The Influence of Conceptual Learning on Critical Thinking Development for Nursing Students

A Dissertation submitted

by

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This Dissertation has been accepted for the faculty of

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Dedication Page

Thinking

"If you think you are beaten, you are.

If you think you dare not, you don't.

If you'd like to win, but you think you can't

It's almost a cinch, you won't.

If you think you'll lose, you're lost,

For out in the world you'll find

Success begins with a fellow's will,

It's all in the state of mind.

If you think you're outclassed, you are.

You've got to think high to rise.

You've got to be sure of yourself before

You can ever win a prize.

Life's battles don't always go

to the stronger or the faster man.

But soon or late the man who wins

is the one who thinks he can."

Walter D. Wintle

For my father, Dr. Tom

Who believed in me and always thought that I could

Acknowledgement Page

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Abstract

Nurses must think critically to ensure safe and quality patient outcomes; therefore, critical thinking development is a priority in nursing education. The purpose of this study was to explore if critical thinking development for pre-licensure nursing students was influenced by the implementation of a concept-based curriculum. Retrospective data was collected from 431 students across six cohorts at a small, private college of nursing in the northeast. Critical thinking was measured by NCLEX-RN® pass rates, ATI Comprehensive Predictor® scores and Lasater Clinical Judgment Rubric (LCJR) ratings in the simulation lab. Mean data averages were measured across cohorts before and after implementation of a concept-based curriculum using an independent-samples *t*-test. The mean Lasater score was significantly higher for students in the concept-based curriculum cohorts than for students in the traditional curriculum cohorts. There were no significant findings realized from NCLEX-RN® pass rates or ATI Comprehensive Predictor® scores. Based on the results of this study, a clearly defined influence was not identified, however, implications suggest that active learning in a concept-based curriculum was an important factor in the development of critical thinking for nursing students in this study. Further research is needed to explore active learning strategies in concept-based curriculums as a method to promote critical thinking development in nursing education.

Keywords: critical thinking, concept-based curriculum, pre-licensure nursing students, NCLEX-RN®, ATI Comprehensive Predictor®, Lasater Clinical Judgment Rubric, simulation lab, active learning strategies

Chapter I: Introduction

This chapter will introduce the reader to the purpose of this research study. The problem will be introduced, and research questions will be identified. Background evidence will be presented in support of this study.

For the past two decades, health care reform and changes in the delivery of our health care system have changed the way that nurses practice. There has been a shift from provider-centered care with an emphasis on the medical model, to a more consumer-based model with a focus on health and wellness in the community. Acute care patients now have shorter hospital stays and higher acuity (Cowen & Maisano, 2013; Del Bueno, 2005; The Evolving Practice of Nursing, 2014). More than ever, nurses must utilize higher-order thinking skills to make clinical decisions that will result in safe and quality patient outcomes.

In nursing, there is an enhanced need for nurses to think critically, applying their knowledge across lifespans and populations with increasing poverty levels and more cultural diversity (Cowen & Maisano, 2013; Nielsen, Noone, Voss, & Mathews, 2013; Romeo, 2010, The Evolving Practice of Nursing, 2014). Due to the depth and the breadth of knowledge needed to provide nursing care in an ever-changing health care environment, nurses must be lifelong learners, using critical thinking to apply knowledge in new situations (Cowen & Maisano, 2013; Forbes & Hickey, 2009). These changes are having an impact on how nurses are educated and teaching nursing students to think critically is a priority.

Since 1985, the Performance Based Development System (PBDS) has been used widely in hospitals across the country to assess critical thinking in terms of clinical judgment for practicing nurses with and without experience. Performance Management Services, Inc. (PMSI) has interpreted and reported results annually to participating institutions. The PBDS has three

measures of assessment, the most challenging is a series of video simulations that assess a nurse's ability to identify and safely manage patient problems with appropriate reasoning and logic. Reports of aggregate results spanning nearly ten years concluded that only 35% of the inexperienced nurses (less than one year of experience) assessed using the PBDS demonstrated the ability to use critical thinking to make good judgments in practice (Del Bueno, 2005). This validates the need to enhance the development of critical thinking in nursing education to prepare nurses for entry-level positions.

Yet, the literature suggests that curricular changes to enhance the development of critical thinking have been minimal and barriers have existed causing the gap to widen between theory and practice (Evans-Prior, Morton, & Brady, 2014; Forbes & Hickey, 2009; Giddens & Brady, 2007; Giddens, Caputi, & Rodgers, 2015; Kaddoura, 2013). To enhance the development of critical thinking, instructional methods are needed across nursing curriculums that help students to develop a deeper, more meaningful learning to close this gap.

In response to this need, concept-based curriculums in nursing are becoming more prevalent in nursing education. In concept-based curriculums, students apply factual knowledge to broad concepts, making connections between concepts to permit the application of knowledge in new situations. Conceptual learning also helps students to organize their ideas and improve their thinking skills (Cowen & Maisano, 2013; Evans-Prior, Morton, & Brady, 2014; Forbes & Hickey, 2009; Giddens, Caputi, & Rodgers, 2015). In a study that measured higher-order thinking, students who were exposed to a concept-based curriculum verbalized more knowledge connections when completing concept maps (Geetha-Eby, Beery, O'Brien, & Xu, 2015). In a mixed methods study conducted by Lasater and Neilson (2009), student nurses who were exposed to concept-based learning activities scored statistically significantly higher in

performance ratings of clinical judgment in the simulation lab when compared to the control group. In focus group interviews these students exposed to concept-based learning activities reported a bridge from theory to practice, remembering concepts from prior experiences when assessing simulated patients. With regard to development of thinking, students reported improvement in interpretation of and response to simulated situations requiring clinical judgment (Lasater & Nielson, 2009). Despite gaining popularity and initial evidential support for concept-based curriculums in nursing education, research is limited.

Purpose of Study

The purpose of this quantitative, ex post facto research study was to explore if critical thinking for pre-licensure nursing students was influenced by a concept-based curriculum at a small private college in the Northeast.

Background and Rationale

In response to the changing health care environment, both the Institute of Medicine (IOM) and the National League for Nurses (NLN), the regulatory body that governs nursing education, have called for a change in nursing education. This change was intended to better prepare nurses to think critically, through a process of curriculum revision (National League, 2004; Romeo, 2010). This call to action proposed that nursing curriculums have evidence of rigor and the propensity to foster deep meaningful learning that results in the ability to apply knowledge and critically think like a nurse.

Nurse educators are tasked with teaching student nurses to think like a nurse. Thinking like a nurse implies that a nurse uses critical thinking skills to apply knowledge and make sound clinical judgments that result in positive patient outcomes (Tanner, 2006). Learning outcomes for nursing students are often reflective of Bloom's Taxonomy, and learning is aligned with a

minimum cognitive level of application in this taxonomy (Su & Osisek, 2011). It is the responsibility of nurse educators to ensure that their curriculum facilitates this applied level of cognitive thinking.

In nursing, problem solving is conducted using the nursing process as a scientific method. The steps of the nursing process begin with analyzing both objective and subjective data to formulate a patient problem or nursing diagnosis. Once identified, the nurse must develop a plan, considering the best nursing intervention(s) to help the patient solve the problem and achieve an optimal state of health. The nurse executes the plan and then evaluates its effectiveness based on the patient's response. If the intended response is not achieved, then the problem-solving process is repeated and the plan is revised (Adams, 1999). The nursing process is a linear process where one step simply leads to the next.

Clinical decisions are born of clinical reasoning and judgment that lead to positive patient outcomes (Cappelletti, Engel, & Prentice, 2014; Kantar & Alexander, 2012). Simply following the steps of the nursing process may not always allow the nurse to think about the big picture, considering all possibilities, with the depth and breadth needed to make sound clinical decisions. This suggests the need to evaluate how nursing students develop the ability to think critically.

Critical Thinking

Critical thinking incorporates the act of rescuing, or anticipating a complication, to avoid an adverse patient event (Kaddoura, 2013). Mastering critical thinking is a process that occurs over time. Before a student can master critical thinking, they must learn the art of thinking at a deep, meaningful level. Reflection is often a powerful tool in this process (Kaddoura, 2013). For this reason, in addition to the oversight of the NLN, accrediting bodies such as the Accreditation Commission for Education in Nursing (ACEN) have proposed that critical thinking development

should be a major outcome of nursing curriculums (Accreditation Commission for Education in Nursing, 2013). It is important then to consider how these outcomes are measured. In this study, critical thinking will be measured using the National Council Licensing Examination for registered nurses (NCLEX-RN®) pass rates, scores from the Assessment Technologies Institute (ATI) Comprehensive Predictor®, and student performance rating scores from the Lasater Clinical Judgment Rubric (LCJR). A copy of the LCJR is provided in Appendix A. These measurements will be introduced in this chapter and discussed in greater detail in Chapter III.

Critical thinking is a major component of the NCLEX-RN® (NCLEX-RN® Detailed Test Plan-Educator Version, 2016). Successful completion of this exam is required for licensure to practice nursing (Giddens & Gloeckner, 2005; Romeo, 2010). To ensure success, in pre-licensure nursing curriculums, it is a priority for faculty to prepare students to develop critical thinking. It is common for nursing programs to use commercial, nationally normed tools to assess the critical thinking ability of students.

Standardized, commercial assessments developed by ATI are an example, measuring the characteristics and skills of critical thinking in nursing students. Faculty can utilize the results of these assessments as diagnostic tools for curriculum revision and for development of instructional practices to improve critical thinking outcomes for nursing students (Assessment Technologies Institute, LLC, 2013). The ATI Comprehensive Predictor® is a 180-item proctored assessment intended to be administered at the completion of a pre-licensure nursing program (ATI Nursing Education, 2016a).

In a research study conducted to identify the variables that predict NCLEX-RN® success, a high correlation was identified between ATI assessment scores for nursing students and NCLEX-RN® pass rates (Ukpabi, 2008). This finding is significant in terms of exploring how

critical thinking development is embedded in the classroom in nursing curriculums and how it can be measured.

For nursing students, critical thinking is needed beyond the classroom, to make clinical judgments that solve patient problems in both laboratory simulations and in clinical practice. Critical thinking can also be measured in these environments. The LCJR is a tool used to rate student performance in identifying and solving patient problems in simulated practice (Lasater, Johnson, Ravert, & Rink, 2014). Implications for the use of this tool explore how critical thinking is embedded in clinical practice settings in nursing education.

In the learning environment, for educators, the process of facilitating learning is as important as the student's ability to construct knowledge (Kantar & Alexander, 2012). Traditional nursing education has had an emphasis on acquiring factual knowledge to realize behavioral outcomes and a teacher-centered pedagogy (Evans-Prior, Morton, & Brady, 2014). This type of superficial learning, often based on the medical model has made it difficult for students to develop the deep meaningful learning needed for critical thinking development. The medical model, which is provider driven, concentrates on interventions that treat patients late in their illness as opposed to anticipating patient problems and health promotion (Giddens & Brady, 2007). This in turn has caused students to memorize information instead of synthesizing information for application in new situations (Evans-Prior, Morton, & Brady, 2014). This teaching methodology does not align with the present-day health care reform or the call for curriculum revision, yet many nursing curriculums remain stuck in this method.

Content Saturation

A problem that has plagued nursing education is content saturation. A concept-based curriculum reduces the amount of content that needs to be covered while teaching students

meaningful learning strategies that facilitate knowledge acquisition through more conceptual understandings (Giddens, Caputi, & Rodgers, 2015; Mills, 2016). Associate degree nursing programs are typically four semesters, and an overabundance of content has posed an additional burden. Scientific advances, content specialty, and the entry of the information age, where knowledge is more readily available, have caused the body of knowledge in nursing to grow tremendously (Giddens & Brady, 2007; Ironside, 2004). Knowledge has been added, but none has been removed. While growth in knowledge is good, nursing curriculums are now overburdened with content and nurse educators often report a responsibility to teach it all. Sometimes they are unsure what content to keep and what content to let go of (Ironside, 2004).

NCLEX-RN® pass rates often drive program success and as a result faculty may be hesitant to remove content for fear that it would have a negative effect on program outcomes (Forbes & Hickey, 2009; Giddens & Brady, 2007). This may place more curricular emphasis on content, than on learning how to think apply knowledge in practice, creating a gap between theory and critical thinking in practice. For novice students, some memorization is needed for basic understanding; however, continuing to memorize information over the course of a curriculum prevents students from thinking deeply. This can be a pitfall of traditional content-laden curriculums that lend themselves to more linear thinking.

Conceptual Learning

In conceptual learning, as students' progress, their learning grows in depth and breadth (Mills, 2016). Conceptual learning helps students organize their knowledge in dynamic frameworks that make sense. Students make connections to past and present knowledge as they learn and because the frameworks are fluid, they learn how concepts are connected and related (Giddens, Caputi, & Rodgers, 2015; Mills, 2016). As the process of metacognition increases so

does conceptual understanding, generating critical thinking and transfer of knowledge to practice.

Faculty has an important role in the facilitation of conceptual learning. For conceptual learning to occur, students must be presented with meaningful learning activities in active and engaging classrooms. For example, use of a case study that encourages active engagement in problem solving in the classroom or enacting a scenario with a high-fidelity manikin that provides real-time feedback in the simulation lab. The literature proposes that meaningful learning activities cultivate deep learning and enhance conceptual understanding and problem solving to promote practice application (Giddens & Brady, 2007; Giddens, Caputi, & Rodgers, 2015; Mills, 2016). This requires a shift from a teacher-centered to a learner-centered environment. As this shift occurs and novice students come to understand concepts, misconceptions may be made. These can be learning opportunities, but care must be taken by faculty to address and correct them, ensuring that students are making accurate connections (Mills, 2016). Although faculty plays a pivotal role, the student bears the responsibility of knowledge construction. And therefore, a theoretical framework is necessary to support the development of conceptual learning.

Introduction to the Theoretical Framework

A combination of theories will be introduced in this research study that supports the influence of conceptual learning on critical thinking. These theories include Malcolm Knowles principles of andragogy (1980; 1984) and David Ausubel's meaningful learning theory (1968). Malcolm Knowles was a well-known educator, author and lecturer. His theory of adult learning has permeated the practice and research of many (Long & Boshier, 1998). His principles of andragogy align with the characteristics of nursing students as adult learners. David Ausubel

earned a Ph.D. in developmental psychology and pursued a lifelong career in academics and research. Like Knowles he was an accomplished educator, author and lecturer who had a strong contribution to the realm of educational psychology (Ivie, 1998). Ausubel's meaningful learning theory provides guidance for faculty instruction that promotes critical thinking in conceptual learning.

Andragogy

Within his theoretical framework, Malcolm Knowles (1980; 1984) defined the characteristics and principles of adult learners and set forth a model for curricular planning that supports conceptual learning. Knowles assumed that adult learners were self-directed learners, in control of and at the center of their learning. He proposed that adults learned best when they bring their own life experience to learning activities to form a deeper understanding of concepts. As learners construct new knowledge built on a foundation of their experiences, Knowles (1980; 1984) stressed the importance of correcting any misconceptions to ensure that learner knowledge is constructed with accuracy. He also asserted that adult learners are often motivated by intrinsic factors and learning occurs when adults are developmentally ready and can align the learning activity with purpose.

Further, Knowles (1984) proposed that adult learning is facilitated by active learning through problem-solving. Active learning is realized when the locus of control shifts from teacher to student in an active learning environment. Knowles (1980; 1984) posited that the learner is in control, yet, it is also important to consider the role that the educator plays as the facilitator of knowledge acquisition and curricular planning. In response to this, Knowles (1975) set forth a model of curricular planning to serve as a guide for educators.

Meaningful Learning Theory

The Meaningful Learning theory affirms that transfer of knowledge is dependent on how the cognitive structures or frameworks are presented in instruction. In meaningful learning, concepts serve as advanced organizers that help students create organizational frameworks for knowledge recall and knowledge transfer to clinical practice (Ausubel, 1968; 2000). Ausubel (1963) postulated a difference between rote learning such as memorization and meaningful learning that generate knowledge built on connections from prior experience that is transferable for problem solving in new situations. A combination of these theoretical underpinnings will be used to support the influence of concept-based curriculums on critical thinking in nursing education and will be discussed further in chapter two.

Problem Statement

There is little evidence in the literature to support that students develop critical thinking skills as they progress in nursing education (Adams, 1999; Giddens & Gloeckner, 2005; Maynard, 1996; Stewart & Dempsey, 2005). The literature does suggest, however, that nursing students have the aptitude to develop critical thinking and support the faculty's use of conceptual learning as a method in that development (Adams, 1999; Giddens & Gloeckner, 2005; Maynard, 1996; Stewart & Dempsey, 2005; Wangsteen, Johansson, Bjorkstrom, & Nordstrom, 2010). Students who learn conceptually are better equipped to make more meaningful connections, organize them logically, and when needed, apply knowledge to new situations (Giddens, Caputi, & Rodgers, 2015). Therefore, it is important to explore conceptual learning in nursing education.

There was evidence in the literature that concept-based curriculums have been used in nursing education, yet measurement of their outcomes, such as critical thinking were limited and dated, and conducted early in their implementation (Duncan & Shultz, 2015; Getha-Eby, Beery,

O'Brien, & Xu, 2015; Giddens & Morton, 2010; Lewis, 2014; Murray, Laurent, & Gontarz, 2015). Therefore, it was necessary to conduct current research to determine what influence conceptual learning has on the development of critical thinking in nursing students.

Research Questions

The central research question for this study is *how is critical thinking for pre-licensure associate degree nursing students influenced after the implementation of a concept-based curriculum, at a small private college in the Northeast*?

Subsidiary Questions

1. How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by first time NCLEX-RN® pass rates before and after implementation of a concept-based curriculum?
2. How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by the Assessment Technologies Institute (ATI) Comprehensive Predictor® score before and after implementation of a concept-based curriculum?
3. How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by student performance rating scores using the Lasater Clinical Judgment Rubric (LCJR) in a simulation lab before and after implementation of a concept-based curriculum?

Operational Definition of Terms

Some terms used in this research study were specific to the practice of nursing, critical thinking, and conceptual learning. Therefore, definitions are provided to assist the reader in order to gain a clear understanding of the terminology.

Assessment Technologies Institute (ATI) Comprehensive Predictor®. A commercial, standardized examination developed by the Assessment Technologies Institute (ATI). It is a 180-item proctored assessment intended to be administered at the completion of a pre-licensure nursing program. The Comprehensive Predictor® is designed to assess student mastery of basic nursing principles from their educational program as well as foundational and critical thinking (ATI Nursing Education, 2016a).

Clinical judgment. The ability to formulate a plan in response to resolving a client's healthcare problem based on a comprehensive understanding of the context of the problem through a process of noticing, interpreting, responding, and reflecting (Lasater & Nielson, 2009; Tanner, 2006).

Clinical. The term clinical is a place where treatment is given to real patients (Merriam-Webster.com).

Concept-based Curriculum. A specialized plan of courses in a nursing program that call for educators to communicate key concepts that students can use to organize their thoughts and ideas in frameworks that can be used to apply theory to practice in new situations (Diamond, 2002; Giddens, Caputi, & Rodgers, 2015; Hardin & Richardson, 2012; Merriam-Webster, n.d.).

Conceptual learning. A process of learning where students organize and store ideas with similar characteristics in mental frameworks. Understanding one example of an idea allows students to apply the knowledge to understand a similar but different example. In this way, students can apply knowledge in new situations without having learned about every specific example for an idea. In conceptual learning, examples are called exemplars (Giddens, Caputi, & Rodgers, 2015).

Critical thinking. A complex, cognitive process of applying conceptualized knowledge acquired through evidence, attitudes of inquiry, experience, intuition, and reflection to identify, analyze, interpret, and evaluate data in the process of solving problems with logic resulting in appropriate clinical actions (Kemp, 1985, Oermann, 1997; Tanner, 1983; Woods, 1993).

Critical thinking outcome scores. The percentage of questions answered correctly on the Assessment Technologies Institute (ATI) Comprehensive Predictor®. Critical thinking items on the exam comprise 75% of the total items and are at a level of application or higher according to Bloom's taxonomy (Ascend Learning, 2017).

Curriculum. Designated courses designed to be taken in a sequence that is a blueprint for a discipline of educational study inclusive of learning outcomes, content, learning strategies and assessments (Diamond, 2002; Merriam-Webster, n.d.).

Lasater Clinical Judgment Rubric (LCJR). A rubric developed using the conceptual framework of Tanner's clinical judgment model to assess the clinical judgment of nursing students in simulation. It incorporates Tanner's four tenants of noticing, interpreting, responding and reflecting with 11 dimensions at four levels from beginning to exemplary (Lasater, 2007).

NCLEX-RN® pass rates. The passing standard for safe and effective nursing practice for entry-level nurses as determined by the National Council Licensing Exam for registered nurses (NCLEX-RN® Detailed Test Plan-Educator Version, 2016).

Nursing practice. Using the framework of the nursing process (assessment, diagnosis, outcomes identification, planning, implementation, and evaluation) as a scientific problem-solving method to critically think and ensure positive client health outcomes (American Nurses Association, 2010).

Pre-licensure associate degree nursing students. Nursing students enrolled in an undergraduate nursing program that have not yet passed the NCLEX-RN® and therefore are not licensed to practice nursing.

Assumptions

In this study, the researcher assumed that nursing education provides the foundation for critical thinking development in practicing nurses. It was assumed that critical thinking is a component of the NCLEX-RN®, the ATI Comprehensive Predictor®, and the LCJR and that these instruments measure the critical thinking ability of pre-licensure nursing students as intended. It was further assumed that students answered examination items and performed in the simulation lab to the best of their ability and with integrity.

Limitations

This study was limited to a convenience sample of participants from a small private nursing college in the Northeast. These participants may not be representative of all pre-licensure nursing students in associate degree nursing programs. Due to the retrospective nature of this study, it was not possible to control for extraneous variables that may have existed or had an influence on the development of critical thinking. The curriculum had already been developed and the data intended for use in this study, NCLEX-RN® pass rates, ATI Comprehensive Predictor® scores and LCJR rating scores in the simulation lab already existed.

Yet it was important to identify potential variables and consider their influence on the results of this study. Variables considered were the characteristics of students and faculty, and the processes of curriculum development, implementation, evaluation and maintenance at the research setting. Characteristics of nursing students may have an influence on their ability to think critically. Giddens and Gloeckner (2005) found that students with higher grade point

averages were more likely to pass the NCLEX-RN®, a measure considered consistent with competent critical thinking ability in nursing students. Conversely, Shell (2001) surveyed educators and found that a lack of motivation, resistance to active learning strategies and beliefs and attitudes of students were barriers that educators realized as having an impact on critical thinking development.

Circumstances surrounding faculty may also present as an extraneous variable. Faculty beliefs and attitudes toward the development and implementation of a new curriculum are important to its success (Giddens, Caputi & Rodgers, 2015). Faculty satisfaction, faculty development, and ongoing oversight to ensure that the curriculum was delivered as intended are important to explore (Giddens, Brady, Brown, Wright, Smith, and Harris, 2008). As a final consideration, the processes of curriculum development, implementation, evaluation, and maintenance may have an influence on critical thinking development in a curriculum (Giddens, et al., 2008). Care was taken to explore and discuss these potential extraneous variables at the research setting and is discussed further in Chapter III.

Delimitations

The focus of this research will be on the critical thinking ability of students participating in this study. This study will not evaluate the efficacy of the faculty or the rigor of the program itself.

Conclusion

Due to changes in the delivery of healthcare, critical thinking in nursing practice is a priority (Cowen & Maisano, 2013; Forbes & Hickey, 2009). Regulating bodies have called for curriculum revisions to address this need (Accreditation Commission for Education in Nursing, 2013; National League, 2004; Romeo, 2010). Response to the call for reform has been slow, but some nursing programs have begun to implement concept-based curriculums in response to

content-laden curriculums and the theory-practice gap (Giddens, Caputi, & Rodgers, 2015; Mills, 2016). Conceptual learning can be supported by the principles of andragogy and the meaningful learning theory and may enhance the development of critical thinking through knowledge construction that occurs as a result of experience, self-initiated active learning and instruction that promotes more enduring understandings (Ausubel, 1968; Knowles, 1984). This study was conducted to determine if a conceptual approach in a nursing curriculum had an influence on critical thinking for nursing students. A comprehensive review of the literature to explore the concepts of conceptual learning, critical thinking, and curriculum outcomes measurement is discussed in Chapter II.

Chapter II: Literature Review

This chapter will discuss empirical evidence from the literature regarding the influence of conceptual learning on the critical thinking development of pre-licensure associate degree nursing students. A review of the literature was conducted, and an integrated analysis is presented in this chapter. Theoretical frameworks and historical perspectives that support the concepts of conceptual learning, critical thinking and measuring curriculum outcomes will be discussed.

The Institute of Medicine, the National League for Nurses (NLN), and the Accreditation Commission for Education in Nursing (A.C.E.N.) have called for a curricular change in nursing education that promotes critical thinking development in nursing students (Accreditation Commission for Education in Nursing, 2013; Cowen & Maisano, 2013; Forbes & Hickey, 2009; National League, 2004). Health care reform has created a shift from provider-centered to consumer-centered care with an emphasis on health and wellness in the community. In addition, patients have shorter hospital stays and inpatient acuity has risen (Cowen & Maisano, 2013; Forbes & Hickey, 2009). This call to action is a result of a healthcare environment that has changed the face of nursing practice.

Critical thinking has become a priority directive as an outcome of nursing education (Accreditation Commission for Education in Nursing, 2013). Nursing students must be taught to think like a nurse with depth and breadth, applying knowledge from theory to practice (Cowen & Maisano, 2013; Forbes & Hickey, 2009). Thinking like a nurse implies the use of critical thinking to make sound clinical judgments that result in positive patient outcomes (Tanner, 2006). There is evidence reported in this chapter that students have an aptitude to develop critical thinking when instructional methods support conceptual learning and students are engaged in

active class learning environments (Adams, 1999; Giddens & Gloeckner, 2005; Maynard, 1996; Stewart & Dempsey, 2005; Wangsteen, Johansson, Bjorkstrom, & Nordstrom, 2010). Planning active learning activities require time and planning yet nurse educators are challenged to implement them due to content saturation. In associate degree nursing education, programs are only four semesters long. The body of knowledge in nursing has grown immensely as a result of scientific advances, growth in content specialties, and the entry of the information age (Giddens & Brady, 2007; Ironside, 2004). Nursing curriculums are overwhelmed with content as a result.

Critical thinking in nursing embodies the act of anticipating and or recognizing a patient problem and implementing nursing interventions to avoid or resolve the problem. Mastering critical thinking is a process of metacognition that occurs over time. For students, the first step is to learn how to think on a more deep and meaningful level (Kaddoura, 2013). Conceptual learning was explored in this study as a means of facilitating metacognitive development and critical thinking in nursing education. This chapter will also discuss the measures used to assess critical thinking as an outcome in nursing education.

To answer the call for curriculum revision, a sound theoretical support is needed to understand how students learn and the instructional methods that facilitate deep meaningful learning. Knowles principles of andragogy (1980; 1984) and Ausubel's meaningful learning theory (1968) have provided foundational support for conceptual learning and will be discussed further in this chapter as a method to influence the development of critical thinking.

Student learning outcomes have measured the influence of conceptual learning in both nursing and non-nursing curriculums. The outcomes of those studies are presented in terms of support for critical thinking development in concept-based curriculums.

Conceptual Learning

In the 1950s, in elementary education, the use of concepts as advanced organizers was introduced (Taba, 1966). In the 1970s, conceptual learning was attempted in nursing education. At that time, nursing was beginning to emerge as a discipline separate from medicine and grand theories in nursing became the foundation for scientific evidence in nursing practice (Marriner,-Tomy & Alligood, 2006). Nursing curriculums were hoping to capture a conceptual approach to learning, but they were grounded in theories more concerned with a broad theoretical scope than specific concepts (Giddens, Caputi & Rodgers, 2015). The execution was not without fault, as nurse educators struggled to both understand and teach nursing in the context of these theories. Concepts derived from grand theories were too abstract, making it difficult to apply them contextually to all the content taught across nursing curriculums (Giddens, Caputi & Rodgers, 2015). For this reason, conceptual learning in nursing education failed in this early attempt.

The 1990s brought about a renewed interest in conceptual learning. Nursing was not the only discipline struggling with content-laden curriculums. Disciplines in primary and secondary education began to endorse the notion that content-laden curriculums were having a negative impact on metacognitive development (Erickson, 1998; Erickson, 2008; Forbes & Hickey, 2009; Giddens, Caputi & Rodgers, 2015; Graham, 2015). This began a transformation from traditional to concept-based curriculums in primary and secondary education (Erickson, 1998; Erickson, 2008; Giddens, Caputi & Rodgers, 2015; Graham, 2015). These events and the call for curriculum reform in nursing over the past two decades have led to a renewed interest in conceptual learning in nursing education.

Stages of Conceptual Learning

To determine if this style of learning has an influence on critical thinking, it is first necessary to better understand how conceptual learning occurs. Conceptual learning goes beyond factual learning and its stages can be likened to the components of Bloom's revised Taxonomy (Anderson & Krathwohl, 2001; Mills, 2016). In a concept analysis Mills (2016) defined the stages of conceptual learning, proposing that each of the following stages; acquiring factual and procedural knowledge, connections, transferring knowledge, and metacognition must occur to ensure a conceptual understanding.

Acquiring factual and procedural knowledge. This stage is where conceptual understanding begins; it is likened to the factual and procedural knowledge dimensions and the cognitive processes of remembering and understanding in Bloom's Taxonomy (Anderson & Krathwohl, 2001). This stage forms a foundation but does not stand on its own to guarantee conceptual understanding (Mills, 2016). Knowledge acquired in this stage can only be used for problem solving situations that occur exactly like the given factual and procedural knowledge (Mills, 2016). This knowledge does not transfer to problem solving in new situations.

Connections. To prevent isolation of knowledge and to facilitate the ability to problem solve in new, but similar situations, this stage must occur. Students who make connections between facts previously learned realize new relationships and meanings. The stronger the connections, the deeper the understanding and active learning strategies foster this process (Mills, 2016). In this stage students begin to build a framework that organizes their knowledge. A solid organizational framework will lend itself to transfer of knowledge.

Transferring Knowledge. This stage entails the process of transferring knowledge from theory to practice. Students cannot transfer knowledge without first making connections and

organizing them in a meaningful way in their framework of knowledge (Mills, 2016). Knowledge transfer also occurs when students use knowledge in a different way to solve new problems (Mills, 2016). In this way students can begin to develop metacognition.

Metacognition. In this stage students fine-tune the process of organizing information in their knowledge inventory allowing for faster retrieval and more accurate use in problem solving situations (Mills, 2016). As thinking becomes more fluid in this metacognitive process conceptual learning is realized. It is important to remember that in this stage, educators must correct any misconceptions made by learners to ensure accuracy in the construction of their knowledge inventory (Mills, 2016). This ensures an accurate construction of knowledge inventory. Theoretical influences can guide the process of designing conceptual frameworks for instruction.

Curricular Planning

In response to the burden of content saturation in nursing education, it is helpful to understand how concept-based curriculums are designed. Concept-based curriculums are designed carefully to enable students to process and retain large amounts of content with a more deep, meaningful understanding that allows for transfer of knowledge to clinical practice.

Organizing Frameworks. Lynn Erickson (2008) developed a structure of knowledge framework to support conceptual learning in K-12 instruction. Erickson posited that educators begin by introducing broad ideas and concepts. Concept-based curriculums in nursing begin with concepts divided into broad categories such as professional nursing concepts or health and illness. In each category, narrower concepts are defined, and examples are identified to illustrate each concept. Once concepts are established, Erickson, (2008) proposed that educators identify

factual examples of the concept. Over time learners construct their own knowledge by comparing the exemplars and discovering how they relate back to the concept.

In response to the call for education reform in an undergraduate program in the mid-west, faculty experts developed and implemented a concept-based curriculum (Giddens, Brady, Brown, Wright, Smith, & Harris, 2008). The concept of infection was identified as a concept in the category of health and illness (Giddens et al., 2008). The exemplars chosen to represent infection; otitis media, influenza, and a wound infection are illustrated in Figure 1.

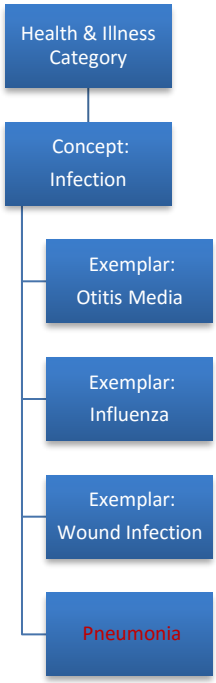

Figure 1. Concepts and Exemplars. This figure illustrates how a single concept, infection, within the domain of a health and illness category has three exemplars, otitis media, influenza and a wound infection. Once these exemplars are understood, in conceptual learning, through knowledge synthesis, students are able to make the necessary connections to understand a fourth concept, pneumonia.

In theory, a student who understands the concept of caring for a patient with an infection such as otitis media, can then make the necessary connections, and apply the same principles to the care of a patient with pneumonia, even though pneumonia was not an example discussed with

regard to this concept (Erickson, 2008; Giddens, et al., 2008; Giddens, Caputi, & Rodgers, 2015; Mills, 2016).

Exemplars. When planning instruction, educators must consider not only a concept but also the context of that concept. A learned concept can be applied to many different contexts or examples of multiple health issues in a variety of populations across the lifespan (Hardin & Richardson, 2012). In other words, concepts are meaningless to students unless they are used in context (Barthes, 1967). In conceptual learning, the use of an example of a concept in context is known as an exemplar (Giddens, Caputi & Rodgers, 2015). Consider the following example using exemplars to illustrate a concept.

Nursing students learn that for adequate oxygenation to occur, oxygen and carbon dioxide are exchanged in the alveoli in the lungs. In terms of performing nursing care, this concept of gas exchange is meaningless for a student unless it can be understood contextually. When a nursing student is assigned to care for a patient with chronic obstructive pulmonary disease, an exemplar of gas exchange, they can better understand what happens to the patient when this concept is compromised. For example, assessment findings of low oxygen saturation, shortness of breath and fatigue may be realized. The student may then think about another patient that they cared for who had similar assessment findings, perhaps this patient had pneumonia. The assessment findings are similar because the concept of impaired gas exchange is the same. The student can then think about how they provided care for that patient and then may employ the same nursing interventions in the care of this patient to restore adequate gas exchange.

Connections can continue to be made if this student collaborates with another student who is assigned to care for a child with asthma. By exploring the similarities and differences of all three patients a deeper understanding of the concept can be realized. This knowledge is then

organized in a framework that can be recalled and used when caring for patients with impaired gas exchange in the future. Through a process of analyzing and synthesizing, learners can construct an even more sophisticated and deeper knowledge base that can be recalled and transferred for use in new situations (Erickson, 2008). In this way, if an emergent situation occurs within the context of this exemplar, the student is more likely to think and act quickly to solve the problem and administer the appropriate care.

The use of concepts with exemplars is important to nursing education as it is becoming impossible to cover every health issue and every population in a nursing curriculum. Teaching concepts with exemplars may be the answer to content saturation. Careful curricular planning will enhance the presentation of content to ensure accurate understanding and organization of students' knowledge inventories. When planning instruction in concept-based curriculums, it is also important to select active and meaningful learning strategies that solidify a deeper, meaningful conceptual understanding.

Meaningful Learning Strategies

Innovative learning strategies are being used by nursing faculty in concept-based curriculums, both in the classroom and in clinical and simulation lab settings. Experts propose that the intent for using these strategies is to develop a deeper, more meaningful learning that enhances metacognition and the ability to think like a nurse (Abel & Freeze, 2006; Evans-Prior & Brady, 2014; Forbes & Hickey, 2009; Getha-Eby, Beery, O'Brien & Xu, 2015; Giddens, Brady, Brown, Wright, Smith & Harris, 2008; Hardin & Richardson, 2012; Heims & Boyd, 1990; Lasater & Neilson, 2009; Neilson, 2009; Vacek, 2009). It is helpful to explore how these strategies align with the development of critical thinking in concept-based curriculums.

Strategies in theory. Concepts and exemplars can be presented to students in unique and innovative ways. One such example is a web-based program entitled, *The Neighborhood.* The Neighborhood is inclusive of 40 characters in 11 households of diverse cultures (Giddens et al., 2008). This innovative teaching approach helps students apply learned principles of concepts in a multi-contextual learning platform.

Concept maps. Concept maps are another innovative strategy used to help students make connections between concepts or within a concept. They allow students the opportunity to demonstrate a logical problem-solving thought process using analysis, synthesis and evaluation in a diagram. These connections enable a student's ability to develop enduring understandings that can be used again and again for problem solving in practice (Abel & Freeze, 2006). In a quantitative, descriptive research study, 28 associate degree nursing students completed four concept maps over a two-year period. The purpose of the study was to determine if over time they increased their ability to use the nursing process to make connections between concepts in care for hospitalized patients illustrated in concept maps. Findings suggested a statistically significant increase in student knowledge as evidenced by conceptual connections made with increasing detail in the maps over time (Abel & Freeze, 2006).

Narrative pedagogy. Using Heideggerian hermeneutics, a qualitative study was conducted to extract experiences of nursing faculty using narrative pedagogy as opposed to traditional content delivery in nursing education (Ironside, 2004). One educator used narrative pedagogy to decenter content delivery, beginning class with student experiences versus content. When students contributed their experiences to the discussion a discourse ensued that allowed the educator to extract themes and help students make connections. This resulted in student

thinking on a deeper level with an increase in connections and understanding by considering all possibilities (Ironside, 2004).

Strategies in practice. The literature also supports the use of concept-based learning activities in a variety of clinical practice settings. Concept-based learning activities (CBLA) in clinical practice include but are not limited to the use of conceptual care versus total client care in clinical practice and use of a clinical judgment model with a high-fidelity simulation manikin in the lab. Using CBLA in practice, students can make connections using processes that allow them to think and problem solve like a nurse, this being the foundation for clinical judgment in practice (Heims & Boyd, 1990; Lasater & Nielsen, 2009). These alternatives to traditional clinical practice support meaningful learning.

Conceptual care versus total patient care. When students are assigned to care for only one concept of a patient's care, such as gas exchange, they can develop a deeper understanding of this concept than if they were responsible to provide all the care for the patient during their shift (Lasater & Nielson, 2009). In addition, if several students care for patients with the same conceptual need, students can participate in rounding and learn by making connections between patients with different aspects of the same concept (Lasater & Nielson, 2009). For example, one patient may have asthma and another lung cancer, in this way a student can make connections by comparing the specific needs of these clients within the principles of gas exchange. In the mixed-methods study introduced in Chapter I, a university in Oregon explored the benefits of this approach. Using hi-fidelity simulation, students in the treatment group were exposed to concept patient care while those in the control group were exposed to traditional total patient care. Using a rubric to rate student performance, the treatment group scored significantly higher in all phases of clinical judgment. In this study, researchers also extracted themes from videos of student

performance. Among them a bridge between theory and practice and development in student thinking and clinical judgment were realized (Lasater & Neilsen, 2009).

Simulated collaboration. In an experimental, mixed methods study the effectiveness of grand rounds as an educational strategy for pre-licensure baccalaureate nursing students was explored (Mann, 2012). The participants were a convenience sample, randomly assigned to three intervention groups and one control group. Both groups participated in discussions to resolve a given health care dilemma. The intervention groups were provided with a simulated educational strategy that involved interacting with the instructor to simulate grand rounds. The control group was not exposed to this strategy. Both the intervention and the control groups were rated on their performance using the LCJR and they completed the ATI critical thinking assessment. The ATI assessment score was compared with scores from the same assessment administered earlier in the program. Findings concluded that there was an increase in ATI critical thinking scores after the intervention; however it was not a statistically significant increase. In addition, a statistically significant increase in clinical judgment was realized for the intervention groups as evidence by LCJR scores (Mann, 2012).

The literature has provided evidence that meaningful conceptual learning strategies have enabled student nurses to improve their ability to think critically, like a nurse. This may be further support the use of a conceptual learning in nursing curriculums. Therefore, it is important to explore the theoretical frameworks that support conceptual learning.

Theoretical Framework

Learning to think like a nurse requires active and self-directed learning that results from knowledge acquisition built on experience. Thinking like a nurse also requires the transfer knowledge to new situations and the ability to think critically using judgment and problem

solving in practice (Giddens, Caputi & Rodgers, 2015; Tanner, 2006). Two major theories will be presented and together they will provide a sound theoretical underpinning for this study. A combination of Malcolm Knowles principles of andragogy (1980; 1984) and David Ausubel's meaningful learning theory (1968; 2000) from the constructivist paradigm, have provided theoretical support for nursing curriculums that are designed to influence critical thinking through conceptual learning. When planning a curriculum to promote critical thinking, it is important to understand how the adult learner acquires knowledge and the learning principles that best guide their acquisition. Knowles' principles of andragogy (1984) have provided a theoretical framework for the adult learner that supports the acquisition of knowledge. If conceptual learning is to be considered as an influence for critical thinking development, then it is equally important to have theoretical support for the delivery of instruction that best supports this acquisition. Ausubel's meaningful learning theory (1968; 2000) has provided a theoretical foundation for the delivery of instruction that best supports conceptual learning. What follows is a detailed description of each of these theories and their relevance to conceptual learning as an influence on critical thinking.

Andragogy

Prior to the work of Knowles, the term pedagogy was widely used to describe the characteristics of both children and adult learners. Malcolm Knowles proposed that adult learners acquire knowledge differently than children (Knowles, 1980; 1984). Nursing students are adult learners, in order to provide an environment that is conducive to deep meaningful learning in nursing education it is important that educators understand and apply the principles of andragogy.

Assumptions. Knowles (1980; 1984) made the following assumptions about adult learners.

Self-concept. No longer dependent on others, as in the pedagogical model, adult learners have a need to be in control or accountable for their learning. Therefore, they must be challenged with independent, self-directed learning strategies. If their need to control their learning environment is not met, then they are at risk to become dependent learners (Knowles, 1980; 1984). Dependence in learning is in direct conflict with the learner's need to construct their knowledge inventory in conceptual learning. Knowles supposed that educators are meant to facilitate adult learning and thereby change the locus of control from instructor to student (Knowles, 1980; 1984). When the locus of control shifts, and self-directed, active learning ensues, learners can discover new possibilities.

Experience. Knowles (1980; 1984) further posited that unlike children, adults can bring a wealth of foundational knowledge to the learning experience. A learner's experiences, including their mistakes, provide a foundation for learning. This breadth of experience can lend itself to collaboration among adult learners as they become resources for one another. In this way, group discussion, problem-solving activities, and simulated activities are necessary to stimulate learners (Knowles, 1980; 1984). In conceptual learning, as nursing students create their knowledge inventory they build on prior experiences. Therefore, it is important to consider what the adult learner brings to the experience when planning active learning strategies in a concept-based curriculum.

Readiness to learn. Knowles asserted that the timing of learning activities must align with the developmental tasks of a learner. It is further important to consider that adults are most interested in learning about topics that are personally and professionally relevant. They are often

motivated by life experiences that present an opportunity or a need to learn, such as a loss, a move, or achieving a developmental stage in life. Knowles believed in exposing potential learners to role models and participating in career planning to facilitate their readiness (Knowles, 1980; 1984). Once readiness is established adult learners can engage in learning.

Orientation to learning. Adults seek learning opportunities because they have a need to fulfill or a problem to solve. In this way learners are ready to apply knowledge in situations that have meaning for them (Knowles, 1980; 1984). Nursing students are required to apply knowledge to solve patient problems in practice. This focus on solving the problem is accomplished by practicing application of knowledge versus memorization (Mills, 2016). Conceptual learning facilitates this transfer of knowledge to practice, satisfying the nursing students' orientation to learning.

Motivation to learn. Although it is evident that there is an orientation to learning, which may be an external force, Knowles (1984) believed that learners were more often motivated by internal factors such as recognition, quality of life or self-actualization.

Principles of andragogy. Based on these assumptions, Knowles (1984) set forth four principles of adult learning

- Adults need to be involved in the planning and evaluation of their instruction
- Experience, including mistakes, provides the basis for learning activities
- Adults are most interested in learning subjects that have immediate relevance to their job or personal life
- Adult learning is problem-centered rather than content-oriented.

Knowles (1984) proposed that the focus of learning is problem centered, nurse-patient situations are often problem centered and nurses must critically think to make clinical judgments to resolve the problem.

Process model. In addition to the assumptions of adult learners and the principles of andragogy that he set forth, Knowles (1975) also developed a model with the intent of guiding educators in curricular planning. The steps of the model; climate setting, planning, diagnosing needs for learning, setting goals, designing a learning plan, learning activities, and evaluating learning outcomes are described as follows.

Climate setting. In this step, Knowles (1975) asserted that it is important to set the stage for learning. Learners must understand that they have the locus of control and that the educator's role is to facilitate and function as a resource. Rules of respect and trust must be collaboratively identified by both learner and educator in order to create an atmosphere conducive to active engagement.

Planning. The educator must consider the input of learners in curricular planning to ensure their engagement based on content that is relevant and valued by the learner and is evident of the necessary rigor (Knowles, 1975).

Diagnosing learner needs. A mutual assessment is needed to create a learning environment that allows the learner to take ownership of the initial ideas and concepts presented by the educator to build their own knowledge inventory (Knowles, 1975).

Setting goals. In this step, Knowles (1975) set forth the logic that educators assist learners to transform their learning needs into appropriate, meaningful and measureable learning objectives that will ensure a foundation for knowledge construction.

Designing a learning plan. Knowles (1975) believed the educators must bring to the table strategies and resources that will enhance and broaden their ability to construct knowledge. The educator must create a plan for learning experiences that is appropriate for the learner's state of readiness and that is sequentially presented to build upon previous knowledge.

Learning activities. Learning activities should be planned to stimulate inquiry and problem–solving through both independent and collaborative learning processes. The educator's role is that of a consultant and resource (Knowles, 1975).

Evaluating learning outcomes. Evaluating or judging the learner for evidence of realizing their objectives must be conducted in an objective and just manner that will be well received by learners in a way that enhances their self-concept as self-directed learners. This may be accomplished by a mutual assessment of both educator and learner (Knowles, 1975).

In the process of problem solving, adult learners identify the problem, use their prior experiences and knowledge inventory, and actively exercise the ability to think critically to make a sound judgment or decision (Knowles, 1984). In this way, if learning outcomes and activities in nursing education are grounded in the active, self-directed learning framework of andragogy, nursing students will be better prepared to think critically and solve patient problems in practice. The principles of andragogy can help the educator to understand the characteristics of learners, their role in learning, and the educator's role in planning. In order to influence critical thinking, this theoretical framework is valuable and supports the development and planning of concept-based curriculums in nursing education.

Meaningful Learning Theory

Instruction that promotes conceptual learning can be guided by Ausubel's meaningful learning theory (1968; 2000). In nursing education, learners must build and organize their

knowledge inventory in a way that is meaningful and useful for higher-ordered thinking, especially in new situations. Ausubel (1968; 2000) believed that for learners, the process of knowledge construction requires deep, meaningful learning. His theory focused on the planning and delivery of instruction that results in the acquisition, retention, and transfer of knowledge for learners. (Ausubel, 1968; 2000). Ausubel's theory (1968; 2000) is less focused on the qualities of the learner and is more concerned with how instruction is delivered with an emphasis on conceptual learning.

To better understand meaningful learning, it is helpful to make a comparison between rote and meaningful learning as described in Ausubel's theory. Rote learning is learning that is accomplished by acquiring factual knowledge in a manner such as memorization. The educator delivers the knowledge in a didactic manner that is not connected to formerly acquired knowledge and it requires little engagement and effort on the part of the learner (Ausubel, 1963). As a result, the learner is limited by short-term recall and a linear application of knowledge.

Meaningful learning however is presented by educators in a manner that supports the learner's ability to connect new knowledge to previously acquired information, thus providing them with the means to store the information in an organized structure (Ausubel, 1963). Compared with rote learning, meaningful learning results in higher-level learning and more long-term recall. Because meaningful learning structures are built on connections, learners can more easily recall information when needed in new situations (Ausubel, 1963). When used in nursing education, this presents an opportunity for students to transfer knowledge from theory to practice and solve patient problems when presented with new situations. Five principles of this theory, concept formation and assimilation, subsumption, progressive differentiation, integrative

reconciliation, and consolidation can lead to further understanding of the relationship between meaningful learning and conceptual learning.

Concept formation and assimilation. Concepts are inclusive of exemplars with common attributes (Ausubel, 2000). They are initially learned in childhood through a process of concept formation as a result of direct exposure. The child who is continuously exposed to the family dog comes to understand the image or sign of a dog long before understanding the concept or common attributes of dogs. As the child's vocabulary develops, they acquire new concepts through the process of assimilation, using both words and images in combination with existing knowledge to examine the criteria of exemplars that define concepts. In this way, they can understand that the family cat is not a dog but rather a new concept (Ausubel, 1968; 2000). Meaningful learning encompasses the skill of comparing and contrasting the attributes of both the previously stored concept of dog with the newly learned concept of cat to understand how they are alike and how they are different (Ausubel, 2000). A reference can be made between this principle and the examples provided earlier in this chapter of connecting the attributes of patients with different types of infections or impaired gas exchange.

Subsumption. When learners receive new information that is connected to ideas that already exist in their knowledge inventory, they can then link this new information to previous knowledge and organize it based on those connections (Ausubel, 1968). Meaningful learning continues when a synthesis of knowledge occurs as a result of new connections. Once a student makes these connections, they can synthesize the knowledge of how exemplars are alike and different. Using the prior example of providing care for a patient with pneumonia, students can utilize an understanding or synthesis of knowledge about all patients with infections. If this information is organized in a way that makes sense to the learner, then it can be easily recalled

and used in new situations. This becomes the basis for transfer of knowledge in new situations. The process of subsumption may be difficult for a learner if new information is not relevant to prior knowledge, or the student's understanding of new information is incorrect (Ausubel, 1968).

Progressive differentiation. Ausubel (1968; 2000) believed that learners organize and store knowledge in a hierarchy, understanding the whole (concept) before understanding the parts (exemplars). Therefore, he proposed that educators present information to learners logically, using broad concepts as advanced organizers to create scaffolding to support new knowledge (Ausubel, 1968). Erickson's structure of knowledge (2008) was built on this belief. Conceptual learning occurs when broad concepts are introduced first and then examples are given to illustrate the concept (Giddens, Caputi, & Rodgers, 2015). In other words, a student should be able to better understand the care of a client with pneumonia after first learning the broad concept of infection. Ausubel (1968) believed that instruction presented in other ways, such as dividing content into equal parts, like chapters in a book, results in rote learning. This principle serves as a strong validation for a conceptual approach to learning.

Integrative reconciliation. It is important that new knowledge is built on accurate information. If new information does not align with existing knowledge in a way that makes sense to the learner, they have difficulty making connections and organizing it. These difficulties may result in incorrect knowledge built on misunderstandings. When new information is misunderstood, Ausubel (1968) proposed that it must be re-structured. The educator is responsible to conduct assessments of knowledge acquisition to ensure that the learner forms an accurate foundation for knowledge construction and ultimately transfer of knowledge in new situations (Ausubel, 1968). In nursing, clinical judgment based on accurate knowledge is

important for positive patient outcomes. Misunderstandings can also be avoided when educators present new information in a way that helps learners make sense of it.

Consolidation. Ausubel (1968; 2000) asserted the importance of achieving learner content mastery of one topic before moving to the next to ensure that subsequent learning is not compromised. Progression of instruction should be based on learner readiness through content mastery. When educators evaluate learner progress this is determined, thus, stressing the importance of measuring learning outcomes. Ausubel (1968; 2000) also believed that when educators provide feedback to learners it affords them the opportunity to self-evaluate their learning.

Well organized, conceptual instruction grounded in Ausubel's theory (1968) has been proposed as a foundation for the deep and meaningful learning required to perform higher-order thinking processes such as application, analysis, synthesis, evaluation and transfer of knowledge in new situations. In this way, students become more skilled in the art of thinking and organizing their knowledge inventory. When students learn to apply their knowledge inventory to new situations, they can more readily solve client problems in practice.

Malcolm Knowles (1980; 1984) and David Ausubel (1963; 2000) both believed that learners construct their own knowledge based on an integration of their past and present experiences to make sense of what they come to know. Both have theoretical principles that support conceptual learning and critical thinking. Knowles principles (1980; 1984) were focused on the characteristics of the learner and have helped us to understand how adults learn in order to plan active learning strategies that best engage adult learners. Ausubel (1968; 2000) was concerned with presenting instruction in a way that learners can acquire, retain and transfer knowledge efficiently. It is important to blend the principles of both theories for a well-rounded

theoretical perspective. Together, they offer a wide base of support for conceptual learning. These theoretical underpinnings serve to guide the reader as empirical evidence from the literature that explored critical thinking and the measurement of student learning outcomes in concept-based curriculums is presented.

Critical Thinking

There was little evidence in the literature regarding the influence of conceptual learning on critical thinking for nursing students. To determine if conceptual learning has an influence on critical thinking for pre-licensure nursing students it was important to first explore the relationship that critical thinking has with nursing practice. There was evidence in the literature that critical thinking has been studied and measured in nursing students (Adams, 1999; Del Bueno, 2005; Fero, Witsberger, Wesmiller, Zullo & Hoffman, 2008; Giddens & Gloeckner, 2005; Kantar, 2012; Maynard, 1996; Shin, Jung, Shin & Kim, 2006; Stewart & Dempsey, 2005; Wangsteen, Johansson, Bjorkstrom & Nordstrom, 2010). There was also evidence that critical thinking can be measured as an outcome of nursing curriculums in terms of competence for entry level practice as a professional nurse.

Thinking like a nurse is born of metacognition. In practice nurses apply existing knowledge to new situations or contexts, consider alternatives and solve problems through a process of critical thinking (Brandon & All, 2010; Peters, 2000; Tanner, 2006). It is a logical expectation that nursing students have an opportunity to develop critical thinking during their education process.

Definition

Critical thinking in nursing practice has many definitions in the literature. It is unclear what relationship exists between critical thinking, clinical judgment, and clinical decision

making and if they are defining characteristics or components of one another (Adams, 1999; Kantar & Alexander, 2012; Mann, 2012; Tanner, 2006). An integrative review of research on critical thinking in nursing education from 1977 to 1995 concluded that there was a lack of evidence for critical thinking development in nursing education (Adams, 1999). Difficulty defining critical thinking may be at the root of this problem.

Development of a widely-accepted or universal definition for critical thinking is well beyond the scope of this study. Refer to a summary of definitions from the literature in Table 1. This table of definitions supports a belief that critical thinking is a metacognitive process required when making clinical judgments to solve patient problems (Fero, Witsberger, Wesmiller, Zullo & Hoffman (2008). Therefore, for this study, a definition that best defines critical thinking is;

> A complex, cognitive process of applying conceptualized knowledge acquired through evidence, attitudes of inquiry, experience, intuition, and reflection to identify, analyze, interpret, and evaluate data in the process of solving problems with logic, resulting in appropriate clinical actions (Kemp, 1985, Oermann, 1997; Tanner, 1983; Woods, 1993).

And further, in this study, sound clinical judgments that solve patient problems with positive outcomes will be evidence of critical thinking. Beyond defining critical thinking, it is important to understand how it is measured.

Table 1

Summary of Critical Thinking Definitions

Author	Definition
Tanner (1983, p.3)	A complex cognitive process, including decision making.
Kemp (1985, p.382)	An attitude of inquiry involving the use of facts, principles, theories, abstractions, deductions, interpretations, and evaluation of arguments.
Woods (1993, p.65)	The intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information gathered from or generated by observation, experience, reflection, reasoning, or communication, as a guide to belief and action.
Kataoka-Yahiro & Saylor (1994, p.352)	Reflective, reasonable thinking.
Facione, Facione, & Sanchez (1994, p.345)	The ideal critical thinker is habitually inquisitive, well informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and circumstance of inquiry permit.
Oermann (1997, p.25)	Thoughtful process underlying effective clinical problem solving and decision-making.
Shin, Jung, Shin, & Kim (2006, p.234)	Critical thinking refers to knowledge, active discussion, rationalization, intuition, application, understanding of meaning, analysis of problems, and ability to devise and make judgments on alternative measures.

Measurement

The lack of consensus in defining critical thinking may have an impact on its measurement. It is important to consider if a lack of development in critical thinking in nursing education is related to a lack of a universal means to measure it (Adams, 1999). A review of the literature has produced several methods for consideration in the measurement of critical thinking. The critical thinking outcomes component of the NCLEX-RN®, the ATI Comprehensive Predictor®, and the Lasater Clinical Judgment Rubric (LCJR) will be discussed in terms of their ability to measure critical thinking in this study. These measures can be supported by the theoretical frameworks of the revised Bloom's Taxonomy (2001) and Tanner's Clinical Judgment Model (2006).

The revised Bloom's Taxonomy. Bloom's taxonomy (Anderson & Krathwohl, 2001; Bloom, 1956), has defined levels of cognitive learning that can be measured. Blooms Taxonomy, illustrated in Figure 2, is a two-dimensional framework that integrates four types of knowledge; factual, conceptual, procedural and metacognitive, with six cognitive processes organized in a stepwise manner of knowledge acquisition from simple (remembering and understanding) to complex (creating new knowledge). The original intent of this taxonomy was to facilitate test construction (Bloom, 1956). It has since been revised with more of an emphasis on student learning (Anderson & Krathwohl, 2001; Su & Osisek, 2011). This framework can be used by educators when planning learning objectives to facilitate learning experiences that will promote higher-order thinking. Bloom's cognitive process level of application is a minimum requirement in NCLEX-RN® blueprints and the ATI Comprehensive Predictor®. Therefore, it is imperative that nurse educators prepare learning outcomes at a minimum of Bloom's cognitive level of

application (NCLEX-RN® Detailed Test Plan-Educator Version, 2016). At this level students can learn to apply knowledge in new situations.

Nurse educators can use the revised Bloom's Taxonomy as a guide when developing student learning outcomes, choosing the correct type of knowledge and cognitive processes for their intended learning opportunity. Instruction that is grounded in learning outcomes written in the higher-order cognitive processes and knowledge domains of this taxonomy, such as application and conceptual knowledge, can enhance the student's ability to think critically and transfer knowledge for problem solving (Anderson & Krathwohl, 2001). For example, a didactic lecture of factual information will foster remembering or understanding while a problem-solving case application in the class room will result in application of previously constructed knowledge in a deeper conceptual manner. This is important as students learn how to think and construct knowledge.

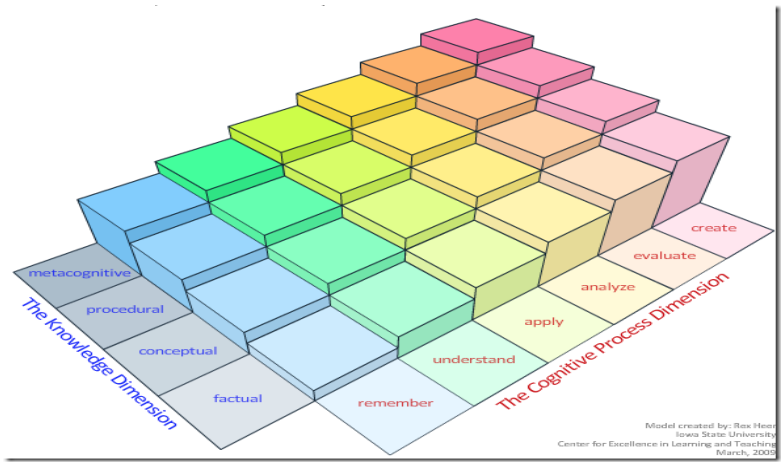

Figure 2. The Revised Bloom's Taxonomy Model. This figure represents a theoretical guideline used by educators to identify appropriate dimensions of knowledge and levels of cognitive process when planning and assessing student learning outcomes. Reprinted from A Model of Learning Objectives–based on *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* by Rex Heer, Center for Excellence in Learning and Teaching, Iowa State University is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License. © Copyright 1995-2015, Center for Excellence in Learning and Teaching, Iowa State University

As the original intent for this model was to facilitate test construction, it is also prudent to think beyond curricular planning and consider its use as a framework to evaluate learning in terms of cognitive processes such as critical thinking. The NCLEX-RN® and the ATI Comprehensive Predictor® were used to measure critical thinking in this study.

Student learning outcomes. There is evidence in the literature that competence in entry-level nursing practice can be measured using the NCLEX-RN®, commercial, standardized assessments developed by ATI, and through use of the LCJR in laboratory simulations. It is important to understand how each measure has a relationship with critical thinking and can be measured as a student learning outcome.

National Council Licensure Examination for Registered Nurses (NCLEX-RN®). In nursing, entry level competence is measured by the NCLEX-RN® and it is a requirement for

licensure to practice as a professional nurse. Nursing students sit for this examination at the completion of their pre-licensure educational preparation. The licensure examination reflects the integrity of nursing programs and are a criterion standard for accreditation (Giddens & Gloeckner, 2005). Therefore, pre-licensure nursing education is strongly focused on preparing students for the NCLEX-RN®. Just as critical thinking is a directive of accreditation in nursing education so are satisfactory program pass rates (Accreditation Commission for Education in Nursing, 2013; Giddens & Gloeckner, 2005; National League for Nursing Board of Governors 2004).

The NCLEX-RN® tests students at a level of application or higher according to Bloom's Taxonomy to capture evidence of metacognitive skills such as critical thinking (NCLEX-RN® Detailed Test Plan-Educator Version, 2016). Critical thinking is a factor of competence measured by the NCLEX-RN® and therefore, a connection can be made between the NCLEX-RN®, critical thinking and conceptual learning (Giddens & Gloeckner, 2005; McCarthy, Harris & Tracz, 2014; NCLEX-RN Detailed Test Plan-Educator Version, 2016. Rodgers, 2010; Romeo, 2010; Wendt & Brown, 2001).

In 2010, a qualitative study of new graduate nurses who had successfully passed the NCLEX-RN® was conducted to identify the factors that contributed to their success. Among the themes that emerged, one of them was the ability to think critically. Another theme identified teaching methods that facilitate a deeper level of thinking, promoted critical thinking. Students were more successful when examinations developed by faculty aligned with the NCLEX-RN® blueprint requiring critical thinking to prioritize, analyze and solve patient problems (Rodgers, 2010). In addition, an integrative review of 12 quantitative studies was conducted using standardized assessments to measure critical thinking in nursing students (Romeo, 2010).

Findings supported evidence for critical thinking as a requirement for successful completion of the NCLEX-RN®. In this way, a conclusion can be made that critical thinking is measured by NCLEX-RN® success.

The NCLEX-RN® is used widely in nursing curriculums as a program outcomes measurement. If student performance on the exam evaluates program performance, it is important to ensure that nursing curriculums reflect those practices that facilitate critical thinking to achieve competence in practice measured by successful NCLEX-RN® pass rates (McCarthy, Harris & Tracz, 2014). Other measures can be used as well, the most frequently discussed method in the literature is commercial, standardized testing.

The ATI Comprehensive Predictor®. Commercial, standardized testing is common in most nursing programs. These nationally normed assessments can serve as admission criteria, identifying aptitude for program success and they are also commonly used to assess mastery of content as a student progresses academically in preparation for the NCLEX-RN® (Rodgers, 2010; Romeo, 2010; Tipton, Pullium, Beckworth, Illich, Griffin & Tibbett, 2008; Ukpabi, 2008).

The Comprehensive Predictor® is a commercial, standardized assessment developed by ATI. It is a 180-item proctored assessment intended to be administered at the completion of a pre-licensure nursing program. This assessment is designed to assess student mastery of basic principles from their educational program (ATI Nursing Education, 2016a). The blue print for this exam aligns with the NCLEX-RN® blueprint in both content topic categories for items and percentages of items within each category. Cognitive items on the exam are from two categories; foundational thinking (from the remembering and understanding level of Bloom's taxonomy) and critical thinking (from a minimum application level from Bloom's taxonomy). Seventy-five percent of the items on the ATI Comprehensive Predictor are classified as critical thinking items

(Ascend Learning, 2017). A relationship between commercial standardized assessments and the NCLEX-RN® was explored.

Relationship to the NCLEX-RN®. A relationship exists between commercial standardized assessments and the NCLEX-RN® in terms of measuring critical thinking (Homard, 2013; McCarthy, Harris & Tracz, 2014; Schooley & Kuhn, 2013). A study was conducted in 2013 to determine if curriculums that encouraged the use of a commercial, standardized test package for practice and reflective thinking, performed better on the NCLEX-RN® (Homard, 2013). When comparing programs, findings concluded that NCLEX-RN® scores were significantly higher for those programs that used them. Further, a study of NCLEX-RN® pass rates found that standardized testing was an important factor of first-time pass rates (McCarthy, Harris & Tracz, 2014). In 2013, a study conducted to determine factors of NCLEX-RN success found that the commercial fundamentals assessment administered was the most predictive of NCLEX-RN success. Students who demonstrated mastery of fundamentals content, early in the program, had a higher NCLEX-RN® pass rate (Schooley & Kuhn, 2013).

Following the implementation of standardized testing to improve NCLEX-RN® pass rates, a study in 2008 reported an increase in NCLEX-RN® pass rates from 93% to 97% (Richards & Stone, 2008). Yet another study conducted after the initiation of a progression policy requiring mastery of standardized testing prior to sitting for the NCLEX-RN®, found that of the 167 students predicted to pass, 22 did not (Spurlock & Hunt, 2008). Of the 12 expected to fail, 10 passed. The researchers concluded that standardized testing was not an accurate predictor and at best should not be a sole predictor of NCLEX-RN® success (Spurlock & Hunt, 2008).

In another study, a high correlation was made between scores for nursing students on the ATI critical thinking assessment and NCLEX-RN® pass rates (Ukpabi, 2008). This further

supports evidence for a correlation between critical thinking development and NCLEX-RN® competence. To that end, it would be important to consider both commercial, standardized assessments and the NCLEX-RN® as outcome measurements for curriculums in nursing.

These assessments have proven their ability to measure critical thinking academically by written examination, it is also important to measure critical thinking in practice. The Lasater Clinical Judgment Rubric (LCJR), developed from Tanner's Clinical Judgment Model, was the third measure of critical thinking used in this study.

Tanner's clinical judgment model and the Lasater clinical judgment rubric. In laboratory and clinical settings Tanner's clinical judgment model (2006) provides theoretical support for critical thinking necessary for making clinical judgments. Making clinical judgments depends more on subjectivity or what the nurse brings to the situation than the objectivity of the situation (Tanner, 2006). Making a clinical judgment in practice is also highly influenced by the context of the client situation (Tanner, 2006). Therefore, in alignment with conceptual learning, a more broad, conceptual knowledge that can be applied in context to a client situation is important when making clinical judgments. Tanner's clinical judgment model can be used as a guide to make these judgments in practice. Tanner (2006) developed the Clinical Judgment Model to provide faculty with a framework to guide learners through the process of metacognitive development in clinical practice. This model, shown in Figure 3, incorporates four steps that assist the learner to use critical thinking to make clinical judgments in practice. (Lasater & Nielson, 2009; Nielson, 2009; Tanner, 2006).

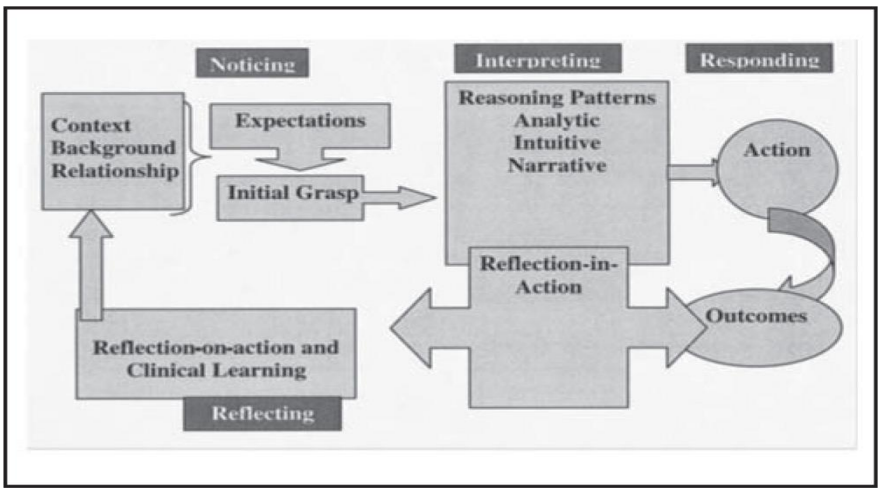

Figure 3. Tanner's Clinical Judgment Model illustrates the process required in steps when nursing students make clinical judgments in practice. From "Thinking like a nurse: A research-based model of clinical judgment in nursing" by C. A. Tanner, 2006, *Journal of Nursing Education, 45*(6), p. 208. Reprinted with permission from SLACK Incorporated.

Students often have difficulty applying knowledge from the classroom to the clinical practice area. Practicing critical thinking to make judgments that solve clinical problems can be accomplished in the simulation lab. As previously discussed, sound clinical judgments that solve patient problems with positive outcomes are evidence of critical thinking (Kemp, 1985). The Lasater Clinical Judgment Rubric (LCJR) (2007) can be used to measure critical thinking in the simulation lab. Based on Tanner's clinical judgment model (2006), the LCJR (2007) measures a student's ability to understand a patient problem and respond in an appropriate manner using a process of noticing, interpreting, responding, and reflecting that is evident of critical thinking (Lasater, 2007; Lasater, Johnson, Ravert, & Rink, 2014; Tanner, 2006). This rubric can be used to collect data that reflects a student's response to a patient problem and their ability to think through the situation.

When students and faculty use the rubric, it clarifies the steps required to think through the process and provided feedback for self–assessment and discussion (Lasater, 2007; Tanner,

2006). The process of debriefing after the simulation also provides a rich metacognitive vehicle for critical thinking (Lasater, 2007; Tanner, 2006). Therefore, evidence of critical thinking in the simulation laboratory can be determined using this tool. Elements of the LCJR (Lasater, 2007) are embedded in the steps of Tanner's model (2006) and are described as follows.

Noticing. Learners collect data from assessment opportunities in clinical practice and compare the findings to and reflect on past experiences to assign meaning and develop an understanding of the situation (Tanner, 2006). The LCJR (2007) measures one's ability to make a focused observation, recognize exceptions in a situation and obtain more information (Lasater, Johnson, Ravert, & Rink, 2014). This step begins the process of critical thinking by identifying the problem and collecting data. One may identify an exception to what is expected by recalling past experiences.

Interpreting. Once data has been collected, a pattern of responses is considered prior to responding. This often requires integration of new information with past experiences and a thorough analysis until one comes to better understand the situation (Tanner, 2006). The LCJR (2007) measures one's ability to understand and prioritize the data collected (Lasater, Johnson, Ravert, & Rink, 2014). In alignment with conceptual learning, one can integrate prior knowledge and experience with the presentation of new information to analyze the situation.

Responding. Learners decide on a course of action and response to the situation (Tanner, 2006). The LCJR (2007) measures one's ability to respond with confidence implementing an appropriate intervention to solve the problem (Lasater, Johnson, Ravert, & Rink, 2014). Analysis of the situation prepares one to take the appropriate action. If one learns by memorizing factual information, they will only arrive at the correct action if they have experienced the exact same

problem in the past. If one learns conceptually, they can apply concepts learned to new situations arriving at the correct course of action.

Reflection. The learner then connects their response with the outcome of the situation and stores the experience in their knowledge inventory for future use. This act is cyclical in nature (Tanner, 2006). The LCJR (2007) measures one's ability to reflect on these tasks with the goal of improving the practice of thinking and learning (Lasater, Johnson, Ravert, & Rink, 2014). Debriefing a situation provides an excellent opportunity to reflect and self-evaluate. The learner's ability to evaluate and reflect in the process of learning is essential to higher-order thinking (Nielson, 2009; Peters, 2000; Tanner, 2006). Metacognitive skills enhance a learner's ability to make the connections necessary for conceptual learning and promote higher-order thinking such as critical thinking, reasoning, judgment and problem solving.

When considering methods that measure critical thinking for nursing students it is beneficial to utilize measurement tools designed specifically for nursing students. It is equally important to capture critical thinking in both theory and practice and therefore these three measures, the NCLEX-RN®, The ATI Comprehensive Predictor® and the LCJR were used in this study. Defining and measuring critical thinking has been discussed; the next section will explore the development of critical thinking in nursing education.

Development

Critical thinking of student nurses has been studied in terms of demographic variables, academic progression, and entry level professional practice. It is important to understand the development of critical thinking in nursing students to determine how to influence its development.

Demographic variables. The critical thinking ability of nursing students has been studied with consideration for demographic variables such as age, gender, grade point average (GPA) and levels of educational preparation. Pre-licensure nursing students are both traditional and non-traditional college students in age. They are predominately female and may have different levels of educational preparation such as a diploma, an Associate degree or a Bachelor's degree (Del Bueno, 2005; Fero, Witsberger, Wesmiller, Zullo & Hoffman, 2008; Giddens & Gloeckner, 2005; Shin, Jung, Shin & Kim, 2006; Stewart & Dempsey, 2005; Wangsteen, Johansson, Bjorkstrom & Nordstrom, 2010). It is valuable to consider the relationship between these variables and their critical thinking ability.

Critical thinking dispositions were studied in 614 newly graduated nursing students who recently completed their education in Norway. Measurement was conducted using the California Critical Thinking Dispositions Inventory (CCTDI). The CCTDI measures dispositions and attitudes of critical thinking in terms of truth-seeking, open mindedness, confidence, analytical and systematic thinking, and maturity (Giddens & Gloeckner, 2005, p.87; Leppa, 1997). Participants over the age of thirty were found to have higher total CCTDI scores. Male participants scored higher solely on analytical ability (Wangsteen, Johansson, Bjorkstrom, & Nordstrom, 2010). In another study, critical thinking of pre-licensure nursing students measured by the CCTDI was compared to critical thinking measured by the California Critical Thinking Skills Test (CCTST), a test used to measure the induction, deduction, analysis, evaluation, and inference in critical thinking for traditional college-age students and NCLEX-RN® results (Giddens & Gloeckner, 2005, p.87; Leppa, 1997). No significant correlation to age or gender was found in this study (Giddens & Gloeckner, 2005).

Students with higher GPAs were more likely to pass the NCLEX-RN®, a measure considered consistent with competent critical thinking ability in nursing students (Giddens & Gloeckner, 2005). In contrast, a study by Stewart and Dempsey (2005) concluded using the CCTDI, that the only correlation between critical thinking and GPA for baccalaureate nursing students was their ability to perform inferential reasoning.

Two studies were conducted comparing critical thinking in new graduate nurses to more experienced nurses from different preparation levels using the Performance Based Development System Assessment (PBDS), a competency-based assessment tool that can be used to assess the critical thinking ability and interpersonal skills of nurses in clinical practice (Fero, Witsberger, Wesmiller, Zullo, & Hoffman, 2008). In both studies, findings concluded that there was no significant difference in critical thinking skills dependent upon preparation level (Del Bueno, 2005; Fero, Witsberger, Wesmiller, Zullo & Hoffman, 2008). An additional study concluded that students with a bachelor's degree preparation scored higher on the CCTST and the CCTDI (Shin, Jung, Shin, & Kim, 2006).

Nursing students have diverse demographic variables, yet there was no current and compelling evidence in the literature that critical thinking ability had a relationship with age, gender or educational preparation. There may be some evidence to consider a correlation with GPA.

Academic progression. As nursing students make academic progress it is reasonable to expect that development of their critical thinking will progress as well. Yet there is little evidence in the literature that suggests that student nurses gain critical thinking skills over the course of their education (Adams, 1999; Giddens & Gloeckner, 2005; Maynard, 1996; Stewart & Dempsey, 2005). It is important to note that this evidence is dated and may not be reflective of

current practice. There was a lack of current research in the literature regarding academic progression.

A longitudinal study of baccalaureate nursing students was conducted to determine if their critical thinking ability improved over the course of their education and after their entry into professional practice. Findings revealed that critical thinking did not improve over the course of nursing education and improvement in critical thinking was realized only after students entered professional practice and progressed along the scale of novice to expert (Maynard, 1996).

A study of baccalaureate nursing students was conducted to examine the impact that critical thinking ability had on NCLEX-RN® results and to determine if critical thinking improved over the course of their education process. Critical thinking was measured using the CCTST and the CCTDI at the beginning and again at the end of their program of study. Findings showed that students who scored high on the critical thinking inventories were more likely to pass the NCLEX-RN®, however, critical thinking ability did not increase over the course of their program of study (Giddens & Gloeckner, 2005).

Critical thinking dispositions were studied in terms of NCLEX-RN® success as students progressed from their sophomore to senior years of education. The CCTDI was administered to students both at their entry and their exit from the program producing a paired comparison. There was no increase in overall scores for the CCTDI as students progressed through the program and no significant relationship was realized between critical disposition scores and NCLEX-RN® success (Stewart & Dempsey, 2005).

Finally, an integrative review of twenty studies from 1977-1995 of critical thinking in nursing students was completed. A specific assumption of the review was that for nursing students', critical thinking skills were developed through the process of formal education. There

was no evidence in the literature to support this assumption. The literature yields little evidence that nursing students develop their critical thinking ability as they progress academically, yet these skills are necessary for entry level competence in professional practice (Adams, 1999).

Entry level professional practice. As student nurses graduate and enter professional practice they are expected to think critically making clinical judgments to solve patient problems. The literature reported that critical thinking in nurses develops over time with experience in practice. The literature also reported that newly graduated nurses entered practice with the aptitude to develop critical thinking (Fero, Witsberger, Wesmiller, Zullo & Hoffman, 2008; Kaddoura, 2013; Kantar & Alexander, 2012; Maynard, 1996; Wangsteen, Johansson, Bjorkstrom & Nordstrom, 2010). This suggests that student nurses can develop critical thinking skills during nursing education if they are in a learning environment that supports this growth.

As previously discussed, Maynard (1996) found that critical thinking ability does not significantly develop during nursing education. In this study, there was evidence that over time, experience in professional practice did have an impact on the development of critical thinking skills for nurses in practice. A study conducted to measure critical thinking skills of nurses using the Performance Based Development System Assessment (PBDS) further supports this finding. It indicated that nurses with more than ten years of experience were better prepared to think critically and solve practice problems than newly graduated nurses (Fero, Witsberger, Wesmiller, Zullo & Hoffman, 2008).

While critical thinking skills in new graduate nurses are not well developed, the literature suggested that they possess the ability to develop them. A study of new graduate nurses in practice using the CCTDI concluded that participants possessed the dispositions or qualities necessary for critical thinking and organizing complex thoughts. They also possessed a level of

inquisitiveness that may be foundational to further development of critical thinking (Wangsteen, Johansson, Bjorkstrom, & Nordstrom, 2010). In another study, the perceptions of preceptors of new graduate nurses from three nursing programs were studied. Using data collected from interviews and Lasater's Clinical Judgment Rubric, findings support that the new graduates were weak in all aspects of critical thinking. Another important finding of this study was that in comparison to a traditional curriculum using primarily lectures, graduates of a more active, process-based curriculum using case studies, discussions, and simulations scored higher in their ability to interpret and respond to patient problems in practice (Kantar & Alexander, 2012). This finding suggests that educators can facilitate development of critical thinking within a curriculum that supports active learning strategies.

As this opens the door for educators to facilitate critical thinking in nursing students, it is important to understand how students perceive critical thinking in relationship to their practice (Kaddoura, 2013). Rather than measuring critical thinking, Kaddoura (2013), studied the perceptions of new graduate nurses with regard to critical thinking. In this study, graduates made connections between critical thinking and problem solving (Kaddoura, 2013).

In summary, there is little evidence that demographic variables or academic progression have influenced the development of critical thinking in nursing education. Studies of nurses entering professional practice, however, have determined that there is an aptitude for critical thinking that may be developed within nursing curriculums. These studies make a case for the need to reform nursing curriculums to facilitate the development of critical thinking in nursing students. It also suggests that this is plausible.

Barriers to Critical Thinking Development

Considering the theoretical frameworks that support this study, critical thinking development occurs best in a learner-centered environment where adults actively engage in learning while simultaneously developing metacognitive skills. This aligns with the previously discussed principles of andragogy and the meaningful learning theory. Teaching methods have an impact on critical thinking. Yet the practice of educators continues to be a barrier in the development of critical thinking (Adams, 1999; Ironside, 2004; Riddell, 2007; Shell, 2001; Walsh & Seldomridge, 2006; Zygmont & Schaefer, 2006). One of the reasons given by educators is student resistance to active learning. This is concerning for educators who rely on student evaluations for promotions and tenure (Shell, 2001; Walsh & Seldomridge, 2006). A lack of time, class size, inexperience in teaching active learning strategies were also reasons cited by educators in the literature (Ironside, 2004; Shell, 2001; Walsh & Seldomridge, 2006; Zygmont & Schaefer, 2006). Most concerning to educators is the need to cover content, believing that this ensures program success and NCLEX-RN® pass rates. As the body of knowledge grows in nursing however, the task of content coverage is becoming difficult to manage. Active learning strategies that foster metacognitive development take more time than lecturing. Experts contend that educators fear that they do not have enough time (Forbes & Hickey, 2009; Ironside, 2004; Riddell, 2007; Shell, 2001; Walsh & Seldomridge, 2006; Zygmont & Schaefer, 2006). Teaching strategies that develop critical thinking in students are needed to address these barriers so that educators can teach students how to think as a priority.

Active learning strategies that are often used in concept-based curriculums may support this development. A qualitative study was conducted with 36 nurse educators from diverse nursing programs. As nurse educators began to experiment with more learner centered and

conceptual teaching strategies, they found that they were teaching students to think rather than just teaching them content (Ironside, 2004).

It is not easy to define or measure critical thinking. Despite a call for curriculum reform that facilitates the development of critical thinking in nursing education, little has changed. Academic variables and academic progression have had little influence. There is evidence that nursing students have aptitude for critical thinking development, but barriers exist. Maynard (1996), suggested the educators consider the development of critical thinking both as an outcome and a process.

Conceptual learning may serve to influence the process of critical thinking in nursing education. The relationship between conceptual learning, critical thinking and outcomes measurement can be seen as a fluid process in figure 4. Research questions for this study asked if conceptual learning influences critical thinking for pre-licensure nursing students. If conceptual learning influences critical thinking, it may be measured in student learning outcomes. Measurement of critical thinking in student learning outcomes can serve to either validate the influence of conceptual learning as a method to facilitate critical thinking development or implement a process of curricular revision until critical thinking is realized. In nursing education, the process of conceptual learning can be revised, and critical thinking can be measured in an ongoing process working toward the goal of thinking like a nurse.

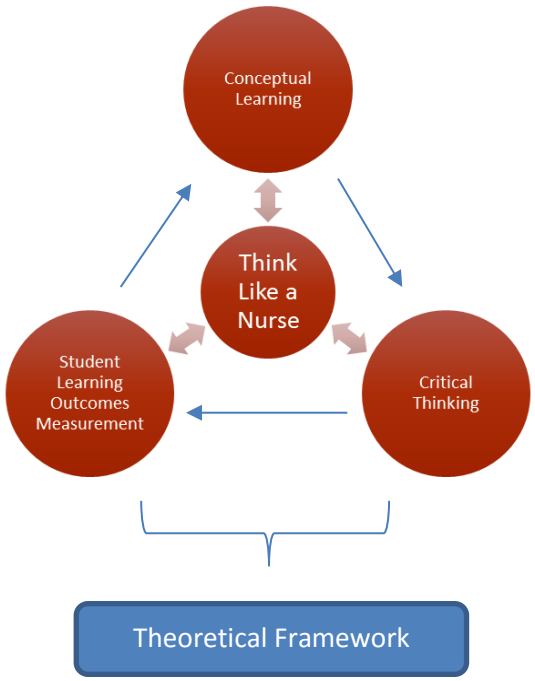

Figure 4. A Conceptual Model of the Literature Review. This model represents how the concepts of this study, supported with a sound theoretical framework, are an ongoing process that results in a nursing student's ability to think like a nurse.

Concept-based Curriculum Outcomes Measurement

Equally as important as exploring the concepts of conceptual learning and critical thinking are the measurement of student learning outcomes in nursing education. In nursing curriculums, student learning outcomes measure entry level competence for graduate nurses entering practice. There was limited evidence of research in the literature regarding the influence of conceptual learning on critical thinking. Meaningful learning strategies can be used to enhance the development of critical thinking and critical thinking can be measured in student learning outcomes.

Outcomes of Conceptual Learning in Related Disciplines

There was evidence in the literature to support the use of conceptual learning to influence critical thinking in non-nursing disciplines. Effects of conceptual learning for both children and

adults has been documented with an emphasis in the disciplines of math and science (Aikenhead, 2004; Geelan, Mahaffy, & Mukherjee, 2014; Hoggan, 2014; Kazemi, 2001). Responding to a directive to move from computational to conceptual learning in elementary mathematics from the National Council of Teachers of Mathematics (NCTM), in 2001, a study was conducted to describe the social outcomes in a classroom environment where conceptual understandings were taught (Kazemi, 2001). Findings supported the notion that solving mathematical problems requires an understanding of relationships between strategies. When argued in collaboration, student consensus was reached, and individual accountability was established. Findings also concluded that errors in computation gave way to opportunities to re-think and explore new alternative strategies. These findings support knowledge construction in the principles of andragogy (1980; 1984) and the meaningful learning theory (1968; 2000). They also support the need to correct misconceptions, aligning closely with the processes required for critical thinking in problem solving for nurses.

Recognizing that when adults have profound experiences that affect how they think in strategy and problem solving, a study was conducted in 2014 that studied breast cancer survivors and their personal growth (Hoggan, 2014). Findings concluded that the use of conceptual metaphors led survivors to develop a deeper understanding of their experiences, enabling them to manage difficult situations and imagine new possibilities for overcoming challenges. This process of transformative thinking is a skill that can be utilized in the process of knowledge transfer in clinical problem solving for nurses.

A study was conducted in 2004, to explore if aptitude in high school science was predictive of success in science-based occupations such as nursing. Findings supported the use of concept-based curriculums in high school as a means of metacognition in preparation for

science-based occupations (Aikenhead, 2004). Computer-based simulations designed to promote conceptual learning for high school science students was also studied in 2014. No significant academic gains were realized; however, the use of this active learning strategy was effective in engaging students (Geelan, Mahaffy, & Mukherjee, 2014). Both studies are evidence of conceptual learning strategies that had an influence on critical thinking for students.

These studies conducted in non-nursing disciplines are important to consider as their benefits may be transferable to nursing education in terms of the influence of conceptual learning on critical thinking in nursing. The following section illustrates evidence from the literature of outcomes measurement in concept-based curriculums.

Outcomes of Conceptual Learning in Nursing Curriculums

A review of the literature produced a limited number of studies that have been conducted to measure the influence that conceptual learning has on critical thinking in nursing education.

While there is no formal evidence of a research study, Giddens and Morton (2010) described their program evaluation process after implementing a concept-based curriculum at the University of New Mexico. Formative measures included course assessments and student surveys each semester. Summative measures include NCLEX-RN® pass rates, graduation rates and student, employer and alumni surveys. The most significant data reported is that two years after implementation, their NCLEX-RN® pass rates fell from 90% to 83%, below the national mean of 85%. It is important to note that there were other factors to consider, such as an increase in the NCLEX-RN difficulty and program changes that both occurred simultaneously. This report is dated and a study that is reflective of current findings should be considered.

In 2014, outcomes of a concept-based curriculum in a small diploma nursing program were studied (Lewis, 2014). Three cohorts before the implementation of the new curriculum

were compared with three cohorts after implementation. Findings revealed that the retention rate increased but there were no significant increases in NCLEX-RN® pass rates or student, alumni or employer survey results. The study was small (n=240), and results were not generalizable (Lewis, 2014).

A comparative study to determine the impact of a transition from a traditional curriculum to a concept-based curriculum was conducted by Duncan and Shultz in 2015. Five cohorts of graduating classes from both curriculums were studied throughout the transition. Demographic variables, NCLEX-RN® results, standardized critical thinking exam scores, and student satisfaction were studied. While there was no evidence that the transition to a concept-based curriculum had a negative impact on program outcomes, there were no significant differences reported. Student satisfaction for the traditional curriculum was higher and the first concept-based curriculum cohort scored the lowest in satisfaction. This may be typical of introducing change. NCLEX-RN® pass rates declined slightly (4%) in the first cohort (Duncan & Shultz, 2015). As previously noted, these findings coincided with an increase in NCLEX-RN® difficulty in 2013 that resulted in a 10% decline in national pass rates (Giddens & Morton 2010).

Student learning outcomes were studied in a nursing program after the implementation of a concept-based curriculum in the Southeast (Murray, Laurent & Gontarz, 2015). Student, employer and alumni surveys as well as NCLEX-RN® pass rates were studied and a neutral to positive effect was noted. Retention rates showed no significant improvements (Murray, Laurent & Gontarz, 2015).

In 2015, a study was conducted to gain a better understanding of the underpinnings for meaningful learning. This study's aim was to explore critical thinking development of students taught in a concept-based curriculum with those of students taught in a traditional curriculum

measured by ATI assessments (Getha-Eby, Beery, O'Brien, & Xu, 2015). There were no significant differences between the groups. An important finding, however, was that students in the concept-based curriculum, verbalized more knowledgeable connections in theory when interviewed and were found to have higher critical thinking scores (Getha-Eby, Beery, O'Brien, and Xu, 2015). This illustrates a positive impact of conceptual learning on higher-order thinking.

Summary

Evidence from the literature has been explored and presented as it relates to conceptual learning, critical thinking, and measuring concept-based curriculum outcomes for pre-licensure nursing students. There is a wide base of theoretical support in the literature for conceptual learning and its influence on critical thinking for nurses. A blend of Malcolm Knowles' principles of andragogy (1980; 1984) and David Ausubel's meaningful learning theory (1968) provide foundation for active and meaningful learning in adults. Bloom's taxonomy (2001) and Tanner's clinical judgment model (2006) offer support when measuring student learning outcomes.

There is little evidence in the literature to support the development of critical thinking in nursing education. However, the literature does suggest that students have the aptitude to develop critical thinking and supports the use of active learning strategies in the development of critical thinking both in nursing and non-nursing disciplines. Although conceptual learning has been used effectively in non-nursing disciplines, a current review of the literature provides limited evidence that it answers the call to develop critical thinking in nursing education.

Initial evidence in the literature measuring the outcomes of concept-based curriculums are limited and dated. Predominantly, studies were conducted early in their implementation phase. It is plausible that as these curriculums have matured, there have been opportunities to

revise and fine tune them realizing more accurately reflected outcomes. This makes a logical case to further study how conceptual learning can have a positive influence on the development of critical thinking in nursing.

The NCLEX-RN® serves as a measure of entry level competence for nursing practice. If critical thinking is a component of the NCLEX-RN®, then it is logical to consider it as a measure. There are a variety of standardized tests presented in the literature and reports of their efficacy in terms of measuring critical thinking are varied. The ATI Comprehensive Predictor® may be used as a supportive measure to the NCLEX-RN® in terms of student learning outcomes measurement. In the simulation laboratory, the LCJR can be used to measure evidence of critical thinking based on clinical judgment. Demographic and academic variables are not well reported in the literature in terms of measurement. It would be prudent to further explore and consider the inclusion of these variables as well to support the measurement of outcomes.

An overwhelming gap in the literature supports further study to explore if conceptual learning can influence critical thinking for pre-licensure nursing students. The NCLEX-RN®, the ATI Comprehensive Predictor® and the LCJR guided the measurement of critical thinking for this study. The methods used to conduct this study will be further discussed in chapter three.

Chapter III: Methods and Procedures

The intent of this quantitative, ex post facto research study was to explore the influence of conceptual learning on critical thinking for pre-licensure associate degree nursing students. This study observed retrospective data from measured outcomes only, there was no manipulation of the independent variable, conceptual learning, and treatments were not administered. Retrospective data was gathered from six distinct cohorts before and after the implementation of a concept-based nursing curriculum.

In this chapter, a discussion of the research design, population and sample, demographics, and the research setting are described. Data gathering tools, the data gathering procedure, and the plan for analysis of the data will be discussed. In addition, methodological limitations and ethical considerations will be considered.

Research Questions

The central research question for this study is; *how is critical thinking for pre-licensure associate degree nursing students influenced after the implementation of a concept-based curriculum, at a small private college in the Northeast?* Subsidiary questions are as follows:

1. How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by first time NCLEX-RN® pass rates, before and after implementation of a concept-based curriculum?
2. How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by the Assessment Technologies Institute (ATI) Comprehensive Predictor®, before and after implementation of a concept-based curriculum?
3. How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by student performance rating scores using the Lasater Clinical Judgment

Rubric (LCJR) in a simulation lab, before and after implementation of a concept-based curriculum?

Background

A small, private college of nursing in the northeast implemented a concept-based curriculum to increase their student's ability to apply knowledge and think critically in the clinical practice setting. Faculty at the research setting were concerned when they noticed a decline in NCLEX-RN® first-time pass rates combined with little evidence of improved critical thinking scores on the ATI Comprehensive Predictor®. In addition, stakeholders reported that graduates of their nursing program were having difficulty applying theory to practice in the clinical setting.

Faculty researched an alternative to their traditional curriculum, consulting with experts from schools that had implemented alternative curriculums. After much consultation and discussion, they decided that a concept-based curriculum would be the best curriculum to address their concerns. Moving forward faculty from the research setting worked in consultation with faculty who implemented a state-wide community college concept-based curriculum in North Carolina. The research setting created an academic coordinator position to lead the effort of implementation as chair of the curriculum committee. As a committee they identified a list of concepts and exemplars that became the framework for their curriculum.

Faculty also chose to deliver the curriculum using active learning strategies in the classroom and increased opportunities in the simulation lab. Faculty were involved from the beginning and participated in educational opportunities. The research setting reported that all faculty members were accepting of the new curriculum and the active learning strategies used to deliver it. Older faculty had more difficulty, particularly with technology in the classroom.

Despite this, they did report that all faculty members were on board. The research setting did not experience any turnover of faculty during this time.

The process of curriculum development took two years before it was implemented for the class of 2015. Since its inception, the college has graduated three cohorts of nursing students, 2015, 2016 and 2017. At the same time that the curriculum was changing, admission criteria was changing as students were being admitted into the dual degree program offered at the research setting. The Scholastic Assessment Test (SAT) admission criteria was increased and faculty at the research setting believed that this resulted in a better pool of candidates. Students in the dual degree program take classes at a four-year college in addition to completing the two-year associate degree program at the research setting. Dual degree students were members of the day cohorts used in this study, although membership was not exclusive to dual degree students. With regard to student satisfaction, the research setting reported that students in the concept-based curriculum were unaware of its differences from the traditional curriculum and therefore student satisfaction was not adversely affected.

After implementation of the new curriculum, the college continued to use the same methods to measure critical thinking for students. These methods included first-time NCLEX-RN® pass rates, Assessment Technologies Institute (ATI) Comprehensive Predictor® scores, and student performance rating scores using the Lasater Clinical Judgment Rubric (LCJR) in the simulation lab. This resulted in comparative data for cohorts before and after implementation of the concept-based curriculum. Retrospective data was collected from these measurement tools and analyzed for this study.

The independent variable for this study, conceptual learning, was not manipulated because the curriculum had already been implemented. The data collected was retrospective as it

is evidence of previously administered assessments. What follows is a brief description of how these assessments were administered. A more detailed description of each assessment will be discussed later in the chapter.

NCLEX-RN®

Nursing students sat for the NCLEX-RN® at the completion of their pre-licensure educational preparation. Passing the NCLEX-RN® is the minimum requirement for practice as a registered nurse (Giddens & Gloeckner, 2005). Students who were members of the cohorts in this study completed their program of study and were certified by the college as eligible to sit for the exam. The NCLEX-RN® was administered and proctored by Pearson VUE at secure testing centers. Students registered online, payed a fee, and chose an individual test date and time available at a testing center of their choice (NCSBN, n.d.).

When students arrived at the test center on the day of the exam they were required to present identification and provide biometrics including their signature, photograph and palm vein scan (NCSBN, n.d.). The format of the exam was computerized adaptive testing (CAT), a process that individualizes test items to each candidate's ability. This means that as the candidate answered each item, the computer software selected the next item based on their ability, ensuring that they had a 50-50% chance of answering the new item correctly or incorrectly. For each candidate, the examination ended when a minimum number of questions had been administered to make the determination with 95% confidence that the candidate scored above or below the passing standard. Students had a total of six hours to complete the exam (NCSBN, n.d.; NCSBN, 2016a).

The National Council for State Boards of Nursing (NCSBN) publically reports national NCLEX-RN® pass rates (NCSBN, 2016b). First-time pass rates were reported to the college by

the New York State Board of Nursing. Results by individual academic institution, state and national levels are reported to academic institutions in New York State on a quarterly basis. For students who are not successful, additional attempts are not included in this report (NYSED.gov). On an annual basis, the college receives individual student exam results (NYSED.gov).

The ATI Comprehensive Predictor®

Each cohort was administered the ATI Comprehensive Predictor® at the completion of their academic program. The Comprehensive Predictor® is a 180-item commercial, standardized assessment. This assessment is designed to assess student mastery of basic principles from their academic program including fundamentals, pharmacology, adult medical-surgical nursing, maternal-newborn care, mental health nursing, nursing care of children, nutrition, leadership, and community health nursing. The blue print for this exam aligns with the NCLEX-RN® blueprint in both content topic categories for items and percentages of items within each category (ATI Nursing Education, 2016a).

The Comprehensive Predictor® was administered in a computer lab on campus. When students entered the computer lab they were required to present their college identification to the proctor. Students accessed their individual accounts and signed an attestation required by ATI for test security. The proctor then signed in, also signed an attestation, and released the assessment to the students. Students had three hours to complete the assessment (ATI Nursing Education, 2016a; 2016b).

Upon completion of the assessment, students were able to sign into their ATI accounts and receive their individual scores and a list of topics to review based on their individual performance. Students were able to use this list as a foundation for creating a study plan for the

NCLEX-RN®. Faculty was able to view group or cohort scores for the Comprehensive Predictor® (ATI Comprehensive Predictor® Exam Results, 2016).

The Lasater Clinical Judgment Rubric (LCJR) in the Simulation Lab

Over the course of their final two semesters, students in each cohort participated in high fidelity simulation scenarios in the laboratory. Students were posed with a patient situation that simulated an actual clinical experience. Each experience posed a patient problem that aligned with classroom instruction. The students had to work together to resolve the patient problem under the leadership of the student performing in the main role. High fidelity simulation is used in nursing education to practice clinical judgments in a setting that closely represents clinical practice. In the lab, students safely learn from misconceptions and mistakes without causing patients actual harm, enhancing the development of critical thinking (Lasater, 2007). Each member of the cohort had an opportunity to perform in the main role of the nurse at least once during these two semesters.

Each simulation was facilitated by a faculty member who rated the performance of the student nurse in the main role using the LCJR. The LCJR is an evidence-based scale developed from Tanner's conceptual model to rate the efficacy of metacognition in clinical decision making (Lasater, Johnson, Ravert, & Rink, 2014). Tanner's model incorporates the tenants of noticing, interpreting, responding, and reflecting that assist the learner to use critical thinking to make clinical judgments in practice (Lasater & Nielson, 2009; Tanner, 2006). Students performing in the main role were rated by the facilitator using the LCJR on four levels from beginning to exemplary (Lasater, 2007). When new faculty functioned in the role of a facilitator, they were paired with an experienced faculty member for rating. Data from the LCJR ratings were

compiled by the manager of the clinical learning laboratory and presented to faculty for analysis of critical thinking ability for students in each cohort.

Research Design

A quantitative, ex post facto research design was used to measure the influence of the independent variable (conceptual learning) on the dependent variable (critical thinking) (Creswell, 2014; Leedy & Ormrod, 2016). Quantitative research is objective and measurable, studying cause and effect, using numbers and statistics. “The term ex post facto literally means, after the fact” (Leedy & Ormrod, 2016, p.194). In this case, a concept-based curriculum had already been implemented and measurement data already existed. Therefore, it was not possible to manipulate the independent variable or administer treatments (Leedy & Ormrod, 2016; Patten, 2014). Although a non-experimental research design was conducted, it was close in rigor to an experimental design studying cause and effect (Leedy & Ormrod, 2016).

Measurement data from precise and valid data collection instruments inclusive of the NCLEX-RN®, the ATI Comprehensive Predictor® and the LCJR was analyzed (Creswell, 2014; Leedy & Ormrod, 2016). A cross sectional design was indicated as measurement data was collected from all six cohorts at one point in time (Creswell, 2014). Quantitative data served to appropriately answer the research questions. The Statistical Package for Social Scientists (SPSS) was used to analyze the data before and after implementation of the concept-based curriculum comparatively using an independent-samples *t*-test to determine if conceptual learning had a statistically significant influence on critical thinking (Patten, 2014; Urdan, 2010).

Measurement data available for 431 students from six cohorts was analyzed for this study. When large numbers of participants are used, results can be generalized to populations (Creswell, 2014; Leedy & Ormrod, 2016; Patten, 2014). This provided a large number of

participants in terms of generalizability. Using the results of a quantitative study, a researcher can either validate or make a case to revise a standard of practice (Leedy & Ormrod, 2016). The results of this study may have the potential to validate conceptual learning in nursing education and may be used as evidence to revise nursing curriculums.

Identification of Population

There are three types of pre-licensure preparation in nursing education, a diploma, an associate degree, or a bachelor's degree. The population for this study was pre-licensure associate degree students at a college of nursing that implemented a concept-based curriculum. Pre-licensure implies that students have not yet met the minimum requirements for practice as a registered nurse. The minimum requirement for practice is successfully passing the NCLEX-RN®, as a result, pre-licensure nursing education is strongly focused on preparing students for the NCLEX-RN® (Giddens & Gloeckner, 2005). In order to capture evidence of metacognitive skills such as critical thinking, the NCLEX-RN® tests students at a minimum level of application according to Bloom's taxonomy (NCLEX-RN® Detailed Test Plan-Educator Version, 2016). As a result of the focus on NCLEX-RN® preparation and evidence of its critical thinking component, it was appropriate to study if critical thinking was influenced by a concept-based curriculum in pre-licensure nursing education.

Associate degree nursing programs are typically four semesters, half the length of a bachelor's degree program, yet students from both programs sit for the same licensing exam. As the body of knowledge grows in nursing, it is becoming more difficult to cover all the content in a four-semester program with a traditional curriculum (Giddens & Brady, 2007). A concept-based curriculum may address the problem of traditional content-laden curriculums by facilitating knowledge acquisition through conceptual learning (Giddens, Caputi, & Rodgers,

2015). An influence of conceptual learning on critical thinking may have a greater impact on a shorter associate degree program.

Identification of Sample

Retrospective data was collected from a convenience sample of six cohorts of pre-licensure associate degree nursing students who completed their education program a college with a concept-based curriculum. Samples of convenience are biased and may have an impact on the generalizability of a study, although they are used when the sample is appropriate to the study (Leedy & Ormrod, 2016; Patten, 2014). This sample may not be representative of all pre-licensure associate degree nursing students, yet it is appropriate because this sample of students is representative of a college of nursing with a concept-based curriculum. The following inclusion criteria were considered for members of this sample.

Inclusion Criteria

Students included in this sample were six distinct cohorts of pre-licensure associate degree students from a college of nursing in the northeast that implemented a concept-based curriculum. Membership in each cohort met the following criteria.

1. Completion of the four-semester full-time day program
2. Membership of a graduating cohort between 2012-2017
3. Evidence of sitting for the NCLEX-RN® and the ATI Comprehensive Predictor®
4. Evidence of participation and LCJR rating in the simulation laboratory

There were no exclusion criteria for this study.

Demographics

The research setting, or college of nursing, offers students several program choices. For the purpose of this study data was collected from cohorts only in the fulltime day program. The

fulltime day program is four semesters in length and most closely associated with a typical associate degree program. Other programs at the college include an accelerated evening/week-end option and an advanced placement option for students who are already licensed practical nurses. The college also partners with a four-year college to offer dual degree options. The student population at the college consists primarily of Caucasian females. Table 2 illustrates gender and race demographics reported by the college in 2016.

Table 2

2016 Demographic Data: Gender and Race

Gender	
Female	87%
Male	13%
Race	
White	85%
Black	5%
Asian	5%
Other	5%

Demographics were also reported solely for the students whose data was collected in this study. In the sample for this study 89.3% of students were female and 10.7% were male and is similar to the college-wide results reported in Table 2. In addition to gender, program entry age was collected for students in this study. A mean age of the sample was 22.3 years. A mean end of program grade point average (GPA) was 3.18 out of 4.0.

Description of Setting

The research setting was a small, private college of nursing in the northeast. This faith-based institution has been a college of nursing for more than 100 years. The college is also affiliated with a faith-based healthcare system with an acute care hospital on the same campus. Although most students commute, the college is equipped with a residence hall. Refer to Table 3 for retention, graduation, and job placement rates over a three-year period from 2011-2013.

Table 3

Program Performance Outcomes 2011-2013

Year	Retention Rate	Graduation Rate	Job Placement Rate
2013	90%	82.8%	97%
2012	86%	78%	98%
2011	84%	79%	89%

The data collected for this study had already been measured. The NCLEX-RN® was administered to students in each cohort following graduation at Pearson VUE test centers that were chosen by the individual candidates. The ATI Comprehensive Predictor® had been previously administered to each cohort at the end of their two-year program in a computer lab on campus. Student performance had been rated during the last two semesters for each cohort using the LCJR in the simulation lab at the college. All data was collected directly from the college.

Data Gathering Tools

Retrospective data was collected from the administration of three tools; the NCLEX-RN®, the ATI Comprehensive Predictor®, and the LCJR to answer the research questions for

this study. Each tool will be described in detail including format and measurement, with attention to validity and reliability.

NCLEX-RN®

The NCLEX-RN® is the national licensing exam required for licensure and ultimately practice as a registered nurse. The exam measures the minimum knowledge, skills and abilities required to deliver safe, effective nursing care for entry-level nurses. The National Council for State Boards of Nursing (NCSBN) conducts a job analysis of nurses currently in practice every three years to determine the relevance and accuracy of the minimum knowledge level. This information is used to revise the exam every three years (NCLEX FAQs, 2017).

The format of the exam is computerized adaptive testing (CAT). The NCLEX-RN® uses the Rasch measurement theory to create an examination scale that is operationalized by CAT and is measured in logits (NCSBN, 2016a). The Rasch measurement theory proposes that test items are individualized to each candidate's ability. As the candidate answers each item, the computer software selects the next item based on their ability, ensuring that they have a 50-50% chance of answering the new item correctly or incorrectly. The examination ends when a minimum number of questions is administered to make the determination with 95% confidence that the candidate scored above or below the passing standard of 0.00 logits. In 2013, the NCSBN raised this passing standard from -0.16 to 0.00 logits (NCSBN, 2016a). The impact of this increase in difficulty was a 10% decline in pass rates nationwide (NCSBN, 2016a).

NCLEX-RN® pass rates are posted by school, educational preparation level and state for public viewing on the NCSBN and individual state boards of nursing web sites. Individual candidate results are not posted on public sites, they are sent directly to colleges of nursing. For this reason, results for participants of the college of nursing being used in this study has been

requested and approved. The college supplied the results to the researcher with candidate anonymity upon receipt of IRB approval.

Validity. Evidence in the literature supported the validity of the NCLEX-RN®. Content validity considers the degree that the NCLEX-RN® measures nursing knowledge (Leedy & Ormrod, 2016). To be inclusive of all nursing content, a plethora of examination items exist written by a panel of diverse volunteer item writers from across the country. This is done to ensure coverage of the entire domain of entry-level nursing knowledge (NCSBN, 2016a). The process of making revisions based on the job analysis also speaks to content validity. (NCSBN, 2016a).

Construct validity considers the degree to which the NCLEX-RN® measures the construct, critical thinking (Leedy & Ormrod, 2016). Constructs such as critical thinking are often difficult to measure. The NCSBN asserts that critical thinking is a component of this exam, testing students at a minimum level of application according to Bloom's taxonomy to capture evidence of metacognitive skills (Giddens & Gloeckner, 2005; NCLEX-RN Detailed Test Plan-Educator Version, 2016). Critical thinking is required to answer questions at this level of cognition. If successfully passing the NCLEX-RN® is dependent on critical thinking ability than the assumption can be made that the inverse is also true, and the NCLEX-RN® tests critical thinking (Wendt & Brown, 2000).

Each candidate received 15 piloted or "try-out" items when the NCLEX-RN® was administered. (NCLEX-RN® Detailed Test Plan-Educator Version, 2016; NCSBN, 2016a). These "try out" items provided a determination of item difficulty and when combined with the Rasch measurement theory for scoring, an accurate measure of each candidate's ability was calculated supporting scoring validity (NCSBN, 2016a).

Reliability. Reliability of the NCLEX-RN® cannot be measured by traditional reliability statistics such as Cronbach's alpha because the examination scale does not utilize pass/fail decisions, it uses ability estimates. Instead of Cronbach's alpha, *the decision consistency statistic* is used. It combines a test candidate's estimate ability and standard error to produce two probabilities:

- The candidate's true ability is above passing
- The candidate's true ability is below passing

The average of this probability for all candidates is the estimated decision consistency. The decision consistency of the NCLEX-RN® is sound at .87-.92 (NCSBN, 2016a).

The ATI Comprehensive Predictor®

The Comprehensive Predictor® is a nationally normed assessment that measures student mastery of entry-level nursing knowledge and it is administered at the completion of a pre-licensure nursing program (ATI Nursing Education, 2016a). The purpose of the assessment is to provide formative data regarding mastery of content thereby preparing them for NCLEX-RN® success. The assessment predicts a student's ability to pass the NCLEX-RN® and to provide them with a study plan to improve their chance for success. The blue print for this exam aligns with the NCLEX-RN® blueprint in both content topic categories for items and percentages of items within each category. This tool produced the following data:

- Individual student scores (percentage of correctly answered items) within all of the content topic categories for the assessment
- A list of content topics for students to review based on individual performance as they prepare for the NCLEX-RN®

- Group or cohort scores of the percentage of items answered correctly for the total assessment and for specific outcomes. The outcomes are as follows, thinking skills (including critical thinking and clinical judgment), nursing process, priority setting, client need categories, QSEN and NLN competencies and BSN essentials (ATI Nursing Education, 2016a).

Critical thinking ability on the Comprehensive Predictor® is reported in the thinking skills outcomes category of clinical judgment/critical thinking. The criteria for this category are described as the ability to use critical thinking skills (interpretation, analysis, evaluation, inference, and explanation) to make a clinical judgment regarding a posed clinical problem. Seventy-five percent of the items on the ATI Comprehensive Predictor® are classified as critical thinking items. Critical thinking outcomes are reported as a group score for each exam. The research setting uses this score to evaluate critical thinking skills for their students.

The test items are leveled at application and analysis on Bloom's taxonomy (ATI Comprehensive Predictor® Exam Results, 2016). Similar to the NCLEX-RN®, the ATI Comprehensive Predictor® also pilots test items. ATI data can be requested directly from ATI with IRB approval. However, to maintain the inclusion criteria for this study, results for cohorts that adhere to these criteria was requested directly from the college. The college supplied the results to the researcher by once IRB approval was secured.

Validity. Content and Construct validity can be aligned with validity of the NCLEX-RN®. Table 4 illustrates how this examination aligns with the NCLEX-RN® blueprint in terms of category, number, and percentage of items. In addition, each item is aligned with the cognitive levels from Bloom's taxonomy (Ascend Learning, 2017). Cognitive items on the exam are from two categories:

- Foundational thinking from the remembering and understanding cognitive level of Bloom's taxonomy (Ascend Learning, 2017).
- Critical thinking from the application, analysis, evaluation or create levels from Bloom's taxonomy (Ascend Learning, 2017).

Table 4

Categories of ATI Comprehensive Predictor® and NCLEX-RN® Test Items

Client Need Categories	# of ATI Comprehensive Predictor® Items	% of NCLEX-RN® Items
Safe and Effective Care Environment-Management of Care	30	17-23%
Safe and Effective Care Environment-Safety & Infection Control	18	9-15%
Health Promotion & Maintenance	14	6-12%
Psychosocial Integrity	13	6-12%
Physiologic Integrity-Basic Care & Comfort	13	6-12%
Physiologic Integrity-Pharmacological & Parenteral Therapies	23	12-18%
Physiologic Integrity-Reduction of Risk Potential	18	9-15%
Physiologic Integrity-Physiological Adaptation	21	11-17%

Note: Adapted from Ascend Learning (2017). Technical Manual for the RN Comprehensive Predictor 2016. Leawood, Kansas: Ascend Learning and The NCLEX-RN® Detailed Test Plan-Educator Version (2016). Retrieved from https://www.ncsbn.org/2016_RN_DetTestPlan_Educator.pdf

Reliability. Unlike the NCLEX-RN®, the ATI Comprehensive Predictor® does not use CAT and therefore reliability is determined using Cronbach's alpha. Cronbach's alpha is the most common measure of reliability, it uses a set of items to determine consistency or reliability in responses to that item. A reliable value is close to 1.0 (Urdan, 2010). The total reliability index for the Comprehensive Predictor® is at 0.96 and this concludes that it is a reliable tool to measure critical thinking across cohorts (Ascend Learning, 2017).

The critical thinking outcome scores for this exam can also be reported by cohort and as previously mentioned the research setting uses them as an outcomes measurement. There is no evidence of reliability for the critical thinking outcome scores to stand alone in comparison across cohorts. Considering that the total score for the ATI Comprehensive Predictor® has been proven reliable and 75% of the items on the assessment are in the critical thinking category, the researcher made the decision to use the total assessment score to measure critical thinking across cohorts for this study (Ascend Learning, 2017).

Lasater Clinical Judgment Rubric (LCJR)

The Lasater Clinical Judgment Rubric (LCJR) is an evidence-based scale developed from Tanner's conceptual model of clinical judgment to rate the efficacy of metacognition in making clinical judgments (Lasater, Johnson, Ravert, & Rink, 2014). The LCJR was developed by Dr. Kathie Lasater, and a simulation facilitator expert as part of a research study for Lasater's dissertation in 2005. The purpose of the study was to develop and pilot a tool to assess clinical judgment in the simulation lab.

Lasater and the facilitator expert first observed students in actual clinical simulations. They initiated the process of developing the LCJR by first writing descriptions of the best and worst student behaviors during simulations. This data led to the development of the rating

dimensions and levels of the LCJR. The process was ongoing with weekly revisions in consultation with rubric development experts. The study concluded that the LCJR informed students of the expectations of clinical judgment in practice, provided them with direct feedback, and accurately assessed their clinical judgment development (Lasater, 2007).

Validity. Lasater (2007) reported validity of the rubric in a mixed methods research study using statistical methods and focus groups. A process of description-observation-revision-review was conducted to ensure that clinical judgment was measured. In addition, Tanner's clinical judgment model (2006) formed the theoretical basis for the rubric by incorporating four steps that assist the learner to use critical thinking to make clinical judgments in practice. (Lasater & Nielson, 2009; Tanner, 2006). The theoretical basis of Tanner's clinical judgment model (2006) combined with Lasater's process of observation in the simulation lab warrants content validity.

The rubric was continuously revised over the course of several weeks to ensure construct validity. The rubric is designed to measure clinical judgment with a non-case specific approach. In this way, the rubric was used repeatedly with different case studies to ensure that it was measuring what was intended, clinical judgment (Adamson, Gubrud, & Sideras, 2012; Lasater, 2007). As outstanding gaps were realized with the rubric, revisions were made to wording, leveling and process. An example is, when measuring assessment; it was found that when students missed an opportunity to reassess there was no measure to capture this. The rubric rating indicated that the student made an assessment but did not capture the need to reassess which is a criterion of clinical judgment. The rubric was revised in be inclusive of a focused assessment for reassessment opportunities (Lasater, 2007).

Reliability. A summary of three additional research studies support reliability of the LCJR using interrater reliability. Each study measured the ability of the rater to accurately use

the rubric considering different aspects (Adamson, Gubrud, & Sideras, 2012). In Adamson's study (2011), reliable evidence that raters could accurately and consistently rate the intended level of performance was realized. The Sideras (2007) study proved that raters could accurately reflect students known levels of ability when using the rubric. And finally, the Gubrud-Howe study (2008) provided reliable evidence of accurate rubric ratings when students were known to have demonstrated a progression of knowledge (Adamson, Gubrud, & Sideras, 2012).

Table 5

Summary of Evidence from Research for Reliability of the LCJR

Study	Variable	Interrater Reliability
Adamson (2011)	Accurate and consistent rating of scenarios	ICC (2,1) = 0.889
Gudrud-Howe (2008)	Accurate rating when students were known to demonstrate a progression of knowledge	Agreement 92-96%
Sideras (2007)	Accurately rated students known level of ability	Agreement 57-100%

Note: Adapted from Adamson, K. A., Gubrud, P., & Sideras, S. (2012). Assessing the reliability, validity, and use of the Lasater clinical judgment rubric: Three approaches. *Journal of Nursing Education, 51*(2), 66-73.

Threats to validity and reliability for the Lasater rubric have been identified in the literature. While the absence of case specificity allows for focus on the construct of clinical judgment, the individual learner's score reflects ability of one specific case at a time. This raises the question of the reliability of evidence due to case variability. In addition, data from observation-based performance poses a threat to interrater reliability (Adamson, Gubrud & Sideras, 2012). Data collection protocol at the research setting addressed interrater reliability.

New raters at the college of nursing in this study were paired with more experienced raters until there was evidence that they used the rubric with accuracy.

Data Gathering Procedure

Data was collected from a small private college in the northeast that implemented a concept-based curriculum. This college was chosen by the researcher because they had data available for six distinct cohorts, three before and three after implementation of the new curriculum. After an initial meeting between the researcher and college administrators the college agreed to provide archival data for this study. Once IRB approval was received the college provided the data to the researcher.

The data was retrospective; it had already been measured for students in each cohort. The researcher had no interaction with participants in this research. Data requested included first-time NCLEX-RN® pass rates, ATI Comprehensive Predictor® scores, and LCJR ratings of student simulation experiences for each cohort. Demographic data regarding the age, gender, and grade point average earned was also requested for students in each cohort.

Once IRB approval was secured, the college provided data to the researcher using the inclusion criteria previously defined. Individual NCLEX-RN® pass rates and demographic data for students in each cohort were anonymously coded by the college registrar. ATI Comprehensive Predictor® scores and LCJR total ratings scores were reported by cohort year. The researcher made an additional request for LCJR ratings scores to be further broken down and reported individually for each of the 11 criteria of the rubric. In the end LCJR ratings scores were reported to the researcher by individual rubric criteria scores and total rubric scores for each cohort. No student names were realized by the researcher for cohort data. Once the data was received, it was stored by the researcher in a password protected laptop.

Data Analysis Plan

Demographic data for individual students in each cohort including age, gender, and grade point average (GPA) were collected. To avoid overwhelming the reader with data, it was important to the researcher that demographic data correlated with evidence in the literature (Lodico, Spaulding & Voegtle, 2010). Demographic variables such as age, gender, and GPA have been reported in the literature with regard to critical thinking for nursing students and were discussed in Chapter II. Demographic data was intended to describe the characteristics of this sample in order to eliminate the potential bias of a convenience sample (Patten, 2014). In addition, demographic data for this sample was intended to describe the likeness or differences of the cohorts before and after the concept-based curriculum was implemented. To accomplish this, demographic data was analyzed with descriptive statistics in the Statistical Package for Social Sciences (SPSS).

Measurement data from NCLEX-RN® pass rates; ATI Comprehensive Predictor® scores and student performance rating scores from the Lasater Clinical Judgment Rubric (LCJR) were collected from three cohorts before and after the implementation of the concept-based curriculum. This measurement data was also entered into SPSS for computation of descriptive statistics. Descriptive statistics described and summarized the data in terms of central tendency, variability and association of variables.

Inferential statistics were then used to determine if there was a significant influence in the measurement of critical thinking in a concept-based curriculum. Inferential statistics can determine if differences are significant and reliable in terms of generalizing results (Creswell, 2014; Leedy & Ormrod, 2016; Patten, 2014). In this way, the central and subsidiary research questions were answered. An independent-samples *t*-test was computed in SPSS to compare the

mean scores of NCLEX-RN® pass rates, ATI Comprehensive Predictor® scores and student performance rating scores from the LCJR across cohorts, before and after implementation of a concept-based curriculum (Leedy & Ormrod, 2016; Patten, 2014).

Methodological Limitations

As previously discussed in this chapter, a convenience sample was used and may limit the generalizability of this study. Participants may not be representative of all pre-licensure nursing students in associate degree nursing programs. Due to the retrospective nature of this study, it was not possible to control for extraneous variables that may have existed or had an influence on the development of critical thinking. However, the following points should be considered.

Characteristics of the Students

The research setting reported that student satisfaction was not adversely affected by the curriculum change. The mean GPA for students was relatively high at 3.18 out of 4.0. As previously discussed the increase in admissions criteria for dual degree students may have lent itself to a higher mean GPA. Students with higher GPAs may be more likely to pass the NCLEX-RN® and therefore have greater potential to think critically as a result (Giddens & Gloeckner, 2005). Chapter IV will report the results of descriptive statistics for students whose data was collected for this study. In this way a likeness or difference in student characteristics will be realized and discussed further.

Faculty and Curriculum Process

The research setting has reported that faculty was involved in the process of curriculum development from the beginning. There was no turnover of faculty and while older faculty was more challenged that newer faculty, they were all on board. This is important because the

attitude and beliefs of the faculty are important to the success of the development and implementation of a new curriculum (Giddens, Caputi & Rodgers, 2015). The process of development, implementation, evaluation, and maintenance may have an influence on critical thinking development in a new curriculum. Equally important is that it is delivered as intended (Giddens, Brady, Brown, Wright, Smith, & Harris, 2008). The research setting reports a well thought out process of development and implementation and an active curriculum committee with faculty membership that supports ongoing evaluation and maintenance.

Ethical Considerations

In compliance with ethical standards, prior to conducting this study of human research, permission was granted from the Internal Review Board (IRB) (Leedy & Ormrod, 2016). An initial meeting was held at the research setting to request approval for data collection. The meeting was attended by the Academic Dean, the Academic Coordinator, and the Manager of the Clinical Learning Laboratory. A verbal agreement was granted pending IRB approval. IRB approval was then requested from both the College of Saint Mary and from the research setting. Data was not collected until permission was granted from both institutions. Approval letters with IRB numbers were issued and both letters are included in the appendices of this study.

Retrospective data collected in this study is the property of the research setting and was collected solely for educational purposes. Permission of the participants was not solicited. There was no benefit to the participants. Participants have the right to privacy; therefore, individual participant performance is confidential and will be held in this regard (Leedy & Ormrod, 2016). Both individual and cohort data was collected; however, individual names are not known to the researcher. Data is stored in a password protected laptop and will be discarded by the researcher after ten years (Creswell, 2014).

Summary

A quantitative, ex post facto research design was conducted to explore if conceptual learning influenced critical thinking for pre-licensure associate degree nursing students. The population, setting, and sampling procedure have been described in this chapter. Data collection instruments have been identified and discussed in terms of validity and reliability. The methodology proposed to answer the central and subsidiary research questions has been presented with regard to data collection and analysis, quality measures, and ethical considerations. Results of the data analysis will be discussed in Chapter IV.

Chapter IV: Results

The purpose of this quantitative, ex post facto research study was to explore if critical thinking for pre-licensure nursing students was influenced by a concept-based curriculum at a small private college in the Northeast. This chapter will report the descriptive statistics of the sample. In addition, results of descriptive and inferential statistical tests calculated from NCLEX-RN® pass rates, ATI Comprehensive Predictor® scores, and the Lasater Clinical Judgment Rubric scores will be presented.

Sample Demographics

The sample consisted of 431 pre-licensure nursing students from six distinct cohorts at a college of nursing. Three student cohorts graduated before the implementation of a concept-based curriculum and three graduated after the implementation. Two hundred and nine students in three graduating cohorts, 2012, 2013, and 2014 completed their education in a traditional curriculum. The remaining three cohorts, consisting of 222 graduates from 2015, 2016, and 2017, completed their education in the newly implemented concept-based curriculum. For statistical analysis, the demographic data of the sample was organized in two groups, a traditional curriculum group and a concept-based curriculum group. Data for 11 students were missing or incomplete and were not included in this data set. Descriptive statistics were analyzed in the Statistical Package for the Social Sciences (SPSS) software inclusive of age, gender, and grade point average (GPA) for both groups in the sample.

Age

Student age was reported as program entry age. The average age for the sample was 22.0 (*SD* = 5.62). The range of age for students in both the traditional and concept-based curriculum groups was the same, 17 to 50 years. As seen in figure 5, the average age was 22.3 (*SD* = 5.56)

for students in the traditional curriculum group and 21.7 (*SD* = 5.68) for students in the concept-based curriculum group.

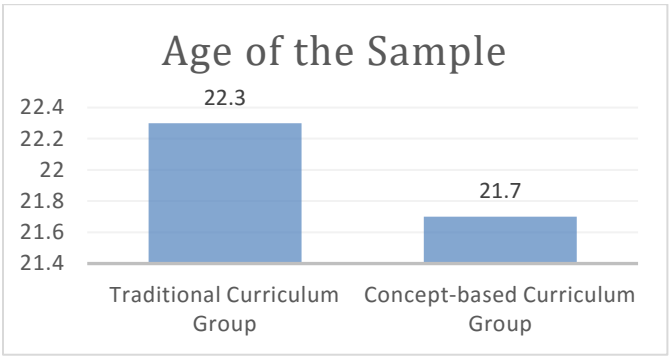

Figure 5. Age of the Sample. This bar graph illustrates the average program entry age for members of each group in the sample.

Gender

The entire sample of students was 89.3% female and 10.7% male. Figure 6 provides a comparison of gender by cohort group. Gender in the traditional curriculum group was 88.3% female and 11.7% male. Gender in the concept-based curriculum group was 90.2% female and 9.8% male.

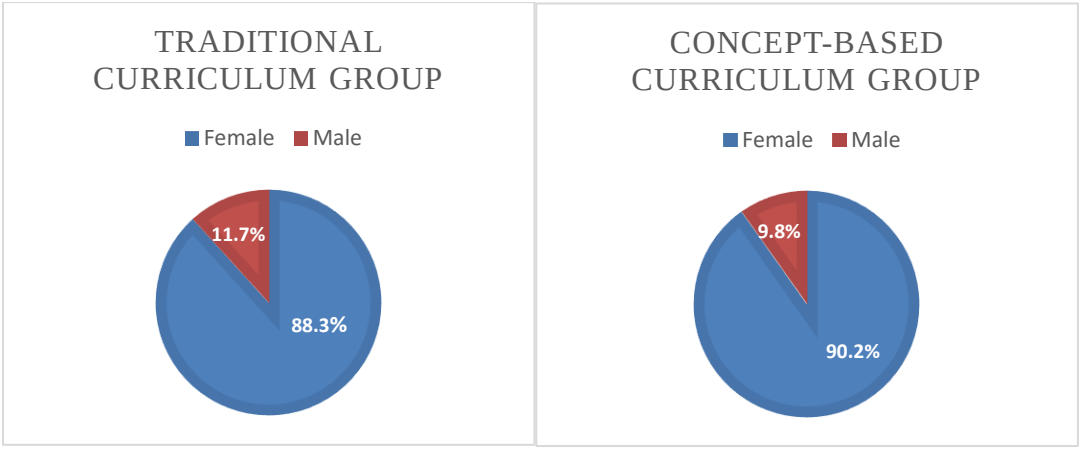

Figure 6. Gender of the Sample. These pie charts depict the average percentage of male and female students in both the traditional and concept-based curriculum groups in the sample.

Grade Point Average (GPA)

The grade point average (GPA) of the entire sample ranged from 2.28 to 4.00 and the average was 3.18 (*SD* .370). In the traditional curriculum group, grade point averages ranged from 2.35 to 4.00 with an average GPA of 3.21 (*SD* .371). In the concept-based curriculum group, grade point averages ranged from 2.28 to 4.00 with an average GPA of 3.15 (*SD* .367). A comparison of the groups can be seen in figure 7.

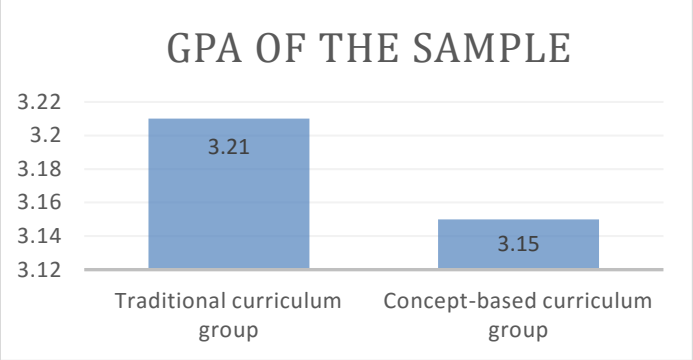

Figure 7. GPA of the Sample. The bar graph is an illustration of the mean grade point average for students in both the traditional and concept-based curriculum groups in the sample.

Data Analysis

Data analysis was conducted to answer the central research question for this study; *how is critical thinking for pre-licensure associate degree nursing students influenced after the implementation of a concept-based curriculum, at a small private college in the Northeast?* Quantitative data was coded for anonymity by the research setting and then shared with the primary researcher. Descriptive and inferential statistics were then analyzed in SPSS. Mean data averages for each subsidiary question were compared using an independent-samples *t*-test. The statistical significance level for this study was set at $p < .05$.

Subsidiary Question #1

How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by first time NCLEX-RN® pass rates before and after implementation of a concept-based curriculum?

First-time NCLEX-RN® pass rates were analyzed to answer this question. Pass rates were reported to the research setting as aggregate data. Table 6 shows how pass rate percentages were calculated for only those students in the day program. The total number of first-time NCLEX-RN® attempts for students at the research setting was divided by the number of first-time pass results for day program students in this study. First time NCLEX-RN® pass rates for each cohort were grouped into a traditional curriculum group consisting of the 2012, 2013, and 2014 cohorts and a concept-based curriculum group, consisting of the 2015, 2016, and 2017 cohorts. Table 7 illustrates the mean averages of pass rates for each curriculum group calculated by an independent-samples *t*-test.

Table 6

NCLEX-RN® First-time Pass Rates by Cohort

Traditional Curriculum Group			
Cohort	Exams Administered	Exams Passed	Pass Rate
2012	68	66	97.05%
2013	70	68	97.14%
2014	71	65	91.54%
Concept-based Curriculum Group			
Cohort	Exams Administered	Exams Passed	Pass Rate
2015	82	75	91.46%
2016	74	68	91.89%
2017	66	62	93.93%

Table 7

NCLEX-RN® first-time Pass Rates by Curriculum Group

Curriculum Group	Pass Rate	Mean (*SD*)
Traditional Curriculum	95.24%	95.24 (3.21)
Concept-based Curriculum	92.42%	92.43 (1.32)

An independent-samples *t*-test indicated that there was no significant difference between NCLEX-RN® pass rates for students in the concept-based curriculum cohorts ($M = 92.43$, $SD = 1.32$), and the traditional curriculum cohorts ($M = 95.24$, $SD = 3.21$), $t(4) = 1.41$, $p = .232$.

Subsidiary Question #2

How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by the Assessment Technologies Institute (ATI) Comprehensive Predictor® score before and after implementation of a concept-based curriculum?

ATI Comprehensive Predictor® scores, reported by cohort, were analyzed to answer this question. Data for the 2012 cohort was not available. Table 8 presents the ATI Comprehensive Predictor® scores for each cohort grouped into a traditional curriculum group consisting of the 2013 and 2014 cohorts and a concept-based curriculum group, consisting of the 2015, 2016, and 2017 cohorts. An independent-samples *t*-test compared the mean averages of scores for each curriculum group and results indicated that there was no significant difference between ATI Comprehensive Predictor® scores for students in the concept-based curriculum cohorts (M = 67.13, SD = 1.54), and the traditional curriculum cohorts (M = 67.80, SD = 2.40), $t(3) = .390$, p = .722.

Table 8

ATI Comprehensive Predictor® Scores by Cohort

Traditional Curriculum Group	
Cohort	Score
2012	----
2013	69.50%
2014	66.10%
Concept-based Curriculum Group	
Cohort	Score
2015	68.90 %
2016	66.40 %
2017	66.10%

Subsidiary Question #3

How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by student performance rating scores using the Lasater Clinical Judgment Rubric (LCJR) in a simulation lab before and after implementation of a concept-based curriculum?

To measure the influence of conceptual learning in the simulation laboratory when making clinical judgments, LCJR scores reported by cohort, were analyzed. Students in each cohort participated in high fidelity simulation scenarios in the laboratory and each member of each cohort had an opportunity to perform in the main role of the nurse. Simulations were facilitated by a faculty member who rated the performance of each student nurse on four levels from beginning to exemplary in the dimensions of noticing, interpreting, responding, and reflecting.

Overall, an independent-samples *t*-test indicated that the total mean Lasater scores were significantly higher for students in the concept-based curriculum groups (M = 30.82, SD = .301), than for students in the traditional curriculum groups (M = 27.90, SD = .512), $t(4) = 8.52$, p = .001. Further, there is a 95% confidence that the true difference between Lasater mean scores for the concept-based and traditional curriculum cohorts will fall between 3.87 and 1.97. The actual mean difference was 2.92.

Statistical analysis was performed for each of 11 criteria within the four dimensions of the LCJR as well as for the total score (sees Appendix A for a copy of the LCJR). LCJR individual criteria and total scores for each cohort were grouped into a traditional curriculum group consisting of the 2012, 2013, and 2014 cohorts and a concept-based curriculum group, consisting of the 2015, 2016, and 2017 cohorts. Table 9 depicts the mean averages of individual criteria and total scores for each curriculum group as calculated by an independent-samples *t*-test.

Noticing. In this category three individual criterion were rated, focused observation, recognizing deviations from expected patterns and information seeking. Results revealed significant findings for each criterion in this category as follows. The mean scores for focused observation was significantly higher for students in the concept-based curriculum cohorts (M = 2.81, SD = .042), than for students in the traditional curriculum cohorts (M = 2.44, SD = .042), $t(4) = 11.74$, $p < .001$. There is a 95% confidence that the true difference between focused observation for the concept-based and traditional curriculum cohorts will fall between .462 and .285. The actual mean difference was .373.

Mean score findings for recognizing deviations from expected patterns was significantly higher for students in the concept-based curriculum cohorts (M = 2.81, SD = .050), than for

students in the traditional curriculum cohorts (M = 2.48, SD = .017), $t(4) = 10.80$, $p < .001$. There is a 95% confidence that the true difference between recognizing deviations from expected patterns for the concept-based and traditional curriculum cohorts will fall between .415 and .245. The actual mean difference was .330.

Results of mean scores for information seeking was significantly higher for students in the concept-based curriculum cohorts (M = 2.80, SD = .030), than for students in the traditional curriculum cohorts (M = 2.48, SD = .044), $t(4) = 10.47$, $p < .001$. There is a 95% confidence that the true difference between information seeking for the concept-based and traditional curriculum cohorts will fall between .405 and .235. The actual mean difference was .320.

Interpreting. In this category two individual criterion were rated, prioritizing data and making sense of data. Findings for prioritizing data was significantly higher for students in the concept-based curriculum cohorts (M = 2.75, SD = .025), than for students in the traditional curriculum cohorts (M = 2.45, SD = .092), $t(4) = 5.41$, $p = .006$. There is a 95% confidence that the true difference between prioritizing data for the concept-based and traditional curriculum cohorts will fall between .449 and .144. The actual mean difference was .297.

Results of mean scores for making sense of data were also significantly higher for students in the concept-based curriculum cohorts (M = 2.79, SD = .029), than for students in the traditional curriculum cohorts (M = 2.50, SD = .104), $t(4) = 4.60$, $p = .010$. There is a 95% confidence that the true difference between making sense of data for the concept-based and traditional curriculum cohorts will fall between .460 and .114. The actual mean difference was .287.

Responding. Four individual criteria were rated in this category, the first being calm, confident manner, followed by clear communication, well-planned intervention/flexibility, and

being skillful. Results from each criterion produced significant findings. Results of mean scores for calm, confident manner was significantly higher for students in the concept-based curriculum cohorts (M = 2.86, SD = .015), than for students in the traditional curriculum cohorts (M = 2.58, SD = .104), $t(4) = 4.56$, p = .010. There is a 95% confidence that the true difference between calm, confident manner for the concept-based and traditional curriculum cohorts will fall between .445 and .108. The actual mean difference was .277.

Mean scores for clear communication concluded significantly higher results for students in the concept-based curriculum cohorts (M = 2.81, SD = .032), than for students in the traditional curriculum cohorts (M = 2.53, SD = .090), $t(4) = 5.09$, p = .007. There is a 95% confidence that the true difference between clear communication for the concept-based and traditional curriculum cohorts will fall between .433 and .127. The actual mean difference was .280.

The outcome of mean scores for well-planned intervention/flexibility was significantly higher for students in the concept-based curriculum cohorts (M = 2.69, SD = .017), than for students in the traditional curriculum cohorts (M = 2.36, SD = .065), $t(4) = 8.40$, p = .001. There is a 95% confidence that the true difference between well-planned intervention/flexibility for the concept-based and traditional curriculum cohorts will fall between .435 and .219. The actual mean difference was .327.

Being skillful, the final criterion in this category also resulted in mean score findings significantly higher for students in the concept-based curriculum cohorts (M = 2.69, SD = .059), when compared to students in the traditional curriculum cohorts (M = 2.48, SD = .087), $t(4) = 3.53$, p = .024. There is a 95% confidence that the true difference between being skillful for the

concept-based and traditional curriculum cohorts will fall between .381 and .046. The actual mean difference was .213.

Reflecting. Two criteria were rated in this category, evaluation/self-analysis and commitment to improvement. An independent-samples *t*-test indicated that there was no significant difference in the evaluation/self-analysis criteria for students in the concept-based curriculum cohorts (M = 2.89, SD = .053), and the traditional curriculum cohorts (M = 2.79, SD = .057), $t(4) = 2.16$, p = .097. There was also no significant difference in mean scores for the commitment to improvement criteria for students in the concept-based curriculum cohorts (M = 2.93, SD = .085), and the traditional curriculum cohorts (M = 2.80, SD = .081), $t(4) = 1.91$, p = .128.

Table 9

Individual Criteria Score for the LCJR by Curriculum Group

Criteria	Traditional Curriculum Mean (*SD*)	Concept-based Curriculum Mean (*SD*)
Noticing		
1. Focused Observation	2.44 (.036)	2.81 (.042) *
2. Recognizing Deviations	2.48 (.017)	2.81 (.050) *
3. Information Seeking	2.48 (.044)	2.80 (.030) *
Interpreting		
4. Prioritizing Data	2.45 (.092)	2.75 (.025) *
5. Making Sense of Data	2.50 (.104)	2.79 (.029) *
Responding		
6. Calm, Confident Manner	2.58 (.104)	2.86 (.015) *
7. Clear Communication	2.53 (.090)	2.81 (.032) *
8. Well-planned Intervention	2.36 (.065)	2.69 (.017) *
9. Being Skillful	2.48 (.087)	2.69 (.059) *
Reflecting		
10. Evaluation/Self-analysis	2.79 (.057)	2.89 (.053)
11. Commitment to Improvement	2.80 (.081)	2.93 (.085)
Total Score	27.90 (.512)	30.82 (.301) *

Note. * The mean difference is significant at $p < .05$

Summary

This quantitative, ex post facto research study was conducted to explore if critical thinking for pre-licensure nursing students was influenced by a concept-based curriculum at a small private college in the Northeast. In this chapter, statistical testing described the demographics of both the traditional curriculum and the concept-based curriculum groups. Results of descriptive and inferential statistical tests calculated from NCLEX-RN® pass rates, ATI Comprehensive Predictor® scores, and the Lasater Clinical Judgment Rubric scores were also reported in this chapter.

Results of this study show that there was not a statistically significant difference between the mean scores for NCLEX-RN® first-time pass rates and ATI Comprehensive Predictor® scores in the traditional and concept-based curriculum groups. Statistically significant differences between the mean scores of each group were reported for nine of the eleven LCJR criteria and for the total LCJR rating scores. An interpretation of these findings will be discussed in Chapter V.

Chapter V: Discussion and Summary

The purpose of this quantitative, ex post facto research study was to explore if critical thinking for pre-licensure nursing students was influenced by a concept-based curriculum at a small private college in the Northeast. This chapter includes a discussion of the findings from data analysis as it relates to the sample demographics and the central and subsidiary research questions for this study. Limitations of the research study will be discussed as well as implications of the findings for nursing education, and recommendations for future research.

Demographic Data

Statistical mean averages for both the traditional and concept-based curriculum groups indicate a likeness between the groups with regard to age, gender and grade point average (GPA). As previously noted in Chapter II, the literature presented little evidence that demographic variables such as age, gender and GPA were linked to critical thinking development in nursing education. However, to ensure that student characteristics were not an extraneous variable in this study, descriptive statistics were analyzed using the demographic data of the sample. Statistical analysis supported with confidence that a likeness did exist between curriculum groups with regard to age, gender and GPA. Some aspects of the sample demographics will be discussed further as this chapter unfolds, but their primary purpose was to validate a likeness among the curriculum groups.

Interpretation of the Results

Positive patient outcomes in today's complex healthcare environment are dependent on a nurse's ability to think critically to make clinical judgments in practice (Cappelletti, Engel, & Prentice, 2014; Carrick, 2011). Therefore, it is important to study how nurses are educated, identifying methods that have an influence on critical thinking development. This research study

explored the influence of implementing a concept-based curriculum on critical thinking skills for pre-licensure nursing students. The central research question was; *how is critical thinking for pre-licensure associate degree nursing students influenced after the implementation of a concept-based curriculum, at a small private college in the Northeast?* The subsidiary reach questions for this study were:

1. How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by first time NCLEX-RN® pass rates before and after implementation of a concept-based curriculum?
2. How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by the Assessment Technologies Institute (ATI) Comprehensive Predictor® score before and after implementation of a concept-based curriculum?
3. How is critical thinking for pre-licensure associate degree nursing students influenced, as measured by student performance rating scores using the Lasater Clinical Judgment Rubric in a simulation lab before and after implementation of a concept-based curriculum?

To answer the research questions of this study, the influence of conceptual learning on critical thinking was measured by NCLEX-RN® pass rates, ATI Comprehensive Predictor® scores and Lasater Clinical Judgment Rubric rating scores in the simulation laboratory. Based on the results of this study, a clearly defined influence of a concept-based curriculum on critical thinking development has not been identified.

Results of this study suggest that implementation of a concept-based curriculum influenced critical thinking development for students in the simulation lab. Findings indicated a statistically significant influence in critical thinking as measured by LCJR ratings. However,

there was a slight decline in NCLEX-RN® pass rates and ATI Comprehensive Predictor® scores after the implementation of the new curriculum and no significant influence. Despite a lack of evidence suggesting an influence, the NCLEX-RN® pass rates and ATI Comprehensive Predictor® scores realized program outcomes criteria and met with the satisfaction of faculty at the research setting. For this reason, a clearly defined influence cannot be identified, and further discussion is warranted.

NCLEX-RN® Pass Rates

When implementing a new curriculum, the faculty takes a risk, acknowledging that NCLEX-RN® pass rates may decline. This can be worrisome because pass rates can define a program's sustainability. Faculty at the research setting were concerned about how a new curriculum would affect pass rates. After much research, consultation and discussion they chose to move forward with a concept-based curriculum revision. Their goal was to balance critical thinking development with continued attainment of their program outcomes.

In this study, the NCLEX-RN® pass rate for the concept-based curriculum group (92.42%) was slightly lower than that of the traditional curriculum group (95.24%) yet it was still notably higher than the national pass rate (85.40%) and the New York State pass rate (82.83%) in the same time period (NCSBN, 2016b; NYSED. gov). Post implementation of the new curriculum, faculty at the research setting report that despite an expected decline, overall, they were satisfied that the pass rates continued to meet the criteria of their program outcomes.

Prior to the curriculum change, an initial decline in NCLEX-RN® pass rates at the research setting was one factor that drove their curriculum revision. For the cohorts of this study, in 2012 and 2013 the NCLEX® pass rate at 97% dropped to 91%. This cohort data coincided with an increase in NCLEX-RN® difficulty resulting in a 10% decline in national pass rates

(NCSBN, 2016a). It is, therefore, possible that the decline in NCLEX-RN® pass rates for cohorts in this study may not have been at all related to the implementation of the new curriculum but rather the increase in difficulty. In 2017 the pass rate for cohorts in this study increased slightly from 91% to 93%. Faculty at the research setting expects that the pass rates will continue to trend upwards.

The results of NCLEX-RN® data analysis for this study is supported with findings from research in the literature in which concept-based curriculums were implemented and NCLEX-RN® pass rates either declined slightly or produced a neutral effect (Duncan & Shultz, 2015; Giddens & Morton, 2010; Lewis, 2014 & Murray, Laurant & Gontarz, 2015). While the NCLEX-RN® pass rates in this study did not produce findings of influence, they do meet program outcomes, indicating a mastery of entry-level nursing knowledge which is the outcome of all pre-licensure nursing programs. Further research is needed to determine if an upward trend continues.

ATI Comprehensive Predictor® Scores

Nursing programs utilize commercial, standardized testing as a means of formative assessment of knowledge in preparation for the NCLEX-RN®. The ATI Comprehensive Predictor® is a standardized assessment administered at program completion. Results of this assessment can be used to formulate individual student study plans for the NCLEX-RN®. It can also provide feedback to faculty about the strengths and weaknesses of their curriculum with regard to NCLEX-RN® success. This is consistent with its use at the research setting. That being said, it would be expected that the ATI Comprehensive Predictor® scores would trend downward in alignment with the NCLEX-RN® pass rates across cohorts in this study. In addition, the blue print for this assessment aligns with the NCLEX-RN® blueprint and updates

of both measures coincide every three years. This means that when the NCLEX-RN® difficulty increased, the difficulty of the ATI Comprehensive Predictor® assessment also increased in alignment (Ascend Learning, 2017; ATI Nursing Education, 2016a). This trend was evident across cohorts in this study.

From 2013 to 2014 the ATI Comprehensive Predictor® scores declined from 69.50% to 66.10%. Recall that the form used in 2013 was different than that of the rest of the cohort years and may not have been comparable across cohorts. After the new curriculum was implemented, the cohort scores remained constant from 2014 to 2017 at 66.10%. A slight increase (68.9%) was noted in 2015, the first year after the curriculum change and may have been an outlier. The majority of current research supports evidence that a correlation between critical thinking development and NCLEX-RN® competence exists. Further research may be needed to determine if ATI Comprehensive Predictor® scores align with the trends of the NCLEX-RN® pass rates in concept-based curriculums. In this study, given that the NCLEX-RN® pass rate for each cohort is well above national and state means, and the ATI Comprehensive Predictor® is a formative assessment in preparation for the NCLEX-RN®, a similar conclusion can be made with regard to upward trends, mastery of entry-level knowledge and the attainment of program outcomes at the research setting.

It is prudent to consider that there may have been extraneous variables when implementing this new curriculum that resulted in a decline in NCLEX-RN® pass rates and ATI Comprehensive Predictor® scores. Variable characteristics of the students can be ruled out based earlier discussion in the chapter regarding the likeness of demographic data between the curriculum groups. While it was not possible for the researcher to control for extraneous variables using retrospective data, as reported in Chapter III, further discussions at the research

setting have not revealed the identification of extraneous variables. Student and faculty satisfaction were not adversely affected and a well thought out process of development and implementation and an active curriculum committee with faculty membership that supports ongoing evaluation and maintenance exists. Still, the potential for undiscovered variables may exist.

LCJR Ratings in Simulation

Based on Tanner's Clinical Judgment Model (2006), faculty at the research setting used the LCJR to rate students in their ability to identify and respond to a patient problem in the simulation lab. The benefits of conceptual learning were realized as evidenced by a statistically significant influence in the total score of the LCJR as well as nine of eleven criteria in the following three categories; noticing, interpreting, and responding. A relationship exists between each of these categories and conceptual learning.

Noticing. Ratings in this category identified the student's ability to notice that client data, objective and subjective, was different from the norm or different from data initially presented, causing the patient to experience a problem. Depending on what students noticed, it may have been necessary to seek out or collect additional supporting data (Lasater, 2007, Tanner, 2006). Students may use factual or procedural knowledge to notice that there is a patient discrepancy, however, students who learn conceptually may be more likely to identify a patient problem that is new or unfamiliar by using connections from previously learned concepts and experiences (Mills, 2016). In this way, it is likely that students who learn conceptually may earn higher ratings in this category of the LCJR.

Interpreting. Students were rated in this category based on their ability to prioritize relevant data and interpret its meaning, in order to determine the correct course of action to solve

the patient's problem (Lasater, 2007; Tanner, 2006). In this category once a problem is recognized students may ask; *what does this mean?* Understanding and interpreting meaning is necessary to determine the correct course of action. Students who learn conceptually can make connections between facts and previous experiences to realize new relationships and meanings (Mills, 2016). Students who can more easily and quickly interpret the meaning of a patient situation may score higher in this category of the LCJR.

Responding. Faculty rated students in this category based on their ability to respond to the problem not only using a correct nursing intervention but also using confidence, skill, and ability when communicating, planning, and implementing the intervention (Lasater, 2007, Tanner, 2006). Using the correct nursing intervention requires an accurate transfer of theory to practice. Students who learn conceptually have organized knowledge in a framework based on connections and interrelated concepts. Students can retrieve knowledge from their framework for use in the act of responding. Transfer of knowledge also occurs when students use knowledge in a different way to solve new problems (Mills, 2016). The more students practice, the more fluid their thinking becomes and the more accurate their responses become. This may lend itself to higher ratings in confidence, skill, and ability in this category of the LCJR.

A connection between conceptual learning and higher LCJR rating scores has been identified. Active engagement in the simulation lab allows students to practice and the more experiences students have, real or simulated, the more opportunities they have to think critically making clinical judgments in practice. This may also support a connection between conceptual learning and active learning strategies. Findings from the LCJR have added additional insights for consideration.

- Active learning strategies, aligned with conceptual learning were an important factor in the development of critical thinking for nursing students in this study.
- Teaching nursing students how to use reflection as a metacognitive skill is important for critical thinking development.

Active Learning in Concept-based Curriculums

With regard to the development of critical thinking, the findings of this study suggest the importance of embracing active learning strategies within concept-based curriculums. A statistically significant influence of critical thinking was realized in this study from LCJR data in the simulation lab, an active learning environment. Active learning is further supported by Knowles Theory of Andragogy (1980; 1984) and Ausubel's Meaningful Learning Theory (1968; 2000). When engaged in active learning strategies, the adult learner brings experience and context to the situation, has the locus of control, is internally motivated, and has a relevant need to solve a patient problem in practice (Knowles, 1980; 1984). In this way, students take an active role in meaningful, versus rote, learning by connecting new knowledge to previously acquired knowledge, thereby transferring theory to practice for the purpose of solving patient problems in new situations (Ausubel, 1968; 2000). In an effort to examine learning in nursing and identify effective teaching interventions, Carrick (2011) proposed that active learning strategies were necessary to engage students in learning. To that end, one may conclude that curriculum revision in theory is dependent on its delivery.

At the research setting active learning strategies were implemented in alignment with a concept-based curriculum. The faculty delivered their curriculum by flipping the classroom, thus increasing student preparation of factual knowledge before class and then providing more opportunities to apply knowledge through active engagement in the classroom. Conceptual

understanding begins with a foundation of factual and procedural knowledge similar to the dimensions and the cognitive processes of remembering and understanding in Bloom's Taxonomy (Anderson & Krathwohl, 2001). This foundational knowledge is not enough to think like a nurse in practice. Nurses must demonstrate the ability to apply foundational knowledge to practice situations. In a flipped classroom, when students come together, this foundation of knowledge is further enhanced by making connections between facts previously learned and new experiences that encourage students to form new relationships and meanings. Students can then organize these connections in a meaningful way in their knowledge inventory resulting in the ability to use knowledge in a different way to solve new problems (Mills, 2016). This process exercises a student's ability to think critically, like a nurse, transferring knowledge to practice.

In addition to flipping the classroom, faculty at the research setting also increased the number of simulation activities in their curriculum. Students often have difficulty applying theory to practice because making a clinical judgment in practice is highly influenced by the context of the patient situation and patient situations are not all identical (Tanner, 2006). In conceptual learning, students make connections between concepts or within a concept. In this way, a more broad, conceptual knowledge can be applied in context to a variety of patient situations. The ability to practice making clinical judgments that solve patient problems with positive outcomes are evidence of critical thinking (Kemp, 1985). Practicing critical thinking to solve clinical problems can be accomplished in the simulation lab.

Lambert (2014) posits that students cannot grasp a deep, meaningful understanding of content in a traditional lecture but do experience metacognitive benefits when active learning strategies are employed. In a study conducted to explore higher-order thinking in concept-based curriculums, Getha-Eby, Beery, O'Brien, and Xu (2015) concluded that meaningful learning

outcomes may be influenced by the metacognitive benefits of active learning strategies in a concept-based curriculum. Findings from this study may support the claims of experts in the literature regarding the benefit of active learning strategies. Thus, more active learning strategies should be incorporated into concept-based curriculums focusing on the metacognitive skills that teach students how to think. Further research is needed to explore a variety of active learning strategies and their role in concept-based curriculums.

Teaching Nursing Students how to use Reflection

Although an influence of critical thinking was realized in this study in nine of the eleven criteria of the LCJR, two criteria, in the category of reflection, evaluation/self-analysis and commitment to improvement, did not yield statistically significant findings. Therefore, these findings support the need to teach students how to develop the metacognitive skill of reflection in active learning experiences such as simulation in a concept-based curriculum. Throughout a simulation, students reflect-in-action, meaning that they think in real time about the patient's response to their chosen intervention and as a result, may choose to modify or enact another intervention (Schön, 1983). After simulation, debriefing is a time for the learner to reflect-on-action. In other words, reflect on the outcome of the simulated experience, evaluating their performance against alternative responses in order to store the experience in their knowledge inventory with accuracy for future use.

Ultimately, a student's commitment to improvement is dependent on their ability to perform this reflection-on-action (Schön, 1983). Thus, it is important that students accurately interpret their response and thoroughly evaluate the alternatives in order to commit to improvement in practice (Lasater, 2007; Tanner, 2006). Reflection-on-action is a powerful and necessary metacognitive learning activity in concept-based curriculums. Again, remembering

that not all patient situations are identical, in concept-based curriculums students can apply a broad conceptual knowledge to practice in a variety of different situations. This act of thinking like a nurse requires practice and building a knowledge base of experiences to draw from. When students reflect of their practice, they can consider what went well and what didn't and adjust their future practice based on their experience.

Findings from this study may align with current evidence from the literature. A study conducted by Fenske, Harris, Aebersold, and Hartman (2013) explored nurses perceptions of their clinical judgment abilities compared to their actual abilities and were rated using the LCJR. The results of the study identified a significant discrepancy between nurses perceived and actual demonstrated abilities in clinical judgment. It was found that novice nurses with one year or less experience and younger nurses 21 to 25 years of age, demonstrated over confidence in self-ratings (Fenske, Harris, Aebersold, & Hartman, 2013). Students in the sample for this study had a mean age of 22. Therefore, findings may indicate that students in this sample were more likely to overestimate their true performance ability as they reflected-on-action.

The art of reflection for self-analysis and improvement requires internal motivation and a shift of the locus of control from educator to learner (Caputi, 2018). Using a more autonomous approach in the process of thinking may result in metacognitive growth. Because accurate reflection is important for developing higher-order thinking and commitment to improvement, findings of this study may also indicate the need for more guidance in reflection, as well as more opportunities to develop self-rating and evaluation as a skill.

Implications for Practice

The results of this study have contributed to the body of knowledge in nursing education with findings that indicate conceptual learning had an influence on critical thinking development

for nursing students in this sample after the implementation of a concept-based curriculum. Although results were not statistically significant, NCLEX-RN® pass rates and the ATI Comprehensive Predictor® mean scores have met program outcomes at the research setting. In addition to program outcomes achievement, NCLEX-RN® pass rates far exceeded state and national means. LCJR ratings in the simulation lab produced statistically significant findings for an influence in critical thinking development. These findings suggest that conceptual learning may promote a deeper, more meaningful learning that addresses the theory practice gap in nursing programs. Nurse educators should explore conceptual learning and active learning strategies as a method to promote critical thinking development in nursing students.

Providing Active Learning Opportunities in Concept-based Curriculums

In this study, the significant influence of critical thinking in the simulation lab suggests the importance of active learning experiences in concept-based curriculums. The more opportunities that students have to actively think like a nurse in simulated patient experiences, the more evidence they will have in their knowledge inventory to draw from in the process of solving patient problems in practice. The findings of this study suggest a benefit to exploring and utilizing a variety of active learning strategies in a concept-based curriculum.

In concept-based curriculums, nurse educators must move away from traditional teaching strategies and move toward active engagement that allows students to apply knowledge (Giddens, Caputi & Rodgers, 2015). As discussed in Chapter II, strategies used in lecture such as the use of multi-contextual learning platforms, concept maps, and narrative pedagogy can enhance the learning environment by decentering the delivery of content and practicing problem solving (Abel & Freeze, 2006, Giddens, Brady, Brown, Wright, Smith & Harris, 2008; Ironside, 2004). Strategies in practice may include expanding simulation opportunities and developing a

conceptual model of clinical practice. By limiting a student's responsibility for total patient care in clinical practice, it allows time for a comparison of patient problems that may lend itself to deeper understandings and conceptual connections (Lasater & Neilson, 2009). Other strategies such as the flipped classroom, small group work in class, case study application and reflection should also be explored. More important than the type of activity is the amount of student engagement, relevance to a clinical situation, focus on metacognition, and a connection to purpose (Giddens, Caputi & Rodgers, 2015). Smaller classrooms versus large lecture halls can provide an environment more conducive to collaboration. Increased opportunities for simulation and actual patient care would be recommended.

Practicing Reflection

When planning active learning strategies in concept-based curriculums, nurse educators can help nursing students to grow in the skill of metacognition through reflection. In simulation and in other active learning strategies, it is more than just the practice experience that is important. It is the ability to improve thinking. An accurate, expanded knowledge construction of interrelated concepts can be gained from reflection that can help students to apply knowledge, thinking like a nurse and bridging the theory-practice gap (Caputi, 2018). In order to be successful in the practice of reflection, students must become familiar with the process, practicing it, just as with any learned skill.

In active learning experiences, during reflection-on-action, educators should allow for adequate time and should pose questions to guide students in the process. In a study conducted by Lasater, Johnson, Ravert, and Rink (2014, p.259) to explore the role modeling of clinical judgment in simulation, the following reflective questions were posed:

- "What was the most effective decision you made for your patient? What was the worst, if any?"
- "What would you do differently in the case if you had the opportunity?"
- "Do you believe the care of your patient better prepared you to care for a patient in the clinical setting?"

Students can also begin to practice reflection through narrative pedagogy and journaling early in their education program in order to operationalize a framework for evaluation/self-analysis and commitment to improvement. In this way students can become more familiar and confident in the process of learning how to self-evaluate.

In this study, LCJR data was collected and grouped into traditional and concept-based curriculum groups for analysis. Faculty may also consider using the LCJR as a method of formative assessment for individual student to reflect on their progress of critical thinking development in concept-based curriculums.

Enhancing Critical Thinking Potential

Findings from this study support an influence on critical thinking development for nursing students in concept-based curriculums. For nurses, critical thinking may continue to develop beyond entry-level practice requirements. Studies conducted to measure critical thinking skills of nurses were previously discussed in Chapter II. Maynard (1996) reported that experience in professional practice after graduation had more of an impact on the development of critical thinking skills for nurses than experiences during their education program. In addition, Fero, Witsberger, Wesmiller, Zullo and Hoffman (2008) reported that nurses with more than ten years of experience were better prepared to think critically and solve practice problems than

newly graduated nurses. That being said, evidence from the literature may suggest that critical thinking may not be fully realized at the time of program completion.

If at program completion critical thinking ability is safe for beginning practice, yet not fully realized, it would be important to support continued development. This gives way to a need for well-developed and supportive orientation programs such as a nurse residency programs at institutions that employ entry-level nurses. Nurse educators in staff development must understand to reach their potential, entry-level nurses need a continuation of guidance and mentoring in a supportive learning environment that supports conceptual learning using active learning strategies and opportunities to reflect-on-action.

Limitations

This study was limited to a convenience sample of participants from a small private nursing college in the Northeast; therefore, these participants may not have been representative of all pre-licensure nursing students in associate degree nursing programs. Retrospective data was analyzed to answer the research questions for this study. The curriculum had already been developed and by the nature of retrospective data, the data used in this study already existed. Extraneous variables that may have influenced the development of critical thinking in this study were explored and although none were identified, they cannot be excluded.

The research setting was unable to provide demographic data for 11 of the 431 students whose data was analyzed in this study. ATI Comprehensive Predictor® scores were also not available for the 2012 cohort and so the traditional curriculum group was comprised of only the 2013 and 2014 data when analyzed. Also, important to consider is that the 2013 ATI Comprehensive Predictor® was not the same form used as in the other cohort years and may not have been as reliable in comparison across cohorts and groups.

Future Research

The outcomes of this study were intended to augment the body of knowledge in nursing education, specifically as it pertains to influences of curriculum on critical thinking development for pre-licensure nursing students. Contemplating the results of this study, recommendations can be made for future studies. Already discussed in this chapter is the need for future research to explore the possibility of an upward trend in NCLEX-RN® pass rates over time in concept-based curriculums. In addition, it may be advantageous to study if trends in the ATI Comprehensive Predictor® align with NCLEX-RN® trends over time. It would also be important to study the effects of other types of active learning strategies in theory and in practice in concept-based curriculums and their influence on critical thinking.

A study comparing outcomes of critical thinking for students in a traditional curriculum school with a concept-based curriculum school may add depth and breadth to the findings of this study. Data in this study was analyzed by cohort. Findings from this study may also indicate that active learning in the simulation lab had a significant influence on critical thinking for pre-licensure nursing students. An important future study would be to explore the individual trajectory of critical thinking development for students using the LCJR over the course of their program.

Finally, considering that critical thinking development may not be fully realized at the time of program completion, a logical next step would be to measure the critical thinking development of graduates of a concept-based curriculum after acquiring experience in practice as a registered nurse. A comparative study may also be explored using a sample of graduates from both traditional and concept-based curriculums. This may add to the body of knowledge with

regard to enhancing critical thinking potential beyond program completion as novice nurses begin to practice.

Conclusion

The impetus for this study was to explore a sound approach to critical thinking development for nursing students. This was born of the researcher's experiences in pre-licensure nursing education and a desire to better prepare students to think like a nurse, narrowing the theory-practice gap and improving patient outcomes. The literature has shown that nursing students may have the aptitude to develop critical thinking in nursing education and that a concept-based curriculum may enhance this development. A concept-based curriculum was selected due to gaining popularity; however, evidence in the literature measuring the outcomes of concept-based curriculums in nursing were limited and dated. The literature has also shown that critical thinking in nursing education is difficult to measure and there was little evidence prior to this study supporting its development in nursing education.

Results of this study have contributed to the body of knowledge in nursing. Significant findings indicate that conceptual learning had an influence on critical thinking development for the students in this study as measured by LCJR rating scores in the simulation lab. Further research is needed to explore the generalizability of this claim. Despite respectable data that supports program outcomes at the research setting, statistical influence was not realized from NCLEX-RN® pass rates and ATI Comprehensive Predictor® scores. These findings are congruent with current research in the literature and results of this study may indicate that critical thinking is not fully realized in pre-licensure education. This suggests a need for additional research measuring the influence of critical thinking in concept-based curriculums.

This study has supported the literature with an important connection between conceptual learning and active learning strategies in nursing education. A wide base of theoretical support from Knowles Theory of Andragogy (1980; 1984), Ausubel's Meaningful Learning Theory, and Tanner's Clinical Judgment Model (2006) exists for concept-based curriculums with active learning strategies.

The literature proposes a need for critical thinking development in student nurses to meet the demands and challenges presented in our emerging healthcare system. As previously discussed in Chapter II, del Bueno (2005) reported that only 35% of graduate nurses entered practice with competency in critical thinking and clinical reasoning skills. A larger implication for this study is a need to provide additional support for critical thinking development for nurses beyond formal nursing education, extending it into the work setting.

This study has added depth to the body of knowledge with regard to conceptual learning and critical thinking in nursing education. It has opened the door to new possibilities in the trajectory of critical thinking development for pre-licensure nursing students and novice nurses. Additional research is indicated to further explore and operationalize these possibilities.

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Appendix A

The Lasater Clinical Judgment Rubric (LCJR)

LASATER CLINICAL JUDGMENT RUBRIC
Noticing and Interpreting

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

LASATER CLINICAL JUDGMENT RUBRIC
Responding and Reflecting

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

Appendix B

Permission to Re-print Bloom's Taxonomy Model

From: Melissa Tiemann <MTiemann@CSM.edu>
Date: Thursday, March 1, 2018 at 9:52 AM
To: "'celt@iastate.edu'" <celt@iastate.edu>
Subject: Permission

Greetings,
Who do I need to contact to obtain permission to use this model posted on your site. http://www.celt.iastate.edu/wp-content/uploads/2015/09/RevisedBloomsHandout-1.pdf We have a doctoral student who would like to use this model in her dissertation. I see that it was licensed using a Creative Commons license and it was based on prior work, so I want to verify that the model in its entirety, including the textual content is covered under the license. Any assistance you can provide would be much appreciated.
Thanks, Melissa

Melissa D. Tiemann
Research, Instruction, and Electronic Access Librarian
College of Saint Mary
7000 Mercy Road
Omaha, NE 68106
402-399-2468
mtiemann@csm.edu

From: Bestler, Laura L [CELT] [mailto:bestler@iastate.edu]
Sent: Thursday, March 01, 2018 10:05 AM
To: Melissa Tiemann <MTiemann@CSM.edu>
Subject: Re: Permission

Hello to you and thank you for your request – below is what we would prefer for citing.
Kind regards,
Laura

Laura Bestler, PhD
Program Coordinator
Center for Excellence in Learning and Teaching
3024 Morrill Hall
603 Morrill Road
Ames, IA 50011-2100

How to cite CELT work when external entities request permission.
For Bloom's Taxonomy requests:
A Model of Learning Objectives–based on *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*
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Appendix C

Permission to Re-print the Tanner Clinical Judgment Model

SLACK
INCORPORATED

March 15, 2018

Victoria Callagan
College of Saint Mary
7000 Mercy Rd, Omaha, NE 68106

Reference #: J21616037
Material Requested: Figure. Clinical Judgment model
Usage Requested: Used in dissertation. Will be housed electronically in the Proquest Dissertations and Theses Database.
Citation: Tanner C. (2006). Thinking Like a Nurse: A Research-Based Model of Clinical Judgment in Nursing. *J Nurs Educ.* 45(6)

Dear Victoria,

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Signature: Victoria Co-Callagan **Date:** 3/19/18

Sincerely,
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SL0507

Appendix D

IRB Approval Letter College of Saint Mary

September 20, 2017

Dear Ms. Callagan,

Congratulations! The Institutional Review Board at College of Saint Mary has granted approval of your study titled *The Influence of Conceptual Learning on Critical Thinking Development for Nursing.*

Your CSM research approval number is **CSM 1710**. It is important that you include this research number on all correspondence regarding your study. Approval for your study is effective through October 31, 2018. If your research extends beyond that date, please submit a "Change of Protocol/Extension" form which can be found in Appendix B at the end of the College of Saint Mary Application Guidelines posted on the IRB Community site.

Please submit a closing the study form (Appendix C of the IRB Guidebook) when you have completed your study.

Good luck with your research! If you have any questions or I can assist in any way, please feel free to contact me.

Sincerely,

Vicky Morgan

Dr. Vicky Morgan
Director of Teaching and Learning Center
Chair, Institutional Review Board * irb@csm.edu

Appendix E

IRB Approval Letter from the Research Setting

HOACNY 10/19/2017 11:49:04 AM PAGE 1/001 Fax Server

ST. JOSEPH'S HEALTH
A Member of Bon Secours Health

October 19, 2017

Victoria Callagan, EdD(c),RN

RE: SJHIRB 411

Your study, **"The Influence of Conceptual Learning on Critical Thinking Development for Nursing Students"** is granted "exempt" status.

It is important to note that the Research Committee be notified immediately if any of following occur:

- significant deviations from the approved protocol;
- serious complications or untoward effects result from the investigation;
- closing of the study;
- results of the study being written up for presentation or publication (any manuscript must be submitted to the Administration Office prior to presentation or publication).

If you have any questions or issues, please feel free to contact me at 315-472-7504.

Sincerely yours,

David Churchill, M.D.
Chairperson, Research Committee