complete the posttest. This created a 12% dropout rate for the study. According to pretest data, the 12% that dropped out of the study averaged 33.6 minutes (3.1 minutes greater than the rest of the pretest completers) and scored an average of 23.4, which is the same average overall score as the rest of the participants. Test fatigue may have impacted the dropout rate and accounted for the nine incomplete posttest scores.

Senior nursing students are expected to complete their course work, the 225 hours required during the preceptorship, practice for licensure exams, study for final exams, and complete senior projects as assigned. Adding the research study and the Health Sciences Reasoning Test on top of all the other testing becomes tiresome on the students. The researcher feels that the student participants were tired from end of semester assignments and were not incentivized to complete the HSRT. This particular group of student participants completed an entire 17-week course in nine weeks. As the semester was coming to an end students were preparing for graduation and final presentations. They were under a great deal of stress that may have also impacted the dropout rate for the study.

In addition to being overwhelmed, this was the first semester that the pre-licensure baccalaureate students were introduced to the OPT Model of Clinical Reasoning. Clinical paperwork for this particular course has changed over the last few years and this was the first semester students were asked to complete this particular type of exercise during clinical experience. Furthermore, the first day of the semester, when students were scheduled to receive information regarding the study and instructions on the use of the OPT Model; the school was closed due to inclement weather. The researcher was given an opportunity to upload explanations of the OPT model on a PowerPoint presentation with voice-overs. This

presentation was uploaded to the course management system for students to review at a later time. Unfortunately, with the school closing due to inclement weather and road/road closings, students did not have the opportunity to ask questions as if there had been face-to-face explanation of the new clinical assignment. The researcher feels that the OPT Model of Clinical Reasoning can be overwhelming upon first glance and it would be beneficial to have had at least a 30 minute session on its use and the expected clinical paperwork as well as previous experience using the OPT Model of Clinical Reasoning.

The second part of the purpose addressed the use of reflection. Study participants were randomly divided into an experimental group and a control group. All participants completed the OPT Model as their clinical assignment. Once completed the OPT Model was turned in to their clinical instructors. The experimental group was also given an additional guided reflection assignment that could be completed in approximately thirty minutes. The control did not receive the guided reflection assignment. There was no statistically significant difference in the students in the experimental group who completed the guided reflection and the control group. This may have been due to the fact that there were no ‘assignments’ to turn in to the clinical instructor.

Reflection has been found to be an integral component of learning (Kolb, 1984; Kuiper, 2013). However, for the purpose of this study there were no written assignments to be submitted to the clinical instructor or principle investigator. The guided reflection activity was emailed to students in the experimental group. There was no written assignment associated with the guided reflection assignment. The principle investigator was not a clinical instructor within the course. Students did not receive an incentive or bonus for participation in the study. Students had no recourse for not completing the assignment. Students were encouraged to be on the lookout for emails from the principle investigator over the course of the semester. Without face-to-face

contact with students they were likely to overlook the emails with the guided reflective activity included or just ignore the reflection assignment. For the purpose of this study there was no instruction on the practice of reflection.

According to the literature multiple studies have shown the importance and efficacy of reflection as a method to increase clinical reasoning skills. However, there were no studies found in the literature that used reflection as an intervention to develop clinical reasoning skill. Furthermore, there were no studies that measured the effectiveness of clinical reflection intervention using the Health Sciences Reasoning Test.

Lastly, clinical judgment scores were measured for all students over time. Data was analyzed to determine if there was a statistically significant improvement in the clinical judgment scores when comparing the students in the control group who did not receive the guided reflection assignment to the students in the experimental group who received the guided reflection assignment. According to the data there were no statistical differences between the experimental group and the control group when compared for clinical judgment. However, it was interesting to note that all participants showed an improvement in rubric scores across the four measurements throughout the course.

There was a statistically significant increase from week one to week two and week three to week four but there was no statistically significant increase between week two and week three. These results suggest that time (experience) plays an important role in the development of clinical reasoning. Kolb's experimental learning theory suggests that experience is the defining factor in developing higher order thinking (Kolb, 1984).

The use of the Lasater's Clinical Judgment Rubric (LCJR) has not been wholly accepted as a measurement tool for clinical experience. Kathie Lasater, the developer of the LCJR, is

vocal about the use of the LCJR tool as a means for faculty to provide formative feedback to students. The LCJR is a valuable tool in assisting in the development of clinical judgment, the rubric is designed around Tanner's Model of Clinical Judgment, which includes four facets that are measured in the LCJR, noticing, interpreting, responding and reflecting (Tanner, 2006). The LCJR rubric was designed for faculty to use over time; preferably over an entire nursing program. The LCJR purposefully incorporates common language to facilitate formative feedback between students and faculty to promote on-going discussions related to growth or opportunities for growth (Lasater, 2007; Lasater, 2011).

### **Implications for Nursing Education**

The current study was an effort to improve clinical reasoning among senior baccalaureate nursing students using the OPT Model of Clinical Reasoning to promote the development of clinical reasoning skills in putting multiple concepts together as an experienced nurse would do in clinical practice. This study is perceived as an important step in exploring the development of clinical reasoning and clinical judgment skills in senior nursing students by combining a guided framework for the development of clinical reasoning skills with the reflective habits of critical reflection found to demonstrate significant implications for expanding on experiences.

After a thorough examination and analysis of the data, and the data findings, the researcher makes the assertion that there is no single way to improve clinical reasoning and clinical judgment skills in pre-licensure nursing students. The OPT Model is but one tool in the toolbox. A much needed tool to improve clinical reasoning skills in nursing students throughout their programs and transition into early practice. The frontal lobe is the physical location of the brain where reasoning occurs; researchers and neurologist say the frontal lobe is not fully developed until age 25 (Johnson, Blum, & Giedd, 2009). Brain maturation is influenced by

heredity and environment, prenatal and postnatal insults, nutritional status, sleep patterns, pharmacology, previous surgical intervention and stress (Arain, et al. 2013). Because there are so many factors influencing frontal lobe development, teaching the individual skills involved in clinical reasoning and reflection are even more important than previous thought. In order for nurse educators to influence clinical reasoning and clinical judgment the basic process of how to make the decision must be taught, students must be given methods that are helpful in reaching a decision, but the potential of the tools may not be realized until well after the student is out of school. Teaching students to use a framework that mimics how the experienced nurse approaches a patient situation early in their education should form the thought habits that will continue into their practice. It is the opinion of the researcher that a student will not continue to practice traditional care plans as they are taught in their fundamental nursing courses.

Adoption of the OPT Model for use in the clinical setting would require; a) ample explanation on the OPT Models use, b) on-going encouragement from clinical instructors throughout the students clinical experience on the use/ application of the OPT Model in clinical. and c) education and demonstration on how the experienced nurse would approach a patient situation. Nursing educators must continue to strive to develop innovative ways to engage the student in activities that promote clinical reasoning, and provide multiple learning activities that develop clinical reasoning.

Reflection methods should be included throughout nursing education curriculum, in order to become a habit of thought as the student transitions into practice. Due to the ever changing healthcare environment, on-going efforts to develop learning exercises are needed more than ever before to improve clinical reasoning skills in students and to help them build connections between the theoretical knowledge learned in the classroom setting with the practical application

of knowledge in the clinical setting. Teaching methods that mold the students patterns of thought within the curriculum should effect the students future patterns of thought. Historically, debriefing is used at a type of reflection but it has not been found to be an effective method to develop clinical reasoning. However, when used in conjunction with other teaching strategies it is helpful in the development of these important skills. As part of including reflection within nursing curriculum it is important to discuss the levels of reflection that the instructor would expect from a student. Based on Hatton and Smith's (1995) description of progressive levels of reflection, reflection should become more indepth as the student becomes more skilled at reflection. Descriptive, which is not actually reflection, is simply recall of the events of an experience. Descriptive reflection is defined as describing events and reporting reasons. Dialogic reflection is defined as reflection as a personal dialog involving questioning things and considering alternatives. Finally, critical reflection is defined as taking into account contexts in which events occur, questioning assumptions, considering alternatives, thinking about consequences of decsions/action on others and engaging in reflective skepticism (Hatton & Smith, 1995). Mastery of this type of critical reflection takes time and effort. Nursing education should continue to emphasize the importance of reflective practice and develop rubrics to help guide reflective practice in nursing students. Time requirements should also be taken into consideration when developing learning activities that require reflection, for the novice reflector meaningful reflection may not occur in 30 minutes, where as as skilled reflector may be able to draw meaning out of an experience in fifteen to twenty minutes.

Clinical judgment is more than the four aspects within the LCJR, and impossible to completely define or measure. Each clinical decision is effected by the past experiences of the student nurse, the clinical instructor, and the patient (Lasater, 2006). No single measurement

tool or rubric can provide a comprehensive assessment of a student's ability to make sound clinical judgments (Adamson et al., 2012). In order to reap the full benefit of using the LCJR tool students would need to evaluate themselves using the tool and then compare it to what the clinical instructor rates them. The LCJR can also be used as a guide for reflection. Nielsen, Stragnell, and Jester (2007) implemented use of the LCJR as a guide to structure students thinking about learning experiences in clinical situations (Nielsen, Stragnell, & Jester, 2007). They found students and faculty alike valued the reflective process to improve evaluation and communication about a student's progress toward competence. Implementing LCJR in to nursing curriculum could change the way students are evaluated, as well as how feedback is provided to students during clinical experiences.

### **Implications for Nursing Practice**

Clinical reasoning is a core competency for new graduate nurses (Benner, Tanner, & Chesla, 2009). If students graduate with strong clinical reasoning skills it is likely that their first year of practice will be less stressful than it has been previously studied. By developing strong clinical reasoning skills new graduate nurses are also able to transition through the phases of development, all the way up to expert nurse in a shorter amount of time. Combining experience with sound reasoning skills and reflective practice will advance the practicing nurse up the scale in their specialty much quicker. Implementing the OPT into nursing curriculum from the beginning could help students develop the habits of mind to continually reflect as they are processing a patient situation, which would have a positive impact on patient outcomes.

Additionally, Lasater's Clinical Judgment Rubric can be used as a Nursing Professional Development tool to improve patient care and outcomes. It was developed to support Tanner's

Model of Clinical Judgment but can be implemented within an educational setting or professional setting to help improve on clinical judgment skills (Miraglia & Asselin, 2015).

### **Limitations**

The limitations of this study are as follows:

1. Convenience sample at only one school, with limited number of participants, limiting generalizability.
2. The Health Sciences Reasoning Test was a tedious test, that caused some subject burden. Students were not rewarded for taking this difficult test, the researcher assumes this was the reason for the 12% dropout rate between the pretest and posttest. The participants seemed overwhelmed with tasks to complete and end of program testing, as well as completing the HSRT twice in one semester.
3. The guided reflection activity was not analyzed. In order to determine exactly how helpful the reflection activity was the content of the reflections should be analyzed. Analysis of the reflection content in regard to development of clinical reasoning could be a study in an of itself.

### **Conclusions**

Based on the findings of this research, the following conclusions were generated.

1. Clinical Reasoning can only occur when there is a strong foundation of knowledge pertinent to the subject.
2. Clinical Judgment must be developed throughout a curriculum not in one semester.
3. There is not one single method to develop clinical reasoning skills. Development of sound clinical reasoning skills takes a combination of multiple types of instruction, for example, concept mapping, reflection, and clinical practice.

## **Recommendations for Practice**

This is one of the first studies to compare pre and post Health Sciences Reasoning Test scores after implementation the OPT Model during clinical experience. Past studies have looked at the OPT as a means to determine if the student has improved their clinical reasoning or clinical judgment skills (Pesut & Herman, 1998). Conducting research on senior nursing students is difficult because they are under additional stress to complete their degree program. They are often not willing to sit through another optional test. The findings of this study support that. Recommendations for future practice are as follows.

1. The first recommendation is to introduce the OPT Model of Clinical Reasoning to students earlier in curriculum. Introducing this learning activity earlier in curriculum to mold the thought processes of the student from early in nursing school, by modeling how an experienced nurse views patient situations.
2. The second recommendation is to further develop the OPT Model of Clinical Reasoning Model. Continued development of this model could be useful in the quest to assign one learning activity to improve clinical reasoning skills in students and build the habits of thought that would shape how new graduate nurses approach any patient situation. The OPT Model can be used as a template to pattern data collection and organization for the improvement of how to problem solve with the patient's outcome in the beginning of interaction with a patient. Developing the OPT further can allow a student nurse simulate how an experienced nurse looks at a patient situation.
3. Consider a focus on ability to complete the steps involved in making a clinical decision rather than making the clinical decision itself. Current educational expectations may be unattainable due to the development of the student's frontal lobe. Allow students to

master the framework by working through it; if they continue to complete the framework the decision-making will come. Integrating reflection as a skill taught within curriculum would help students apply knowledge as they increase their foundational knowledge.

### **Recommendations for Research**

The findings of this study indicate further studies should be conducted to investigate the use of the OPT Model in the clinical experience to increase clinical reasoning skills. As well of the continued development of a variety of learning exercises that focus on integrating methods to improve clinical reasoning and instill habits of lifelong learning in students. Research studies that investigate the development of specific levels of reflection and assessment of those reflections could improve the skill of reflection among nursing students. In a 2017 study, Walton, Lindsay, Hales, and Rook, found that new graduate nurses that practiced reflection during their first year of practice found the exercise of reflection helpful in the identification of personal attributes, professional behaviors, situational challenges, communication difficulties, and found reflection as a useful tool in achieving outcomes they desired (Walton, Lindsay, Hales, & Rook, 2018).

Additionally, replication of this study using masters level students or associate degree nursing students, as they are typically older students, investigating their development of clinical reasoning could provide more information concerning the development of sound clinical reasoning skills at multiple age levels. Clinical reasoning continues to be non-measurable and hard to attain in new graduate nurses, this study shows that alternate methods should be investigated in order to have positive effects on patient outcomes. By implementation of the OPT Model of Clinical Reasoning along side guided reflection to improve students metacognitive abilities throughout their education, patient situations could be positively affected.

Nursing research must continue to develop methods of instruction to enable gains in the development of clinical reasoning.

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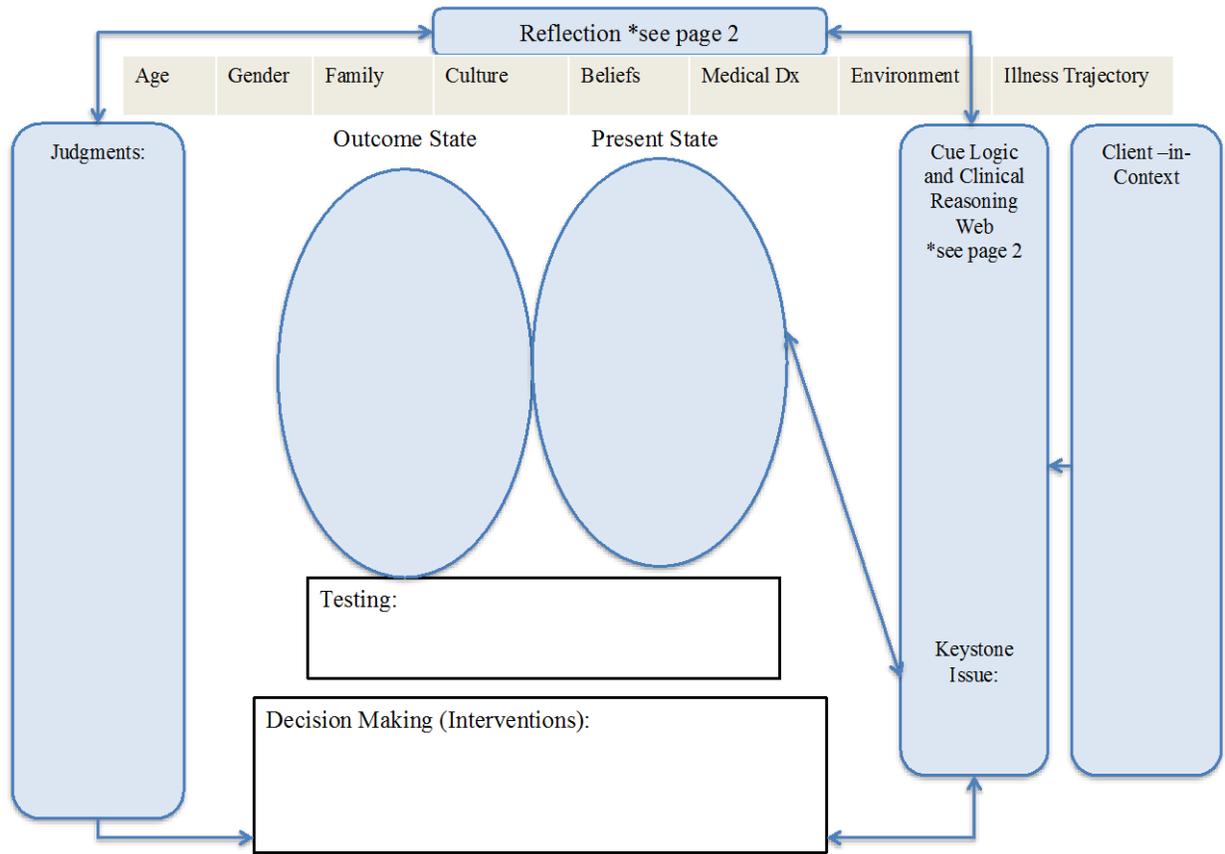
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## APPENDIX A – OPT MODEL OF CLINICAL REASONING WORKSHEET



## APPENDIX B – OPT MODEL OF CLINICAL REASONING WEB

<p style="text-align: center;">Clinical Reasoning Web</p>	<p>Reflective Questions:</p> <p>Describe the keystone issue for this patient. Over the course of the day did your keystone issue ever change? If so, describe how it changed.</p> <p>What relevant situational factors did you consider as you attempted to improve this issue?</p> <p>Where there ethical or cultural issues to consider before selecting appropriate interventions? Describe one cultural or one ethical concern and explain how it effected the patient's plan of care.</p> <p>What is the worst possible complication that you can anticipate based on the keystone issue? What would you expect to see if this occurred, and how would you respond if it did occur?</p>
<p>Patient Education Needs:</p> <p>Discharge Plan:</p>	

## **APPENDIX C – GUIDED REFLECTION EXERCISE**

Guided reflection exercise for experimental group

Describe a problem you encountered during your clinical experience in detail. How did you attempt to solve the problem?

What were the possible solutions that you identified? How did you choose the solution you chose? What was the outcome of this choice you made?

Was there an alternate intervention? How would it have changed the outcome of the situation?

How do you think this will change your practice in the future?

## APPENDIX D – DEMOGRAPHIC QUESTIONNAIRE

### Demographic questionnaire

1. What is your age?

18-22	23-27	28-32	33-37
38-42	43-47	48-52	53-57
58-62	63-67	68 or older	

2. What is your gender?

Male                      Female                      Other – please specify

3. What is the highest level of school you have completed or the highest degree you have been awarded?

Less than a high school degree	Associate degree
High school degree or equivalent (e.g. GED)	Bachelor degree
Some College but no degree	Graduate degree

4. Which race/ethnicity best describes you?

White/Caucasian	Black or African American	Asian/Pacific islander
American Indian/Alaska native	Hispanic	Other – please specify

5. What is your current GPA

4.1 or above	3.6-4.0	3.1-3.5	2.6-3.0
2.1-2.5	2.0 or less		

6. What previous work experience do you have?

Retail	Childcare	Healthcare
Restaurant/Hospitality	None	

7. Do you have any previous hospital experience?

Volunteer	Internship/Externship	Paid Position
None		

## APPENDIX E – LASATER’S CLINICAL JUDGMENT RUBRIC

### Lasater's Clinical Judgment Rubric

	Exemplary 4	Accomplished 3	Developing 2	Beginning 1	Score
Effective Noticing involves	4	3	2	1	
Focused observation	Focuses observation appropriately; regularly observes and monitors a wide variety of objective and subjective data to uncover any useful information	Regularly observes and 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 of the most obvious data, missing some important information	Confused by the clinical situation and the amount and kind of data; observation is not organized and important data are 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 and deviation from expectations misses opportunities to refine the assessment	
Information seeking	Assertively seeks information to plan intervention: carefully collects useful subjective data from observing and interaction with the patient and family	Actively seeks subjective information about the patient's situation from the patient and family to support planning interventions; occasionally does not pursue important leads	Makes limited efforts to seek additional information from the patient and 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 interaction with the patient and family and fails to collect important subjective data	
Effective Interpreting involves	4	3	2	1	
Prioritizing data	Focuses on the most relevant and important data for explaining the patient's condition	Generally focuses on the most important data and seeks further 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 or 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 (a) note and make sense of patterns in the patient's data (b) compare these with known patterns (from nursing knowledge base, research, personal experience, and intuition), and (c) develop plans for interventions that can be justified in terms of their likelihood of success	In most situations, interprets the patient's data patterns and compares with known patterns to develop an intervention plan and accompanying rationale; the expectations are rare or in complicated cases where it is appropriate to seek the guidance of a specialist or a more experienced nurse	In simple, common, or familiar situation, is able to compare the patient's data pattern with those known and to develop or explain intervention plans; has difficulty, however, with even moderately difficult data or situations that are within the expectations of students inappropriately requires advice or assistance	Even in simple, common, or familiar 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 developing an intervention	

Effective Responding involves		4	3	2	1
Calm, confident manner	Assumes responsibility; delegates team assignments, assesses patients and reassures them and their families	Generally displays leadership and confidence and is able to control or calm most situations; may show stress in particularly difficult or complex situations	Is tentative in the leader role, reassures patients and 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, makes patients and families anxious or less able to cooperate	
Clear communication	Communicates effectively explains interventions; calms and reassures patients and families; directs and involves team members, explaining and giving directions; checks for understanding	Generally communicates well; explains carefully to patients; gives clear directions to team; could be more effective in establishing rapport	Shows some communication ability (e.g. giving directions); communication with patients, families, and team members is only partly successful; displays caring but not competence	Has difficulty communicating; explanations are confusing; directions are unclear or contradictory; patients and families are made confused or anxious and are not reassured	
Well-planned Intervention/flexibility	Interventions are tailored for the individual patient, monitors patient progress closely and is able to adjust treatment as indicated by patient response	Develops interventions on the basis of relevant patient data; monitors progress regularly but does not expect to have to change treatments	Develops interventions on the basis of the most obvious data; monitors progress but is unable to make adjustments as indicated by the patient's 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 and accuracy	Is hesitant or ineffective in using nursing skills	Is unable to select and/or perform nursing skills	
Effective Reflecting involves		4	3	2	1
Evaluation/self-analysis	Independently evaluates and analyzes personal clinical performance, noting decision points, elaborating alternatives, and accurately evaluates choices against alternatives	Evaluates and analyzes personal clinical performance with minimal prompting, primarily about major events or 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 and choices without evaluating them	
Commitment to improvement	Demonstrates commitment to ongoing improvement; reflects on and critically evaluates nursing experiences; accurately identifies strengths and weaknesses and develops specific plan to eliminate weaknesses	Demonstrates a desire to improve nursing performance; reflects on and evaluates experiences; identifies strengths and 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 is unable to do so; rarely reflects is uncritical of himself or herself or overly critical (given level of development); is unable to see flaws or need for improvement	

## APPENDIX F – IRB APPROVAL LETTER



Office of the Vice President for  
Research & Economic Development  
Office for Research Compliance

December 6, 2017

Victoria Junkin  
Department of ELPTS  
College of Education  
The University of Alabama  
Box 870302

Re: IRB # EX-17-CM-088 “Developing Clinical Reasoning Using the Outcome-Present State Test Model of Clinical Reasoning”

Dear Ms. Junkin:

The University of Alabama Institutional Review Board has granted approval for your proposed research. Your protocol has been given exempt approval according to 45 CFR part 46.101(b)(1) as outlined below:

*(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.*

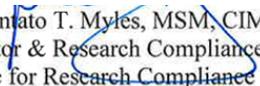
Your application will expire on December 5, 2018. If your research will continue beyond this date, complete the relevant portions of Continuing Review and Closure Form. If you wish to modify the application, complete the Modification of an Approved Protocol Form. When the study closes, complete the appropriate portions of FORM: Continuing Review and Closure.

Please use reproductions of the IRB approved informed stamped consent form to obtain consent from your participants.

Should you need to submit any further correspondence regarding this proposal, please include the assigned IRB application number.

Good luck with your research.

Sincerely,

  
Carpanato T. Myles, MSM, CIM, CIP  
Director & Research Compliance Officer  
Office for Research Compliance

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