

RELATIONSHIP OF CRITICAL THINKING DISPOSITIONS
OF BACCALAUREATE NURSING STUDENTS
TO ERI-RN ASSESSMENT SCORES AND GPA
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Abstract

RESEARCH SUBJECT: Relationship of Critical Thinking Dispositions of
Baccalaureate Nursing Students to ERI RN Assessment
Scores and GPA

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Critical thinking (CT) is an essential component of clinical judgment in nursing practice. Faculty in schools of nursing need to track CT competence and link it to other measures of student performance. The purpose of this study is to determine if CT dispositions of baccalaureate nursing students change from sophomore to senior level and the relationship between CT dispositions and Educational Resources Inc. (ERI) RN Assessment scores and GPA. This is a partial replication of Stewart and Dempsey's (2005) study. The conceptual framework is Facione, Giancarlo, Facione, & Gainen's (1995) definition of critical thinking disposition. A convenience sample of 50 students will be recruited from a large Mid-western university. Data collection will begin during the students' sophomore level first semester and be completed post-graduation. CT will be measured by the California Critical Thinking Disposition Inventory (CCTDI) (Insight Assessment, 2008). Other measures are the ERI RN Assessment scores (Educational Resources, Inc., 2008) and student cumulative GPAs.

Chapter 1

Introduction

The current health care environment is highly complex and technical (Nickitas, 2009). Hospital mergers have formed mega-systems that have created complex economic systems. Medicare and Medicaid reimbursements are decreasing while hospital costs are increasing (Hines & Yu, 2009). Providing cost effective quality care and controlling financial performance will improve hospital performance. Hospital and nurse administrators are mandated to reduce high cost DRGs and increase quality of care.

Americans are seeking high quality care (Nickitas, 2009). The Joint Commission on the Accreditation of Healthcare Organizations (TJC) Standards (2006; as cited by Fero, Witsberger, Wesmiller, Zullo, & Hoffman, 2008) identified that relevant clinical education and competence are key factors in promoting patient safety and preventing sentinel events. TJC (2009) defines nursing as a professional process for the assessment, diagnosis, planning, implementation, and evaluation of patient care designed to promote patient health, recovery, or a peaceful death. TJC identifies nurses as the primary patient caregivers. Competence is directly tied to safe, quality patient care. Health care organizations must provide initial orientation and ongoing education to clinical staff, as well as evaluate and document staff competencies on an ongoing basis.

Fero et al. (2008) reported that nurses must be competent. Nurses must have the ability to recognize changes in patients' conditions, practice independently and in collaboration with others, anticipate patient needs, and prioritize patient care. However, due to the nursing shortage and budget constraints, hospital based orientation programs are being shortened. Duchscher's (2008) research indicated that new nurse graduates have limited practical nursing experience, lack maturity in social and developmental skills essential to being effective in a hospital environment, and struggle with basic clinical and workload management skills. More than 10% of the nursing workforce are new graduate nurses (Berkow, Virkstis, Stewart, & Conway, 2008).

In a survey of over 5,700 nurse leaders working in patient care environments, only 10% considered new graduate nurses to be competent in providing safe and effective patient care. Six dimensions of new graduate nurse competencies were evaluated. Results showed that respondents were most satisfied with new graduate nurses' technical competencies, such as working with data systems, performing assessments, or maintaining a sterile field. In contrast, critical thinking (CT) competencies of new graduate nurses ranked 5th, with abilities to anticipate risk, interpret assessment findings, and recognize changes in patient status receiving some of the lowest ratings in satisfaction (Berkow et al., 2008).

CT is widely accepted as an essential construct of sound clinical judgment in nursing practice. In addition, accrediting agencies are reviewing practices based on standards to insure graduate nurses have basic competencies in CT (Berkow et al.,

2008; Fero et al., 2008). According to TJC (2006; as cited by Fero et al., 2008), failure to develop and access CT competencies of nurses puts the general public at risk.

CT competence is an essential outcome for schools of nursing. Faculty need to evaluate the development of CT competency in nursing students to determine the effectiveness of curriculum outcomes. Over the past 25 years, a tremendous amount of research has been conducted defining CT, linking CT to the nursing process and clinical judgment, teaching CT, and measuring CT. Through this vigorous research, CT has been established as a critical component of competent nursing practice.

Walther (2004) found that logical thinking, curiosity, and openness were essential attributes of CT. Within the nursing context, receptivity, empathizing, sensing, and female ways of knowing were also identified as potential components of CT but lacked objectivity. Turner (2005) reviewed those definitions of CT most often cited in nursing research and other nursing literature. Facione's (1990) definition was the most cited and defined CT as a process of purposeful self-regulatory judgment requiring interactive and reflective reasoning processes. Abel and Freeze (2006) evaluated Facione's definition of CT and believed it complemented the various steps of the nursing process. Baxter and Rideout (2006) found that students in clinical settings felt intimidated and insecure, and often made decisions that were pleasing to the patient, even if the decision was contrary to safe patient care. Baxter and Rideout concluded nursing students often lack practical knowledge, self-confidence, and

emotional maturity to make sound clinical judgments, which are essential constructs of Facione's definition of CT.

Bowles (2000) investigated the relationship between CT and clinical judgment and found that students' scores on the California Critical Thinking Skills Test (CCTST) and Clinical Decision-Making in Nursing Scale (CDMNS) were significantly related. In Martin's (2002) research, clinical judgments among nursing students, unlicensed graduates, and nurses with greater than 5 years of experience were compared. Results indicated clinical judgment scores were related to level of expertise, age, GPA, and whether or not the nurse had taken a course in CT. Lasater (2007) investigated the use of high fidelity simulation to develop and assess CT and clinical judgment in nursing students and found students wanted detailed feedback, including what outcomes would have been if initial decisions were followed.

Another method to develop and assess CT and clinical judgment has been concept mapping. Abel and Freeze (2006) and Daley, Shaw, Balistreri, Glasenapp, and Piacentine (1999) utilized concept maps to teach and assess CT. Both studies found that concept maps improved as students progressed through the curriculum, and concept maps were useful to identify strengths and weaknesses in CT.

To investigate if different methods of instruction were related to the development of CT, Beckie, Lowery, and Barnett (2001) introduced didactic and clinical teaching methods linked to the development of CT with nursing students. The CCTST was used to measure students' CT. Results indicated CCTST scores

increased over time; however, the curriculum revisions were not consistently related to students' CCTST scores.

Since standardized tests are often used to measure CT, linking these tests to clinical judgment is necessary. To determine goodness of fit of the CCTST and California Critical Thinking Dispositions Inventory (CCTDI) to measuring CT as it applies to nursing, Stone, Davidson, Evans, and Hansen (2001) surveyed 338 Deans or Department Chairs from NLN accredited baccalaureate schools of nursing. The research showed that the CCTST and CCTDI measured essential elements of CT as applied to clinical judgment.

In addition to the goodness of fit analysis, Stone et al. (2001) investigated if the CCTST and CCTDI were related to Student Aptitude Test (SAT) scores, overall GPA, nursing curriculum GPA, and the NCLEX-RN exam results. Student CCTST scores were related to SAT verbal, SAT math, overall GPA, and nursing GPA. Student CCTDI scores showed no relationship to the other variables. Profetto-McGrath (2003) investigated if CT of nursing students changed as students progressed through the curriculum. The researchers found the systematicity subscale of the CCTDI improved as students progressed through the curriculum, student scores on the CCTST and the CCTDI were significantly related to each other, and CCTST scores were related to GPA.

Stewart and Dempsey (2005) and Giddens and Gloeckner (2005) utilized standardized tests to investigate if CT changed over time and if CT was linked to other performance measures. Authors of both studies found that CT changed as

nursing students progressed through the curriculum. Stewart and Dempsey found relationships existed between some of the CCTDI subscales and GPA, but were varied. Giddens and Gloeckner found a relationship existed between GPA and NCLEX-RN performance.

In summary, schools of nursing have been investigating and revising curricula in order to better develop CT in students. However, while revisions to curricula may have an impact on student learning, results are inconsistent regarding the impact curricula has on CT. Several studies indicated that CT is enhanced with age and life experience, and may not necessarily be a teachable competency. However, Martin (2002) found that subjects that took a course in CT demonstrated higher levels of clinical judgment. In addition, it was found that CT competence was related to GPA (Giddens & Gloecker, 2005; Stewart & Dempsey, 2005), and GPA was related to NCLEX-RN performance (Giddens and Gloecker), but CT was not consistently related to NCLEX-RN performance (Giddens & Gloecker; Stewart & Dempsey). Further study is needed to investigate the effectiveness of curriculum in the development of CT skills of students and the relationship CT has to other measures of competence.

Background and Significance

Over the last century, CT skills have become an outcome of post-secondary education. The concept of CT is traceable to the Greek philosophers of Socrates, Plato, and Aristotle. Socrates believed that a questioning spirit facilitated learning and understanding. Plato believed that education developed skills to question,

examine, and reflect upon ideas and values. Aristotle believed that it was through sound thinking that intellect could develop and influence society (Staib, 2003). Contemporary definitions of CT have flourished in philosophical and nursing literature.

The contemporary belief that CT should be an outcome of higher education can be traced back to John Dewey's book *How We Think* (1933; as cited by Facione et al., 1995). Dewey believed that decisions were made based upon personal attributes and knowledge, logical reasoning, and the technical skill to manipulate or apply special logical processes. During the 1990's, CT was identified by the U.S. Congress as a key outcome of higher education. First, it was adopted by the US Department of Education (1990; as cited by Facione et al., 1995) that college graduates must demonstrate an advanced ability to think critically, communicate effectively, and competently solve problems. These objectives were adopted by congress with the Goals 2000: Educate America Act (Ratliff, 1993; as cited by Facione et al., 1995).

Watson and Glaser (1964; as cited by Staib, 2003) considered CT as the ability to define a problem, identify solutions, recognize assumptions, formulate hypotheses, draw conclusions, and validate inferences. Facione (1990; as cited by Staib) considered CT to be a purposeful, self-regulatory process that uses content and context specific information for the interpretation, analysis, evaluation, and inference to make judgments. Paul (1992; as cited by Staib) considered CT to be an active

process of conceptualizing, applying, analyzing, synthesizing, and evaluating information to guide action and reflection.

Abel and Freeze (2005) evaluated the goodness of fit between Facione's (1990) definition of CT with the nursing process of assessment, analysis and diagnosis, planning for outcomes and interventions, implementation, and evaluation. Abel et al. determined Facione's definition complemented the nursing process based upon the focus on content and contextual knowledge, inquiry for evidence, evaluation of options, taking action, and reflecting upon outcomes. In addition to Abel and Freeze's research, Stone et al. (2001) also found that Facione's definition of CT was applicable to the nursing process and the development of clinical judgment.

Stewart and Dempsey (2005) investigated how nursing students CT dispositions changed as over time and how CT dispositions were related to other measures of performance. As Berkow et al. (2008), Duchscher (2008), and Fero et al. (2008) found, nurses are expected to possess basic competencies in CT in order to provide safe patient care. However, new graduate nurses lack skills essential to recognition of changes in patients' conditions, lack maturity in social and developmental skills to be effective in hospital environments, and struggle with basic clinical and workload management skills. In order to determine if curriculum content and instructional methods are effective in developing CT competency in nursing students, faculty in schools of nursing need to track CT competence and link it to other measures of student performance.

Problem Statement

Nursing practice requires a high level of CT skills and CT disposition. The disposition to think critically is required for effective clinical decision making (Stewart & Dempsey, 2005). It is important to examine whether CT disposition changes over time. CT and CT disposition contribute to competence in nursing practice.

Purpose of the Study

The purpose of this study is to determine if CT dispositions change as nursing students' progress through the curriculum and if there is a relationship between CT abilities and other indicators of competency. This is a partial replication of Stewart and Dempsey's (2005) study.

Research Questions

1. Do CT dispositions of baccalaureate nursing students change while progressing from the sophomore level to the senior level?
2. Are there significant correlations between CT disposition, Educational Resources, In. (ERI) RN Assessment scores, and accumulative GPA?

Organizing Framework

The organizing framework is Facione, Facione, and Sanchez's (1994) definition of CT dispositions. While CT is "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodologic, critiologial, or contextual consideration upon which judgment is made" (Facione & Facione, 1996, p. 129), CT

dispositions facilitate “reasoned consideration to evidence, context, theories, methods, and criteria in order to form a purposeful judgment and, at the same time, monitors, corrects, and improves the process through meta-cognitive self-regulation” (Facione, Facione, & Sanchez, 1994, p. 346). This is a partial replication of Stewart and Dempsey’s (2005) study.

Operational Definition of Terms

Critical Thinking.

Facione’s (1990) definition of CT will be used in this study. This definition states CT is “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criitriological, or contextual considerations upon which that judgment is based” (p. 2).

Critical Thinking Dispositions.

According to Facione (1990), cognitive skills alone will not result in higher level CT. A good critical thinker must also possess certain dispositions that are associated with CT. Seven dispositions identified by Facione et al. (1994) essential to nursing practice are:

1. Inquisitiveness- Intellectual curiosity and desire for learning, even when the application of knowledge is not readily apparent. Its absence would result in a fundamental limitation of ability to develop expert knowledge and clinical practice.

2. Systematicity- Tendency toward organized, orderly, focused, and diligent inquiry. Systematicity is essential to competent clinical practice, and deficits in this disposition could predispose a nurse to negligence in practice.
3. Analyticity- Application of reasoning and the use of evidence to solve problems, anticipate conflicts, and being consistently alert to intervene. Analyticity is essential to in clinical performance to connect theory to clinical observations and forecast potential threats to patient wellbeing.
4. Truth-seeking- Behavior of investigation the best knowledge regarding a given subject or situation, courageous in asking questions, is objective in accepting findings, and continually reviews new information and evidence. Truth-seeking is essential to preventing issues of malpractice due to inattention to evidence or missing key information essential for appropriate diagnoses or changes in patient condition.
5. Open-mindedness- Tolerant of divergent views and identifies the potential influence of personal bias. Open-mindedness is essential to culturally competent care and preventing the disenfranchisement of historically underserved populations.
6. Self-confidence- Personal trust in self-judgments and the ability to lead others in problem resolution. The self-confidence level of an incumbent must be appropriate to mastery of subject matter and clinical expertise. Overestimation of clinical competence could lead a clinician to act

without appropriate caution, while underestimation of clinical competence could interfere with decision making and taking essential actions.

7. Maturity- Judicious behavior of evidence gathering and decision making even when problems are ill-structured, multiple plausible options are identified, or when standards, contexts, or evidence that lack concreteness. Maturity is an essential component of ethical clinical decision making when rapid, time sensitive decisions must be made that impact patient outcomes (pp. 346-347).

Accumulative Grade Point Average (GPA).

Reported in a zero to four point scale, this performance measurement is used to document student classroom, laboratory, and field or clinical performance. This measure will be calculated on students each semester during the course of this research study.

California Critical Thinking Dispositions Inventory (CCTDI).

A testing instrument comprised of 75 Likert-type items used to measure CT dispositions. The seven subscales are: inquisitiveness; systematicity; analyticity; truth-seeking; open-mindedness; self-confidence; and, maturity. (Facione et al., 1994, pp. 346-347).

Educational Resources, Inc. (ERI) RN Assessment.

A mock NCLEX-RN examination that provides a total score comprised of 32 subscales. The CT subscales included in this research were:

1. CT1: prioritizing, discriminating.
2. CT2: inferential reasoning.
3. CT3: main idea and predicting outcomes.
4. CT4: application and knowledge.
5. CT5: evaluating predicted outcomes (Steward & Dempsey, 2005, p. 83).

Limitations

Since this study will be conducted at a School of Nursing located in a small municipality of the Midwestern United States, its findings may not necessarily be generalizable to the population of nursing students. In addition, this study will be longitudinal and subject participation is voluntary. It is anticipated that the number of subjects may diminish due to attrition, voluntary withdrawal, or fail to complete all necessary data collection activities.

Assumptions

CT is essential to sound clinical judgment and safe patient care (Fero et al., 2008). New graduate nurses lack the social maturity, organizational, investigative, communicative, evaluative, and developmental skills essential to being effective in hospital environments (Duchscher, 2008). These constructs are consistent with Facione et al.'s (1994) definitions of CT dispositions. CT skills can be developed through instruction (Martin, 2002). Nursing schools are expected to include CT skills

as a curriculum outcome and provide learning environments that develop CT dispositions (Berkow et al., 2008).

Summary

CT is widely accepted as being a construct essential to sound clinical judgment in nursing practice. Because of its essentialness to competent nursing practice, schools of nursing are expected by accrediting agencies, as well as institutions where graduate nurses will begin their careers, to possess basic competencies in CT. The organizing framework of this study is Facione et al.'s (1994) definitions of CT dispositions. The purpose of this study is to determine if CT dispositions change as nursing students' progress through the curriculum and if there is a relationship between CT abilities and other indicators of competency. This is a partial replication of Stewart and Dempsey's (2005) study. Findings will provide information on how students' CT dispositions change over time to assist faculty with curriculum development.

Chapter II

Literature Review

CT is an essential component of clinical judgment in nursing practice. In order to evaluate the effectiveness of curriculum, faculty in schools of nursing need to track students' CT competence and link it to other measures of student performance. The purpose of this study is to determine if CT dispositions of baccalaureate nursing students change from sophomore to senior level and if CT dispositions have a relationship to GPA and ERI-RN Assessment scores.

Organization of the Literature

The literature review is divided into four sections:

1. Theoretical framework.
2. Perceptions of CT and clinical decision making
3. Methods to teach CT: concept mapping
4. Predictors of CT
5. Summary

Organizing Framework

The organizing framework of this study is based upon Facione et al.'s (1994) study that examined the relationship of CT dispositions to CT. An assumption of the study was disposition towards CT is essential to the development of CT competence.

Facione et al. (1994) utilized the Facione's (1990) definition of CT. The researchers contended this definition of CT reflects competencies needed in clinical decision making, such as "reasoned consideration to evidence, context, theories, methods, and criteria in order to form a purposeful judgment and, at the same time, monitors, corrects, and improves the process through meta-cognitive self-regulation" (p. 346). The researchers also believed CT is more than skill. Critical thinkers must possess dispositions towards CT, and these dispositions must be nurtured in order for CT to mature.

Facione et al. (1994) investigated the utility of the CCTDI as a method to measure CT dispositions in nursing students. The seven subscales and applications to nursing are as follows:

1. Inquisitiveness- The intellectual curiosity and desire for learning and is essential for nurses to develop expert knowledge and competent clinical practice.
2. Systematicity- The tendency toward organized, orderly, focused and diligent inquiry and is essential for competent clinical practice. Deficits could lead to negligence in clinical practice.
3. Analyticity- The reasoning and use of evidence to resolve problems, anticipate potential difficulties, and identify situations requiring intervention. Essential for the linking of theoretical knowledge to the clinical setting.

4. Truth-seeking- The eagerness to seek the best knowledge within a given context and being object regarding findings, even when findings fail to support preconceived opinions. Deficits could lead to nursing practice transitioning to habit, failure to identify and implement best practice and evidence, or recognize changes in patient condition.
5. Open-mindedness- The ability to tolerate divergent views with sensitivity to personal bias. The lack of this ability may result in culturally incompetent care and lead to disenfranchisement of individuals or groups.
6. Self-confidence- The ability to trust personal judgment and facilitate problem resolution. The level of self confidence must coincide with the other CT dispositions and subject matter expertise. Overcompensated self-confidence may lead to acting without appropriate knowledge or caution. Under-compensated self-confidence may lead to the failure to take appropriate action.
7. Maturity- The ability to understand that some problems are ill-structured, may have multiple resolutions, require judgments based on standards or evidence, or lack certainty. Maturity is a required disposition when making time-pressured ethical decisions and in developing clinical expertise (pp. 346-347).

This framework is appropriate for this study because CT dispositions are essential to CT skill development (Facione et al., 1994; Profetto-McGrath, 2003) and curriculum designed to include critical thinking development improves clinical judgment competencies (Martin, 2002).

Perceptions of Critical Thinking and Clinical Decision-Making

A precise definition of CT as it applies to nursing does not have consensus. To facilitate the development of CT in nursing students, nursing educators must develop a working definition. In a qualitative study by Walthew (2004), the researcher proposed that most theories of CT lack key elements that are unique to nursing. The purpose of this study was to investigate nursing school instructors' perceptions and conceptual evaluation of nursing students' CT ability.

Constructivism was used to guide Walthew's (2004) research. Twelve nurse educators from an urban university in New Zealand participated. Ten were female, two were male. Selection criteria for study participants included possessing 10 or more years of teaching experience and having held senior level positions in a variety of health care environments. Data were collected through individual semi-structured interviews approximately 1 hour in length. Each interview was conducted by the same researcher. Participants discussed student work that demonstrated CT.

Research questions asked were:

1. In your own words, can you tell me what you understand by the concept of CT?

2. What is it about this piece of work that leads you to think the student is thinking critically?
3. What did you observe the student doing in the clinical area that made you think he or she was thinking critically? (p. 409).

Interviews were audio taped and transcribed. The transcriptions were reviewed to evaluate the presence of patterns and themes. In addition, an interpretive description of emerging themes was developed and supported by actual excerpts from the interviews.

All participants identified rational, logical thinking as a central requirement for CT in nursing. Logical thinking included the attributes of “information gathering, recognizing patterns, linking theory to practice, analyzing the situation, presenting arguments, and problem solving” (Walthew, 2004, p. 409). Some participants conveyed the belief that the nursing process stifled creativity and was linear in its approach to problem solving. Another recurrent theme focused on attitudes and dispositions. To be an effective critical thinker in nursing, an incumbent must possess a sense of curiosity and openness. CT is essential to taking action and is not just a mental exercise (Walthew, 2004).

Some concepts essential to CT in nursing were traceable to feminist views. The concepts of subjective knowing and intuition, contextual knowing, and emotions were frequent components of CT in nursing. It was through intimately experiencing situations with keen interest, curiosity, and flexibility that essential knowledge was gained in order to intuitively approach and respond to a present or future situation.

However, one participant stated that intuition must be challenged at times and that intuition is not the same as a habitual response to perceived recurrent stimuli (Walthew, 2004).

Another variant in CT that applied to nursing was contextual knowing and connecting. While CT emphasizes rational thinking, within the nursing context, relationships and emotions were often a component of CT. In nursing, prior to applying rational skills, an agreement and understanding of needs must first take place between all parties. This receptivity was a component of caring. It was through this connection that CT was used to arrive at nursing decisions (Walthew, 2004).

Many participants described attributes that could be essential to CT in nursing. Attributes which were not recognized by most models of CT included: listening, empathizing, sensing, and female ways of knowing. Because of this, many of the standardized tools used to assess CT were considered inadequate to analyze CT as it related to nursing (Walthew, 2004).

Walthew (2004) concluded since an adequate definition of CT in nursing lacks consensus, educators may be less able to teach and assess CT skills of students. The researcher reiterated the importance of the development of a clear concept of CT in nursing and indicators of its constituent components. The researcher recognized that the sample size of this study was small and recommended the study be replicated in other educational institutions.

How competence in clinical decision-making is developed and assessed in an educational setting lacks understanding. Research by Baxter and Rideout (2006) investigated the effect that experience, knowledge, locus of control, and confidence had on student decision-making. The purpose of this qualitative study was to determine how decision-making activities of baccalaureate students in the second year of nursing school were reached. The four outcomes this study was to achieve were:

1. Discover how second-year baccalaureate nursing students determine the need to make a clinical decision.
2. Determine how nursing students respond to a pending clinical decision.
3. Discover the types of decisions nursing students make in the clinical setting.
4. Explore the factors that enhance or impede the decision-making process (p. 122).

Data were collected from 12 second-year baccalaureate nursing students completing the first clinical rotation on either a gynecological surgical unit or an orthopedic surgical unit within a large metropolitan hospital located in Ontario. Students were required to provide direct patient care for 7 hours per week for 12 weeks. Clinical faculty were assigned to the two inpatient areas to provide support, facilitate learning, and give timely and informative feedback to the subjects (Baxter & Rideout, 2006).

Data collection methods used in Baxter and Rideout's (2006) study included student journaling and unstructured interviews. Student subjects were to describe clinical decisions made related to the actual provision of care to patients. Specific instructions were:

1. Look back at an experience or event that happened during your clinical day. Review it in your mind as if you were watching a video.
2. Elaborate and describe in writing what happened.
3. Analyze and describe, in writing, your thoughts and feelings as you encountered and responded to this clinical situation.
4. Reflect and describe what you feel you did well in this situation and what you feel you could have done better.
5. Next time, how would you handle the same situation? (p. 122).

Data from the clinical faculty were collected through semi-structured interviews. The interviews were audio taped and transcribed for analysis. Inductive analysis was used to identify themes and topics that were consolidated into related categories from the data. Categories were further analyzed to determine that all pertinent information had been included and redundancy eliminate. The three categories used to present findings were student-patient encounter, student-nursing staff encounter, and student-clinical instructor encounter (Baxter & Rideout, 2006).

Student-patient encounter findings were the most complex and clinically sensitive. Students viewed patients as a source of help, conflict, fear, intimidation, and knowledge. Patients influenced decisions often with the priority of reducing

conflict and pleasing the patient, even if the final decision resulted in unsafe patient care. Rarely were students able to make an independent clinical decision due to an emotionally-based lack of confidence in abilities. Another finding was students relied on previously gained knowledge in clinical decision-making. The lack of knowledge was a stimulus to seek guidance from the clinical instructor or nursing staff (Baxter & Rideout, 2006).

Students' reasons for seeking nursing staff for consultation were to determine the need for a clinical decision, what the clinical decision should be, ascertain essential information, and seek support. Students' responses on this category indicated interactions with nursing staff were positive, negative, intimidating, and confusing. Regardless of the encounter, it often resulted in impacting the students' self-perception of knowledge and ability. No data supported that students' gained knowledge through the encounters. Students frequently perceived barriers that either hindered or discouraged approaching nursing staff. After the encounter, students had to discern if the information obtained was useful in taking appropriate action (Baxter & Rideout, 2006).

Clinical instructors were perceived by students as a source of information, help to establish priorities, and aid in understanding complex clinical situations to aid students in clinical decision-making. Students approached the clinical instructors primarily to confirm nursing rationale for actions, provide emotional support, or intermediate between student and nursing staff. Lastly, if students believed the

clinical instructor was supportive, students were more likely to make clinical decisions (Baxter & Rideout, 2006).

The conclusion of Baxter and Rideout's (2006) study was that decision-making in the clinical setting is a complex process. To enable students to improve clinical performance, students should be instructed on how to respond to conflict, intimidation, and fear, in addition to the roles of the patient, nursing staff, and the clinical instructor.

Clinical judgment is required by professional nurses, and is manifest when nurses consider a variety of conflicting and complex factors in the decision making process. Lasater (2007) believed clinical judgment was particularistic and situational specific and the validity of using self-report measures to assess clinical judgment was questionable. Because of this, high-fidelity simulation may be a means of developing and assessing clinical judgment skills in nursing students. The purposes of Lasater's (2007) study were:

1. Describe the students' responses to simulated scenarios, with the framework of Tanner's (2006) Clinical Judgment Model.
2. Develop a rubric that describes levels of performance in clinical judgment.
3. Pilot test the rubric in scoring students' performance (p. 496).

Lasater (2007) used Benner, Tanner, and Chesla's (1996) definition of clinical judgment. Benner et al. (as cited by Lasater) defined clinical judgment as the mechanism nurses use to understand problems, issues, or concerns of clients, to attend to salient information and to engage in appropriate responses. The conceptual

framework was Tanner's (2006; as cited by Lasater) four stages of clinical judgment, defined as noticing, interpreting, responding, and reflecting. This model relies on a variety of reasoning processes, including analytical, intuitive, and narrative, which involves reflection upon choices made and actions taken.

Lasater (2007) utilized a quantitative-qualitative design, which incorporated a description-observation-revision-review method of data collection and analysis. Data were collected on 48 third-term junior level nursing students. Fifty-three qualitative observations involving 39 students were used in the initial development of the Lasater Clinical Judgment Rubric (LCJR). At the end of the study a focus group of eight participants convened to further evaluate the findings.

Data collection took place over a 7 week period. Before the data collection began, the simulation facilitator and researcher benchmarked the best and worst behaviors that students could display on each of the four stages of the LCJR. Data collected during the first 5 weeks were used to refine and define descriptors by the researcher, facilitator, and clinical judgment experts. During the 4th and 5th week, 26 students were scored using the LCJR and further refinement of the rubric was done. Each simulation was carried out in two phases: (a) the actual simulation that involved students through active participation or observation of a contextual patient scenario and (b) holding debriefing sessions to allow students to critically think about and discuss the simulation experience. Each week four groups of 12 students participated in a 2.5 hour simulation. Each group was divided into four patient care teams of three subjects. As each team executed the simulation, the other nine subjects were able to

observe the simulation from a debriefing room. Responsibilities rotated throughout the term, so each subject was able to participate in the simulations serving as the primary care nurse (Lasater, 2007).

The LCJR scores from the 26 students during the 4th and 5th weeks were analyzed using descriptive statistics and ANOVA. The independent variables were day of the week, time of day, scenario order, team composition, and size of team. The dependent variable was that clinical judgment scores of students assuming the primary nurse role during simulation. The mean clinical judgment scores of students assuming the primary nurse role (n=26) was 22.68, SD=6.07, range of 5 to 33, with a possible score of 44. No significant relationships were found between the independent and dependent variables (Lasater, 2007).

From the focus group interviews, five themes emerged:

1. The strengths and limitations of high-fidelity simulation.
2. The paradoxical nature of simulation (i.e., provoking anxious and stupid feelings, yet increasing awareness).
3. An intense desire for more feedback about performance. Specifically, students wanted definitive feedback on performance, what outcomes may have occurred if decisions were followed, and what should have been done differently.

4. The importance of students' connection with others. Students believed that narrative learning developed clinical judgment, as well as working in teams. Debriefing offered reflection, and allowed others' perceptions enhanced their personal repertoire of choices.
5. Some general recommendations for improved facilitation (Lasater, 2007, p. 501-502).

The outcomes from simulations that students valued most were: focus on patient needs; using data; and evaluation options for possible responses. The use of the LCJR identified gaps in student understanding, facilitated debriefing sessions, and identified teaching points to be included in curriculum (Lasater, 2007).

Methods to Teach CT: Concept Mapping

The linking of components of the nursing process to the constructs of CT has been an issue of concern for nursing educators and researchers. Abel and Freeze (2006) evaluated the utilization of concept mapping as an instructional and assessment tool for CT of nursing students. This study was a partial replication of previous research (Daley et al., 1999). The conceptual model utilized in both studies was Ausubel, Novak and Hanesian's Assimilation Theory of Learning (1986; as cited by Abel & Freeze; Daley et al.).

Daley et al. (1999) explained the Assimilation Theory of Learning advocated that "learners shift away from behavioral learning strategies to cognitive learning strategies" (p. 43). Learning is not accomplished through memorization, but through organizing, relating, and subsuming concepts in accordance with existing cognitive

structures. When meaningful learning occurs concepts are linked together and assimilated with pre-existing knowledge in such a way that unique meanings are developed and organized.

Assimilation learning occurs in three steps. First, learners rearrange and reorder lower order concepts under higher order concepts utilizing a hierarchical strategy. Second, through analysis learners break down newly learned concepts into component or differentiated parts or concepts. This process enables the learner to differentiate concepts in the cognitive structure. Third, through integrative reconciliation, connections are sought between the previously differentiated concepts. CT involves the process of purposeful, self-regulatory judgment that takes into account evidence, contexts, conceptualization, methods, and other criteria to arrive at a meaningful conclusion (Daley et al., 1999).

Daley et al. (1999) conducted a study on the value of using concepts maps.

Research questions were:

1. Can concept maps be used to both teach and evaluate CT in nursing education?
2. Will concept maps measure changes in students' critical-thinking abilities over the course of a semester?
3. How do faculty and students evaluate the use of concept maps in nursing education? (p. 44).

Fifty-four senior nursing students from six clinical groups participated as subjects and were taught to use concept maps as a learning tool. Students were provided instructions on the how to complete concept maps. After the introductory session, each student completed a map based on a case study and discussed the content with the group to ensure all students had a basic understanding of concept mapping. During the course of the semester, each subject completed a total of three additional maps based upon client care experiences (Daley et al., 1999).

At the end of the semester, three students from each clinical group were randomly selected ($n=18$), and the first and third concept maps were scored. The awarding of points was based upon “the demonstration of hierarchical organization of the map, the progressive differentiation of concepts, and the integrative reconciliation of the concepts” (Daley et al., 1999, p. 44). Reliability was established by two separate expert raters on each concept map, resulting in an inter-rater reliability coefficient of .82.

The results indicated significant improvement in concept mapping over time. The mean scores on the first map was 40.38 and on the last map 135.55 ($t = -5.69, p = .001$). However, students believed the maps were time consuming, found difficulty with demonstrating concepts and relationships on paper, and if introduced earlier may have been better accepted (Daley et al., 1999).

Faculty believed concept maps had utility as a learning and assessment tool. With concept maps, faculty could see the development of the students' thinking processes, identify unsafe practitioners, and identify for correction misperceptions of students (Daley et al., 1999).

Abel and Freeze (2006) arrived at the following assumptions regarding learning and CT:

1. Learners organize information based on previous knowledge, past experiences, and the context of the current situation to create and construct knowledge by linking concepts in unique ways.
2. Understanding the meaning of CT provides a basis for developing and evaluating nursing education strategies.
3. CT is the deliberate logical reasoning and linear and nonlinear thinking used to analyze, synthesize, and evaluate relationships between components of the nursing process for the purpose of self-regulatory judgments and clinical decision making.
4. Nursing process consists of assessment, analysis and nursing diagnosis, planning for outcomes and interventions, implementation of interventions, and evaluation of outcomes to provide nursing care.
5. Components of the nursing process are consistent with the selected definitions of CT.

6. The nursing process uses CT for synthesis of current and previously attained knowledge to identify and describe client needs, nursing care, and relevant relationships among components (pp. 356-358).

The goal of Abel and Freeze's (2006) study was to determine if concept mapping could be used to develop and assess CT skills in nursing students.

Specifically, three research questions were asked:

1. Can the subjects utilize concept maps to demonstrate and describe CT and use of the nursing process in the care of their clients?
2. Can the evaluation of concept maps measure changes in CT performance over time?
3. How do subjects and faculty evaluate the utility of concept maps as a learning activity? (p. 358).

Participants included 28 associate degree nursing students. Of this group, 24 were Caucasian, 2 were African American, 1 was Hispanic, and 1 was Asian. Twenty five of the students were female, and 3 were male. The mean age was 28 years, with a range in age from 21 years to 43 years. Each student completed a total of four maps during the second (one map), fourth (one map), and fifth (two maps) semesters (Abel & Freeze, 2006).

Two evaluators participated in this study. The same scoring criteria were used by each evaluator in the evaluation of each concept map. Each map was evaluated by both evaluators. The scoring involved awarding points for the appropriate application of propositions (1 point each), demonstrating a hierarchy from general to specific

approach to care (5 points for each level), cross-linking one segment of the hierarchy to another segment (10 points each), and the utilization of examples to describe a specific instance of the application of a concept (1 point each) (Abel & Freeze, 2006).

Inter-rater reliability was determined from a pilot study using the same scoring criteria and the same instructor evaluators. Independent scores were obtained on 51 subjects. The percentage of agreement between the two evaluators regarding the independent scores was 85%. In addition, intrarater reliability for each evaluator was 97% and 94% (Abel & Freeze, 2006).

Students were given guidelines for an acceptable concept map that included: the utilization of assigned concepts (e.g. client physiological and psychological needs); the arrangement of concepts in hierarchal order; linking of concepts by arrows and proposition or linking words; and, the identification of valid cross-links or relationships among presented concepts. In addition, each map was evaluated for validity and content sufficient for safe care prior to being scored. According to the researchers, “the nursing process steps of assessment, analysis and nursing diagnosis, planning for outcomes and interventions, implementation, and evaluation were evident in both maps” (Abel & Freeze, 2006, p. 361).

The findings were congruent with the assumptions. Over the course of time, cross link scores improved from a mean of 89, median of 80, and range of 30 to 140 on the first map submission during the second semester to a mean of 159, median of 140, and a range of 50-390 on the third map submission during the fifth semester. Total concept map scores improved from a mean of 73, median of 72, with a range

from 88 to 253 on the first map to a mean of 263, median of 249, with a range of 135-489 on the third map (Abel & Freeze, 2006).

Abel and Freeze (2006, p. 362) stated that “the maps reflected a holistic perspective of the clients and meaningful relationships in client care.” The evaluators found that the maps were useful in understanding student utilization of pathophysiology, diagnostic tests, and the components of the nursing process in the maps. Maps provided a quick identification of student misunderstandings of key concepts or lack of knowledge. Over time, the increased use of cross-links indicated an increased knowledge of the interrelationships of concepts, improved CT ability, and improved understanding of client care. Sixty-four percent of students stated concept mapping should be used in addition to traditional nursing plans. Some students experienced frustration and apprehension about the assignments, and the researchers contended this was due to “the difficulty some students have in moving from linear to nonlinear thinking” (Abel & Freeze, p. 363).

Abel and Freeze (2006) presented multiple definitions of CT concepts and strong similarities to nursing process concepts. Findings showed that as participants gained didactic and clinical experiences, concept maps became more detailed and the nursing process/CT applications became more apparent.

Predictors of Critical Thinking

CT is an essential component to clinical judgment. Knowledge of nursing students’ CT skills and CT dispositions is important in the design, delivery, and evaluation of curriculum. Bowles (2000) investigated the relationship between CT

and clinical judgment and if age, years in college, and GPA were related clinical judgment. The researcher employed a correlational design that explored relationships among the variables. A convenience sample of nursing students from two public colleges in Northern California was solicited. From 128 enrolled students, 68 initially participated. Three withdrew for personal reasons, leaving 65 (50%) in this sample. Subjects were in the final semester of a baccalaureate nursing program. Only students without health care licensure were included. From this sample, ages ranged from 22 to 50 years, GPA ranged from 2.8 to 4.0, and number of years in school ranged from 4 to 12 years (Bowles, 2000).

The CCTST Form A was used to measure CT. This instrument was based on a Delphi study that conceptualized CT. It is comprised of 34 multiple choice items. It provides an overall CT score and scores on the subscales of analysis, inference, evaluation, inductive reasoning, and deductive reasoning. This instrument has an internal consistency reliability estimate based upon a Kuder Richardson-20 between .68 and .70. The researchers considered a Kuder Richardson-20 between .65 and .75 to be acceptable (Bowles, 2000).

To measure clinical judgment, the Clinical Decision-Making in Nursing Scale (CDMNS) was used. This instrument is composed of 40 Likert-type items ranging from “always” to “never” that reflect personal behavior displayed while providing nursing care. Scores can range from 40 to 200, and the higher the score the greater perceived decision making ability (Bowles, 2000).

Results on the CCTST were analyzed. The total possible score was 34, range 8 to 27, and mean score 18.2 with a standard deviation of 4.2. The analysis subscale possible score was 9, range 2 to 8, and mean score 5 with a standard deviation of 1.4. The evaluation subscale possible score was 14, range 1 to 12, and mean score was 6.8 with a standard deviation of 2.3. The inference subscale possible score was 11, range 2 to 10 with mean score of 6.4 and standard deviation of 1.7. The deductive reasoning subscale possible score was 16, range 3 to 14, and mean score 8.9 with a standard deviation of 2.6. Lastly, the inductive reasoning subscale possible score was 14, range 1 to 12, mean 7.6 with a standard deviation of 2.1 (Bowles, 2000).

A one-tailed Pearson Product Moment Correlation procedure was used to analyze the relationship between the CCTST scores and the CDMNS scores. The correlation between the CCTST total scores and CDMNS scores was $r = .21, p < .05$, and 4% of the variance in the CDMNS was explained by the CCTST total scores, $R^2 = .04$. From the CCTST subscales, only inductive reasoning ($r = .27, p < .05$) and inference ($r = .23, p < .05$) were related to CDMNS scores. Results from the correlation between the CCTST or CDMNS and demographic data found only CCTST scores and GPA were significantly related ($r = .55, p < .00$) (Bowles, 2000).

The results of this study indicated that a relationship existed between CT disposition and clinical judgment. The researcher continued to address the need for educational institutions to utilize curriculum strategies that enhanced the development of CT skills (Bowles, 2000).

Beckie et al. (2001) proposed that CT is essential for clinical judgment. The purpose of the study was to evaluate if incorporating changes into a baccalaureate nursing program curriculum resulted in changes in student CT skills. Specific research questions included:

1. What is the difference between CT skills of baccalaureate nursing students who completed the former nursing curriculum and those who completed the revised curriculum that promotes CT?
2. What is the change over time in baccalaureate students' CT skills from entry into the junior year of an upper-division, baccalaureate nursing program, at midpoint, and at ext? (p. 20).

The study took place at a school of nursing located in west central Florida. Beckie et al. (2001) used a pretest-posttest nonequivalent control research design. The control group (cohort 1) consisted of students that completed the curriculum prior to revision. The two experimental groups (cohorts 2 and 3) consisted of students who completed the same revised curriculum. Demographic data of each cohort was as follows:

1. Cohort 1: 55 students, 89.1% female, average age 24.6 years, 77.8 had no formal CT education.
2. Cohort 2: 55 students, 81.8% female, average age 25.8 years, and 90.6% had not formal CT education.
3. Cohort 3: 73 students, 86.3% female, average age 26.4 years, and 88.7% had no formal CT education.

Additional demographic data included regarding all subjects was 66.3% were single and 72% were Caucasian.

Students from all cohorts were given the CCTST Form A on the first day of the Introduction to Clinical Judgment course. This test measures CT ability. It is comprised of 34 multiple choice items that provide a total score and five subscale scores of analysis, evaluation, inference, deductive reasoning, and inductive reasoning. Items are dichotomous, and a correct response is scored as 1, and an incorrect response is scored as 0. Previously established Kuder-Richardson-20 internal reliability estimates were .68-.70 (Beckie et al., 2001).

Forty-five minutes were allotted for test-taking. Mid-point testing took place at the beginning of the subjects' senior year using the same process and procedure. Exit testing took place during the senior year after the completion of all coursework using the same process and procedure (Beckie et al., 2001).

Beckie et al. (2001) used a revised curriculum as the treatment. Revisions to the curriculum were linked to teaching CT. In the didactic environment, new teaching methods included: cooperative learning groups; Socratic questioning; using student learning contracts to establish grading; and, reflective journal writing. In the clinical environment, new teaching methods included: actively caring for patients; preparing and presenting case studies; and self-evaluation and peer-evaluation techniques.

Internal consistency for each cohort was established using the Cronbach alpha, which ranged from 0.55 to 0.83. Using repeated measures ANOVA showed significant differences in total CCTST scores ($F=10.04, p<.001$). Differences were found on the following subscales: analysis ($F=7.96, p<.001$), inductive reasoning ($F=9.28, p<.003$), inference ($F=7.96, p<.001$), and evaluation ($F=8.06, p<.001$). After removing the effects of repeated testing, only cohort 2 showed statistically significant higher scores than cohort 1. Results were: total score ($F=18.58, p<.001$), inductive reasoning ($F=16.37, p<.001$), inference ($F=12.98, p<.001$), and evaluation ($F=18.70, p<.001$) (Beckie et al., 2001).

Cohorts were combined to determine if CCTST scores changed significantly over time and yielded the following significant results: total score ($F=4.80, p<.00$); analysis ($F=4.78, p<.009$); and inference ($F=18.49, p<.000$). A test for cohort interaction was significant for total score and all subscale scores, with F values ranging from 6.20 to 10.40, and p values ranging from .000 to .003. Differences in subscale scores over time were determined by comparing test 1 to test 2, test 1 to test 3, and test 2 to test 3. Test 2 was significantly different than test 1 only on the inference subscale ($F=16.09, p<.000$). Among cohorts, only changes in the inductive reasoning subscale score were significant ($F=5.72, p<.004$). Test 3 was significantly different than test 1 on total score and every subscale (F values ranged from 4.49 to 13.03, and p values ranged from .000 to .013), cohort 1 scores remained statistically unchanged, cohort 2 improved significantly, and cohort 3 dropped significantly. No significant differences between test 2 and test 3 were found (Beckie et al., 2001).

Beckie et al. (2001) found conflicting results regarding the relationship between CT and teaching methods. The researchers suggested that the performance of cohort 3 could have been impacted by life transitions, such as not having CCTST testing performance influencing the course grade, being distracted by graduation and upcoming NCLEX-RN examination, and having a tendency to be negatively motivated.

Stone et al. (2001) were concerned about the goodness of fit of accepted definitions of CT and standardized measurement tools to nursing. Particular concerns included: subject matter specificity; generalizability across disciplines; integration of general concepts to a specific discipline; and, the knowledge and context necessary to utilize CT effectively. The purpose of the study was to examine evidence justify the use of the CCTST and the CCTDI to measure nursing students' CT. As stated by the researchers:

This study examined the extent to which the test reflects the CT domain that is important to nursing (content evidence), as well as the extent to which critical-thinking scores are consistent with other outcomes reflecting the construct of CT (convergent evidence) and irrelevant outcomes (divergent evidence) (p. 66).

To determine content evidence, a survey was developed that reflected skills and dispositions measured by the two forms of the CCTST. Respondents were asked to indicate the strength of the belief that listed skills and dispositions were: (1) not essential; (2) somewhat essential; (3) essential; or (4) absolutely essential to

competent nursing. Respondents were then asked to indicate the five most important criteria to competent nursing. Next, respondents were asked about current methods by which CT skills were measured and strength of agreement with the measurement actually reflecting critical-thinking skills of nurses. Lastly, data were collected from respondents regarding demographic information, beliefs regarding the formal evaluation of student critical-thinking skills, and opinions regarding the type of tests currently used to evaluate student critical-thinking skills. No reliability and validity data from previous studies was listed (Stone et al., 2001).

In the spring of 1999, 632 surveys were sent to the Deans or Department Chairs of each nursing program accredited by the National League of Nursing (NLN) for schools offering baccalaureate and higher degrees. Of 632 surveys distributed, 338 were completed and returned. From this sample, the following degrees were offered by the 22 participating programs: associate (12%), baccalaureate (85%), RN completion (68%), master (51%), and doctoral (9%) (Stone et al., 2001).

Over 50% of the respondents believed the concept of CT was moderately integrated into the curricula of the participating programs. Almost all respondents reported it was important to formally evaluate the critical-thinking skills of students. The most commonly used tool was the CCTST, with 35% of respondents using this instrument to measure CT skills of students (Stone et al., 2001).

Results from the CCTST, the mean and percentage of respondents who believed the measure was essential or absolutely essential were calculated. The range for each subscale is 1(not essential) to 4 (absolutely essential). Results for

items on the analysis subscale were: categorize or organize information (3.7, 96%); decode the significance of information (3.7, 96%); clarify meaning (3.7, 97%); examine ideas (3.5, 94%); detect arguments (3.1, 83%); and analyze arguments (3.3, 88%). Results for items on the measurement of inference subscale were: identify or obtain necessary evidence for an argument (3.4, 91%); form alternative hypothesis (3.5, 94%); draw conclusions (3.7, 97%); examine ideas, explanations, results, and biases (3.7, 97%); and correct ideas, explanations, results, and biases (3.5, 94%). Results for items on the measurement of evaluation subscale were: assess claims or judge credibility of information (3.7, 97%); evaluate arguments (3.4, 90%); state or present results (3.5, 94%); justify procedures (3.5, 91%); and present arguments (3.4, 89%). The five most important skills for nurses were: decode the significance of information; draw conclusions; categorize or organize information; examine ideas, explanations, results, biases, etc.; and, assess claims or judge credibility of information (Stone et al., 2001, p. 68).

Next, seven generic test items associated with three of the subscales from the CCTST were evaluated for the appropriateness of measuring CT skills of nurses. Data were collected via a Likert-type scale with values from 1 (not at all) to 4 (a great deal). Five items had a mean between 2 and 3, and the remaining 2 items had a mean greater than 3, indicating that respondents believed that test items on the CCTST, for the most part, only moderately reflected CT in nursing (Stone et al., 2001).

Pertaining to the 13 traits or characteristics measured by the CCTDI, the mean and percentage of respondents who believed the measure was essential or absolutely essential were calculated. The range for each subscale is 1 (not essential) to 4 (absolutely essential). The results were: able to consider and revise one's views (3.5, 94%); fair in evaluating or selecting and applying criteria (3.4, 93%); flexible in considering alternatives and opinions (3.5, 94%); tolerant and understanding of the opinions of others (3.5, 94%); open-mindedness regarding divergent world views (3.4, 89%); sensitive to personal biases (3.6, 96%); alert to potentially problematic situations (3.6, 96%); use reasoning and fact-finding to resolve conflicts (3.5, 96%); disposed to systematic, orderly, and focused inquiry (3.4, 92%); diligent in seeking relevant information (3.6, 97%); self-confident in one's own ability to reason (3.3, 91%); inquisitive with regard to a wide range of issues (3.3, 87%); and concern to become and remain well-informed (3.6, 94%). Regarding the identification of the five most important traits, the broad range of options made it impossible to identify those five traits. However, the two traits that were the most relevant were "concern to become and remain well-informed" (55%) and "flexible in considering alternatives and opinions" (45%) (Stone et al., 2001, p. 70).

Stone et al. (2001) also investigated if scores on critical-thinking measurement tools had a relationship to verbal and math SAT scores, GPA, GPA based solely on grades received for the didactic portion of clinical courses, and NCLEX-RN outcomes. Students were seniors in a BSN program from the School of Nursing, University of Pittsburgh, from 1996 to 1999. A total of 238 students participated and

were administered tests, 226 completed only the CCTDI, 150 completed only CCTST form A, and 34 completed only the CCTST form B. Only the psychometric properties of the CCTST were analyzed for the 150 students who completed form A. Due to incomplete responses, 15 cases were deleted from the analysis.

Of the sample, 83% were female and 94% were Caucasian. The average proportion of correct responses was less than .5, the alpha reliability was .61 for the total score, and the alpha value for the analysis subscale was .20, for the evaluation subscale was .32, and for the inference subscale was .43. These findings were inconsistent with those reported in the CCTST test manual (Stone et al., 2001).

Regarding the CCTDI psychometric properties, the mean score across the 75 item, 6 point Likert scale was 4.4. The alpha reliability was .89, which was consistent with the CCTDI test manual. The alpha for the subscales ranged from .54 to .76. CCTST total scores and subscores were the only variables that showed correlations significant at the $p < .01$ level. The correlation coefficient to SAT verbal was .39, SAT math was .47, GPA was .30, and GPA for didactic courses was .29. Correlations between the CCTST subscales and the other measures were significant and ranged from .24 to .67. A t -test analysis between CCTST scores of students who passed the NCLEX-RN on the first attempt ($n=108$) and students who did not pass on the first attempt ($n=12$) showed no significant difference (Stone et al., 2001, p. 72).

Stone et al. (2001) evaluated the utility of using standardized CT instruments to measure critical-thinking skills of nursing students. The content analysis supported that the traits and skills incorporated in the measurement tools were essential or

absolutely essential components to nursing competency. However, the subject matter experts indicated that the CCTST-like items, in general, only moderately reflect CT as it applied to nursing. CCTST scores did correlate to other measures, with the strongest relationship existing with SAT scores, not class room performance. CCTDI scores showed no relationship to other measures of competency.

Stone et al. (2001) concluded there was support for a framework to test for CT but support diminishes concerning the way the construct is actually measured. If empirical evidence fails to support the use of general measurement tools for CT in nursing students, nursing programs need to reexamine how CT competencies should be evaluated.

According to Martin (2002), CT is a thought process that is essential for clinical decision-making. The purpose of this descriptive correlational study was to determine the relationships among CT, clinical-decision making, and clinical expertise. The theoretical framework Benner's Novice to Expert Theory (1984; as cited in Martin) and Paul's Critical Thinking Theory (1992; as cited in Martin). Benner's theory proposes nurses pass through four levels of expertise, which are novice, advanced beginner, competent, and proficient, prior to becoming experts. Paul indicated (as cited by Martin) "CT occurs when a person thinks systematically and continually probes for and evaluates additional information in a dialectic, reflective manner that often leads to a decision" (p. 244). In addition, Paul believes "CT consists of four domains that include elements of thought, abilities, affective dimensions, and intellectual standards" (as cited by Marin, p. 244). Based on the two

theories, Martin developed the midrange Theory of Critical Thinking, which proposed nursing students and nurses develop expertise through the use of knowledge and gaining experience. In addition, CT is developed and used to make sound clinical decisions.

Specific research questions asked by Martin (2002) were:

1. Is there a difference in CT, as conceptualized by Paul, among nursing students, graduate nurses, and expert nurses representing differing levels of clinical nursing expertise as defined by Benner?
2. Is there a difference in CT among nursing students, graduate nurses, and registered nurses prepared at associate degree in nursing (AD) and Bachelor of Science in nursing (BSN) levels?
3. Is there a difference in quality of decisions made during a clinical simulation among the levels of clinical expertise of nursing students, graduate nurses, and expert nurses?
4. What are the relationships among demographic variables (age, college-level GPA, college credits, additional degrees, area of clinical nursing expertise, years of experience in nursing, nursing certification, CT course), CT, and decision-making? (p. 244).

The study took place in the Midwestern United States. A stratified convenience sample was comprised of 149 students and nurses selected from a list of 300 potential subjects provided by various nursing schools and health care agencies. From this population, 149 voluntarily agreed to participate. Subjects included 27

ADN and 20 BSN students enrolled in the first clinical course; graduate, but not yet licensed, nurses from ADN programs (n=28) and BSN programs (n=20); and 54 expert nurses employed in health care agencies who had at least 5 years clinical experience in the current field of practice and supervisors' considered to be experts.

Of the students and graduates, 20% held other degrees prior to enrolling in nursing school. Of the expert nurses, 24 held specialty certifications, collectively represented seven different service specialties, and had a mean of 12.17 years of experience in current specialty area. Thirty had graduated from either an ADN or diploma program, and 24 had graduated from a BSN program. Six had completed a CT course. The demographic profile included: 136 subjects were female, 13 were male; student and unlicensed graduates ages ranged from 17 to 56, with 84% between the ages of 17 and 36; expert nurses ranged in age from 25 to 56, with 96% between the ages of 27 and 56; GPA's across all groups ranged from 2.3 to 4.0, with 91% having a GPA of 3.0 or higher. Fifty-five percent had previous experience in the health care field prior to enrolling in a nursing program, and current student subjects had accumulated a mean of 42.5 credit hours prior to starting a nursing program (Martin, 2002).

Martin (2002) used the Elements of Thought Instrument (ETI) to measure CT. It is comprised of 38 continuous points using intellectual standard adjectives that describe CT. A three-point Likert-type scale was used to categorize each adjective, providing a range in scoring from 38 to 114. The Cronbach's alpha for the ETI was 0.96 with an intrarater reliability of .96. Another instrument was developed that rated

the appropriateness of decisions made, with a score of 1 indicating no decisions were identified, and a score of 5 indicating most of all possible decisions were identified.

During the initial data collection phase, each participant privately viewed one of five simulation videotapes, 1 to 2 minutes in length. While viewing, each participant was requested to verbalize into a tape recorder everything that came to mind related to making a decision about the clinical problem presented in the videotape. The ETI was used to establish a CT score from the audiotapes, in addition to a decision score based upon ETI results. Scoring of audiotapes was done again 4 weeks later to establish scoring consistency (Martin, 2002).

Martin (2002) used a descriptive correlational design to investigate characteristics of CT and the quality of decisions made. Independent variables included level of education, descriptors of clinical nursing expertise, and demographic variables. Dependent variables were ETI scores and total decision scores. To address the first research question, an ANOVA indicated ETI scores significantly increased as level of expertise increased ($F(2,144)=11.79, p<.001$). A Student-Newman-Keuls indicated that each group significantly differed from the other two groups at the .05 level. Regarding the second research question, results from a *t*-test found that ETI scores between ADN and BSN students, graduates, and expert nurses were not significantly different ($t(147)=.93, p=.36$).

Using ANOVA, a progression of mean decision scores was found, with the lowest means at the student level, and the highest means at the expert level ($F(2,149)=11.114, p<.0001$). A Student-Newman-Keuls test indicated that each

group's expertise level was significantly different from the other two. Decision scores were correlated with ETI scores ($r=.70, p<.000$). Participants' ages, GPA's, and years in nursing were significantly related to ETI and decision scores. Participants who had taken a CT course were found to have increased scores on the CT measurement instruments (Martin, 2002).

Martin (2002) pointed out that the relationship of GPA to CT measurement was skewed, since only 14 participants had GPA's less than 3.0 due to admission and graduation requirements for most schools. The finding that years of experience were strongly related to CT measurements supported Benner's theory.

Sound clinical judgment is dependent on a high level of critical thinking. In order to develop critical thinking skills, critical thinking dispositions must be present (Facione et al., 1995). The purpose of Proffeto-McGrath's (2003) research was to determine if CT skills had a relationship CT dispositions. The theoretical framework was Facione and Facione's (1990) definition of CT attributes and CT dispositions. Proffeto-McGrath asked the following questions to guide research:

1. What are the CT skills and CT dispositions of baccalaureate nursing students?
2. Do baccalaureate nursing students' CT skills scores and CT disposition scores differ according to the number of years in the programme?
3. Is there a relationship between baccalaureate nursing students' CT skills scores and CT disposition scores? (p. 571).

The study took place within a 4 year baccalaureate program at a university in western Canada. The sample consisted of 268 full time nursing students (41%) who volunteered to participate from 649 full time students. Demographic characteristics included: 89.5% were female; mean age of 22.6 years; 45% had a high school education prior to admission; 29% had completed university level; and 26% had completed some college courses or had a diploma, certificate, or baccalaureate degree in another field. The data were analyzed and results found the sample was comparable to the nursing student population. Lastly, students in year 1 totaled 38, year 2 totaled 53, year 3 totaled 57, and year 4 totaled 80 (Profetto-McGrath, 2003).

The CCTST and the CCTDI were used to measure CT skills and CT disposition. The CCTST is comprised of 34 questions, each with four possible responses, one of which is correct. Scores can range from 0 to 34, with higher scores indicating stronger skills in CT. In addition to a total score, scores on the following five subscales were calculated: analysis, evaluation, inference, deductive reasoning, and inductive reasoning. The Kuder-Richardson 20 internal consistency reliability for the CCTST ranged from 0.68-0.70.

The CCTDI consists of 75 declarative statements, using a 6 point Likert type scale, with 1 indicating strongly agree and 6 indicating strongly disagree. Responses were used to generate a total score and seven subscale scores, which were: truth-seeking, open-mindedness; analyticity; systematicity; confidence; inquisitiveness; and maturity. The maximum total score is 420, and scores on each subscale can range from 5 to 60. Total scores above 350 indicate a strong disposition to CT. Scores

between 280 and 350 indicate a positive inclination toward CT. Scores less than 280 indicate an overall deficiency towards CT. The overall Cronbach alpha internal consistency reliability and overall instrument alpha reliability were 0.91, and the Cronbach alpha coefficients of the seven subscales ranged from 0.64 to 0.84 (Profetto-McGrath, 2003).

Profetto-McGrath (2003) utilized a non-experimental cross sectional design. Data were collected at the same time from four separate cohorts that were enrolled in years 1 through 4 of the nursing program. Prior to collecting CCTST and CCTDI data, subjects were asked about CT and logical reasoning, with 46.1% indicating “extremely important,” 39% indicating “more important than most other things,” and 14.5% indicating “helpful, but not nearly as important as lots of other things” (p. 573).

For the CCTST, the mean was 17.4 and the range was 16.7-17.9 out of possible 34. Mean scores increased from years 1-4, except for year 3. There was no statistically significant difference between cohorts on the CCTST ($F=1.234$, $d.f.1=3$, $d.f.2=224$, $p=0.295$). For the CCTDI, the score ranged from 136 to 392, 1.8% scored less than 280, 85.5% scored between 280 and 350, and 12.7% scored above 350. There was no statistically significant difference between cohorts on the CCTDI ($F=0.822$, $d.f.1=3$, $d.f.2=224$, $p=0.483$). Results on the CCTDI subscales, out of a possible score of 60, the lowest mean score was on truth seeking (37.6) and the highest mean scores were on inquisitiveness (48.9) and open-mindedness (46.5). The only subscale which showed a statistically significant difference between cohorts was

systematicity ($F=3.582$, $d.f.1=3$, $d.f.2=224$, $p=.015$). The scores on this subscale were higher on the cohorts in years 3 and 4. Using the Chi squared test, CCTST and CCTDI scores were significantly related ($\chi^2=9.37$, $p=.014$, $\text{power}>.80$) (Profetto-McGrath, 2003).

Profetto-McGrath (2003) suggested that cognitive development of CT requires more time than 4 years to complete a baccalaureate degree. Results could be related to the cognitive development or other characteristics of the sample. There was concern that most students' scores showed an ambivalent or negative inclination towards truth seeking, since the lack of this disposition could endanger the well being of patients. The improvement in the systematicity subscale could be attributed to students gaining organizational and research skills.

Stewart and Dempsey (2005) made assumptions regarding the application of CT to nursing. First, CT skills and clinical judgment are a priority of nursing programs. Second, a CT disposition is related to CT ability. Third, possessing a CT disposition enables a person to utilize CT skills appropriately. Finally, the development of CT is an appropriate outcome of nursing education.

The purpose of Stewart and Dempsey's (2005) study was to investigate if students' CT abilities change as students' progress through the curriculum and if there is a relationship between CT abilities and other indicators of competency. Specific questions this study asked were as follows:

1. Is there a significant change in CT dispositions of baccalaureate nursing students as they progress from the sophomore level to the senior level?

2. Are there significant correlations between CT disposition; Educational Resources, Inc., (ERI) RN Assessment scores, and GPA?
3. Is there a difference in CT dispositions between those students who passed the NCLEX-RN and those who did not? (p. 82).

The participants were a group of nursing students enrolled in a baccalaureate nursing program in the Midwest region of the United States. Data collection began during the second semester of the sophomore year, and finished after students graduated and received NCLEX-RN examination results. All students enrolled participated as subjects in this study (Stewart & Dempsey, 2005).

Stewart and Dempsey (2005) utilized a longitudinal one group pretest-posttest descriptive design. Through the duration of the study, the subject pool decreased in size due to attrition of students. Second semester sophomores totaled 55, and of those 34 completed the second semester senior curriculum during the time of data collection. Of the 55 initial participants, the mean age was 22.96, the mean GPA was 3.0, 44 were single, 7 were married, and 4 were divorced.

The CCDTI was used to measure CT dispositions as students progressed through the program. Data were collected using this instrument during week 10 of each semester from Sophomore II to Senior II. This instrument is based upon the Facione's (1990) Delphi study that conceptualized CT. It is comprised 75 Likert-type items that are used to assess CT disposition along seven dimensions and provide a composite CT disposition score. The seven attributes are truth seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and maturity.

Construct validity of this instrument was established in previous research, and the overall alpha coefficient was .90, with alphas of .60 to .78 in its seven subscales (Stewart & Dempsey, 2005).

From the data collected with the CCTDI over the duration of the study, Cronbach's Alpha was performed to determine internal consistency and reliability. At the .05 level of significance, Cronbach's alpha ranged from .67 to .77 (Stewart & Dempsey, 2005).

Another instrument of data collection used by Stewart and Dempsey (2005) was the ERI-RN Assessment, which is a mock NCLEX-RN examination. Participants completed this test 5 to 6 weeks prior to graduation. The published reliability of this test is .90. The ERI RN provides a total score comprised of 32 subscales. The CT subscales included in this research were:

1. CT1: prioritizing, discriminating.
2. CT2: inferential reasoning.
3. CT3: main idea and predicting outcomes.
4. CT4: application and knowledge.
5. CT5: evaluating predicted outcomes (p. 83).

Student grade point averages (GPA's) were collected from records. NCLEX-RN pass/fail status was collected after students graduated and received testing results (Stewart & Dempsey, 2005).

Regarding research question one, a one-way ANOVA was utilized to compare CCTDI subscale and composite scores as students progressed through each semester

form Sophomore II to Senior II. The results were significant for the total CCTDI score and five of the seven subscales across the five observations. Results for only four subscales and total score were provided. These results were: open-mindedness ($F = 27.68, p = .000$); analyticity ($F = 37.47, p = .000$); self-confidence ($F = 7.13, p = .000$); inquisitiveness ($F = 38.9, p = .000$); and, total CCTDI score ($F = 35.55, p = .000$). Scores from subscales that failed to show a significant difference were truth seeking and maturity (Stewart & Dempsey, 2005).

A univariate analysis of variance with a post-hoc Tukey's test showed significant differences in CCTDI total scores and five of its subscales, with the highest total scores being achieved during the Junior I and II semesters. However, scores between Junior I and II semesters were not significantly different from each other (Stewart & Dempsey, 2005).

Regarding question two, the relationship between CCTDI subscales and GPA were significant but varied. At the Sophomore II and Junior II semesters, open-mindedness was positively correlated with GPA ($r = .28, p = .045$ and $r = .39, p = .001$ respectively). At the Junior I semester, total CCTDI ($r = .29, p = .044$) and the maturity subscale ($r = .30, p = .040$) were positively correlated with GPA. The systematicity subscale was positively correlated to GPA for the Junior II semester ($r = .39, p = .03$). There was a negative correlation between the confidence subscale and GPA for the Senior I semester ($r = -.51, p = .001$). In the Senior II semester, only the inferential reasoning subscale from the ERI-RN showed a relationship to GPA (Stewart & Dempsey, 2005).

Regarding question three, no significant difference was found between CCTDI and NCLEX-RN performance. The total CCTDI scores for students who passed the NCLEX-RN was 265 and students who failed the NCLEX-RN was 276 (Stewart & Dempsey, 2005).

Stewart and Dempsey (2005) recognized a limitation of this study was the small sample size and the attrition rate of students. In addition, the CCTDI was administered early in the Senior II semester, prior to the completion of the students' final clinical internship. CCTDI total and subscale scores did not increase as the students progressed through the curriculum. The researchers contend that CCTDI scores showed no significant relationship to ERI-RN scores and NCLEX-RN passing status because the later two instruments assess knowledge essential to basic safe nursing practice and are not designed to assess CT skills. With such an emphasis on CT being taught in schools of nursing, emphasis should be placed on NCLEX-RN examination criteria to assess an applicant's CT competence. Since nursing programs include CT as part of program outcome data, then data should be collected from students at the point of entry, as students' progress through the curriculum, and at post graduation (Stewart & Dempsey, 2005).

Since CT is endorsed to be a critical component of nursing education, Giddens and Gloeckner (2005) assumed it was a component of the NCLEX-RN examination. The purpose of this study was to determine the relationship between nursing students' CT skills and dispositions to NCLEX-RN examination performance and if other

variables have a relationship to CT and NCLEX-RN examination performance.

Research questions implied were:

1. Does CT of students changed over time?
2. Can CT competency be a predictor for NCLEX-RN exam outcomes?
3. Are there other demographic variables associated with NCLEX-RN outcomes?

Giddens and Gloeckner (2005) used existing data for a non-experimental ex-post-facto study. This study took place at a university in the southwestern United States. The sample consisted of 218 baccalaureate nursing students enrolled between 1998 and 2001 that had completed either the CCTST or the CCTDI during enrollment in nursing school and whose NCLEX-RN results were known. Of this sample, 22 were men and 196 were women; mean age was 30.3 years; 39% were minority students; and 93% had passed the NCLEX-RN exam.

The CCTST is considered to be a discipline-neutral instrument that measures CT skills of the atypical college-age student. The instrument generates six scores: a total score, analysis, evaluation, inference, inductive reasoning, and deductive reasoning sub scores. The CCTDI is used to assess attributes that contribute to a person's CT ability. It is comprised of 75 six-point Likert-type items with response options ranging from "strongly agree" to "strongly disagree." It provided a total score and subscale scores on the dimensions of truth-seeking, inquisitiveness, open-mindedness, confidence, analyticity, systematicity and maturity (Giddens & Gloeckner, 2005).

Three of the CCTST scores obtained upon entry into the nursing program showed a significant relationship to NCLEX-RN performance. Scores included: total score ($t(101)=2.5, p=0.015, d=1.0$); analysis ($t(101)=2.4, p=.017, d=1.1$); and deductive reasoning ($t(101)=3.0, p=.003, d=1.2$). None of the entry scores on the CCTDI showed a relationship to NCLEX-RN performance (Giddens & Goeckner, 2005).

All of the CCTST mean scores obtained upon exiting the nursing school program were significantly higher for graduates who passed the NCLEX-RN. Results were: total score ($t(191)=3.0, p=.003, d=.81$); analysis ($t(191)=2.2, p=.026, d=.60$); evaluation ($t(191)=2.2, p=.030, d=.59$); inference ($t(191)=2.6, p=.011, d=.69$); inductive reasoning ($t(191)=2.7, p=.008, d=.72$); and, deductive reasoning ($t(191)=2.1, p=.035, d=.69$) (Giddens & Goeckner, 2005).

CCTDI scores for the total and four subscales were significantly higher for individuals who passed the NCLEX-RN. The results were: total score ($t(183)=2.6, p=.010, d=.72$); truth-seeking ($t(183)=2.7, p=.007, d=.64$); synthesis ($t(183)=2.2, p=.030, d=.60$); and maturity ($t(183)=3.6, p<.001, d=.96$). However, upon comparing the NCLEX-RN fail group to national mean scores using a one-sample *t*-test, no statistically significant difference existed between the NCLEX-RN pass and fail groups (Giddens & Goeckner, 2005)

Regarding scores of CT changing over time, there was a significant change on the CCTST deductive reasoning subscale ($t(84)=2.4, p=.02, d=.26$), and the CCTDI confidence subscale ($t(84)=3.5, p=.001, d=.3$) where the scores were higher over

time. However, an independent *t*-test showed that there was no relationship between changes in CT measurements and NCLEX-RN performance (Giddens & Gloeckner, 2005).

Neither age nor gender had a significant relationship to performance on the NCLEX-RN. However, a *t*-test indicated the group mean GPA's of graduates who passed the NCLEX-RN examination and graduates who did not pass the NCLEX-RN examination was significant ($t(209)=5.3, p<.001, d=1.38$) (Giddens & Gloeckner, 2005).

A discriminate analysis using nursing GPA, CCTST scores, and CCTDI scores as the independent variables and performance on the NCLEX-RN exam as the categorical criterion was performed. The results indicated that 92% of the students were correctly categorized, 98% of students passing the NCLEX-RN exam were correctly categorized, but 79% of the students failing the NCLEX-RN exam were incorrectly categorized (Giddens & Gloeckner, 2005).

Limitations included a small sample size, in particular nurses who failed the NCLEX-RN exam ($n=16$, compared to those nurses who passed, $n=202$). Giddens and Gloeckner (2005) indicated that student performance on the CCTST, CCTDI, and nursing GPA had predictive value regarding students that passed the NCLEX-RN exam, but not adequately identifying nurses that failed could also be due to sample size. Despite the focus on developing CT, subjects' gains in CT as measured on the CCTST and the CCTDI were limited. The researchers challenged if CT was a trait

that could be taught, how it would be best taught, and what improvements should be expected (Giddens & Gloeckner, 2005).

Summary

CT is an essential component of clinical decision-making. The purpose of this study is to determine if students' CT competence changes over time and if CT dispositions have a relationship to other measures of performance. To facilitate the development of CT in nursing students, nursing educators must develop a working definition of this concept, develop methods of teaching CT, utilize methods of assessing CT competence, and link CT to other measures of performance.

Walther (2004) found that logical thinking, curiosity, and openness were essential attributes of CT. Within a nursing context, receptivity, empathizing, sensing, and female ways of knowing were also identified as potential components of CT. Baxter and Rideout (2006) investigated the effect experience, knowledge, locus of control, and confidence had on student clinical decision-making. Students viewed patients as a source of help, conflict, fear, intimidation, and knowledge and often make decisions that were pleasing to the patient, even if they knew the decision contrary to safe patient care. Students viewed interactions with nursing staff as negative, intimidating, and confusing and warranted further investigation prior to taking action. Students initiated encounters with clinical instructors to affirm rationale, secure emotional support, and intervene between students and nursing staff. Thus, part of student clinical decision-making is how a student responds to fear and intimidation.

It was evident that sound clinical judgments are often reached after considering a variety of complex and conflicting factors. To aid in developing and assessing student competence in clinical decision-making, Lasater (2007) investigated the use of high fidelity simulation to develop and assess clinical judgment in nursing students. Findings indicated that simulation provoked anxiety yet increased student awareness to clinical-decision making. Students' desired detailed feedback, including what outcomes would have been if initial decisions were followed. Debriefing, narrative learning, and working in teams were also perceived as essential in the development of clinical judgment competence. Another method to develop and assess clinical judgment has been concept mapping. Daley et al. (1999) and Abel and Freeze (2006) utilized concept maps to teach and assess CT. Both studies found that concept maps improved as students progressed through the curriculum, and concept maps were useful to identify strengths and weaknesses in CT.

Profetto-McGrath (2003) investigated the utilization of the CCTST and CCTDI as instruments to measure CT of nursing students. Regarding CCTST test scores, Profetto-McGrath found no significant difference existed between cohorts enrolled in years 1 through 4 of a baccalaureate nursing program. Regarding CCTDI test scores, only the systematicity subscale improved as students progressed through the curriculum. Student scores on the CCTST and the CCTDI were found to be significantly related. Bowles (2000) investigated the relationship between CT and clinical judgment, and if these variables had a relationship to age, years in college, and GPA. The research found that CCTST and CDMNS scores were significantly

related. Regarding demographic data, a relationship between CCTST scores and GPA was found to exist.

To investigate if different methods of instruction were related to the development of CT, Beckie et al. (2001) incorporated didactic and clinical teaching methods into the development of CT in nursing students. The CCTST was used to measure students' CT. Results indicated CCTST scores increased over time; however, the curriculum revisions were not consistently related to students' CCTST scores.

Since standardized tests are often used to measure CT, linking these tests to clinical judgment is necessary. To determine the goodness of fit the CCTST and CCTDI have with measuring CT as it applies to nursing, Stone et al (2001) gathered data from 338 Deans or Department Chairs from NLN accredited baccalaureate schools of nursing. The research showed that CCTST and CCTDI were believed to measure essential elements of CT as it applied to nursing. In addition to the goodness of fit analysis, it was also investigated if the CCTST and CCTDI had a relationship to Student Aptitude Test (SAT) scores, overall GPA, nursing curriculum GPA, and the NCLEX-RN results. Student CCTST scores were related to SAT verbal, SAT math, overall GPA, and nursing GPA. Student CCTDI scores showed no relationship to the other variables. Neither CCTST nor CCTDI scores were related to NCLEX-RN performance.

Because CT and clinical judgment are required outcomes for schools of nursing, faculty should evaluate the development of this student competence over time to determine the effectiveness of curriculum. In Martin's (2002) research, clinical judgment between nursing students, graduates but not yet licensed, and nurses with greater than 5 years of experience were compared. In addition, it was investigated if the type of education received had a relationship to a participant's clinical judgment competency. Results indicated clinical judgment scores were related to level of expertise, age, GPA, and whether or not a student had taken a course in CT. However, there was no significant difference in clinical judgment scores between those participants who were enrolled or who had graduated from AD or BSN programs.

Giddens and Gloeckner (2005) and Stewart and Dempsey (2005) utilized standardized tests that measured CT to investigate if CT changed over time and if CT was linked to other performance measures. Both studies found that CT changed as nursing students progressed through the curriculum. Stewart and Dempsey found relationships existed between the some of the CCTDI subscales and GPA, but were varied. Giddens and Gloeckner found a relationship existed between GPA and NCLEX-RN performance. Regarding the relationship between CT measurements and NCLEX-RN performance, Stewart and Dempsey did not find a relationship existed. However, Giddens and Gloeckner found a relationship existed that warranted further study.

This literature review demonstrates the complex nature of CT and its relationship to clinical judgment. Schools of nursing have been investigating and revising curriculums in order to better develop these competencies in students. However, while revisions to curriculums and delivery may have an impact on student learning, results are inconsistent regarding the impact curriculum and its delivery has on CT. Several studies indicated that CT is enhanced with age and life experience, and may not necessarily be a teachable competency. However, Martin (2002) found that individuals who took a course in CT demonstrated higher levels of clinical judgment. In addition, it was found that CT competence was related to GPA (Giddens & Gloecker, 2005; Stewart & Dempsey, 2005), and GPA was related to NCLEX-RN performance (Giddens & Gloecker), but CT was not consistently related to NCLEX-RN performance (Giddens & Gloecker; Stewart & Dempsey).

Chapter 3

Methodology and Procedures

Introduction

CT is an essential component of clinical judgment in nursing practice. Faculty in schools of nursing need to track CT competence and link it to other measures of student performance. The purpose of this study is to determine if CT dispositions of baccalaureate nursing students change from sophomore to senior level and the relationship between CT dispositions and Educational Resources Inc. (ERI) RN Assessment scores and student grade point average (GPA). This is a partial replication of Stewart and Dempsey's (2005) study.

Research Questions

1. Is there a significant change in CT dispositions of baccalaureate nursing students during the progression from the sophomore level to the senior level?
2. Do significant correlations exist between CT dispositions, ERI-RN assessment scores, and cumulative GPA?

Setting, Population, and Sample

The study will take place at a large Mid-western university in the United States. This is a longitudinal study in which data will be collected from students several times over approximately a 2 year, 6 month period. Because of the design, there is a possibility of subject attrition. A convenience sample of at least 50 baccalaureate nursing students beginning the second semester of the sophomore year

will need to be recruited. Only students that maintain minimal GPA and other performance standards will be included in the analysis of data. No other criteria will be used in the selection of participants.

Protection of Human Subjects

The proposal of the study will be submitted to the Ball State University (BSU) Institutional Review Board (IRB) and the School of Nursing (SON) IRB. The population of nursing students beginning the second semester sophomore term will be provided the purpose and procedures of the study in written form. Participation will be voluntary and participants will be allowed to withdraw from the study at any time. All information gathered regarding individual participant data will be kept confidential. Written consents outlining data collection procedures and instruments used will be obtained from participants. Benefits of the study include an increased understanding of how CT changes over time to assist with curriculum evaluation and development.

Procedures

Data will be collected from students over five consecutive semesters. Once approved by the BSU and SON IRB's, a request will be made to the School of Nursing Dean, or designated person or committee, to review the proposed study. Permission will be obtained from the appropriate administrators and teaching faculty. Meetings will take place between the principle researcher and SON teaching faculty to determine the location, method, and schedule to administer the CCTDI (California

Academic Press, 1992) and how the additional data of student GPA and ERI-RN Assessment (Educational Resources Inc., 2008) scores will be collected.

It is proposed students will take the CCTDI during week 10 of each semester immediately prior to or after a didactic course in collaboration with the assigned SON teaching faculty. Scheduling this activity at this time will avoid conflict with student preparation for final exams or other academic commitments. Since the CCTDI takes 20 minutes to complete, it is not anticipated that participation will create an undue hardship resulting from participation. Student GPA data will be collected at the end of each semester in collaboration with appropriate SON faculty. Students will take the ERI-RN Assessment 5 to 6 weeks prior to graduation and student results will be collected following participant completion of this assessment tool.

CCTDI tests will be administered, collected, and scored by the researcher. Student GPA will be provided through the Office of the Dean of the SON. ERI-RN Assessment scores are electronically tabulated by Educational Resources Inc. and are provided to appropriate faculty. Student scores on the ERI-RN Assessment will be collected from appropriate SON faculty.

Research Design

This will be a longitudinal study incorporating a comparative descriptive one-group pretest-posttest design and a correlational-predictive design. Longitudinal studies examine the same subjects over time for changes in a particular variable or variables. Comparative descriptive designs examine three or more data sets for the existence of differences. Correlational-predictive designs examine data for the

existence of relationships between two or more variables, and determine if the value of one or more variables can be used to predict the value of one or more other variables (Burns & Grove, 2005). Since this research will utilize a one-group, pretest-posttest design, the data collected at the initial administration of the CCTDI will be the pre-test or control. Data collected on subsequent administrations of the CCTDI will be the posttests.

Regarding the comparative descriptive design component, CCTDI scores will be examined for differences as students' progress through the curriculum. Regarding the correlational-predictive design component, each semester CCTDI scores and student cumulative GPA will be analyzed to determine if a relationship exists between the two variables and, at the end of the study, if a relationship exists between ERI-RN subscale scores and GPA.

Instrumentation

The CCTD will be used to measure students' CT disposition. This instrument is based upon Facione and Facione's (1992) definition of CT, which is "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual consideration upon which that judgment is based" (p. 2). However, CT is not just a skill, but involves dispositions that facilitate "reasoned consideration to evidence, context, theories, methods, and criteria in order to form a purposeful judgment and, at the same time, monitors, corrects, and improves the process through meta-cognitive self-regulation" (Facione et al., 1994, p. 346.)

The CCTDI is comprised of 75 Likert-type items that provides a total CT disposition score and seven subscale scores. The seven subscales are: truth seeking; open-mindedness; analyticity; systematicity; self-confidence; inquisitiveness; and maturity. Total scores can range from 70 to 420, with a score of 280 or greater indicating an overall positive disposition to CT. Subscale scores 30 or less indicate weakness towards that disposition, 40 indicates minimal endorsement of the disposition, and greater than 50 indicates a strong endorsement of the disposition. The published alpha reliability of this test was .90, with subscale alpha coefficients ranging from .60 to .78 (Facione et al., 1994). In research by Stone et al. (2001), the instrument was found to have an alpha reliability of .89, with alpha reliabilities on the seven subscales ranging from .54 to .76. The results are consistent with Facione et al.'s (1994) results.

The ERI-RN Assessment is currently being used by the School of Nursing. The ERI-RN Assessment is a mock NCLEX-RN examination that provides feedback along 32 subscales, indicating areas of strength and weakness. Students are taking the ERI-RN Assessment during the last six weeks of the second semester senior year as part of the curriculum fulfillment requirement. The test takes up to 3 hours to complete. Data regarding ERI-RN Assessment subscale scores will be collected in collaboration with appropriate faculty. The published reliability of the test is .90 (as cited in Stewart & Dempsey, 2005). The ERI-RN is comprised of 32 subscales. Only data from the subscales that measure CT will be included in this research. The subscales are:

1. CT1: prioritizing, discriminating
2. CT2: inferential reasoning
3. CT3: interpretive reasoning
4. CT4: application and knowledge
5. CT5: evaluating predicted outcomes

As previously stated, student accumulative GPA's will be collected at the end of each semester.

Data Analysis Methods

Regarding research question 1, a one-way ANOVA will determine differences in means by comparing CCTDI total and subscale scores over the five data collection events. This test compares the individual group variance within each data collection event to the groups' total variance resulting from combining all data collection events (Burns & Grove, 2005). Since five data collection events will be utilized, it will be necessary to perform a post-hock Tukeys Honestly Significant Difference (HSD) test. This test is used to better determine if there are significant differences between more than two data groups and reduce the possibility of Type I error.

Regarding research question 2, a multiple regression analysis will be used. This test determines if a linear relationship exists between three or more independent variables and the dependent variable (Burns & Grove, 2005). First, data will be analyzed to determine if CCTDI total and subscale scores are correlated to accumulative GPA. Next, data will be analyzed to determine if the ERI- RN subscale scores are correlated to accumulative GPA.

Summary

The purpose of this study is to determine if CT dispositions of baccalaureate nursing students change from sophomore to senior level and the relationship CT dispositions and ERI RN Assessment scores have with GPA. Since this study will utilize a longitudinal comparative descriptive design, a convenience sample of at least 50 participants will be recruited. Data collection will begin during the 10th week of the second semester sophomore term and will be completed post-graduation. Instruments to be used are the CCTDI and ERI-RN Assessment. An additional data component is student GPA.

One-tailed ANOVA will be used to determine if CT dispositions change as participants' progress through the program. A Tukey's HSD test will also be utilized to better determine significant differences between data collection events and reduce the possibility of type I error. A multiple regression analysis will be used to determine the relationships CCTDI total scores, CCTDI subscale scores, and ERI RN Assessment subscale scores have with GPA. Findings will provide information on how students' CT ability changes over time to assist faculty with curriculum evaluation and development.

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Journal of Nursing Education, 43(9), 408-411.

NUR 697 Critical Thinking Literature Table

Source	Problem	Purpose/Research Questions	Framework or Concepts	Sample	Design	Instruments	Results
Abel & Freeze (2006)	Linking the components of the nursing process to the constructs of critical thinking is a concern to nurse educators and researchers. Concept maps as possible tool to teach and assess linkages.	To determine if concept mapping could be used to develop and assess critical thinking skills. Research questions: 1. Can students utilize concept maps to demonstrate critically thinking in the nursing process? 2. Can concept maps measure changes in critical thinking over time? 3. How are concept maps evaluated as a learning activity?	Ausubel, Novak and Hanesian's Assimilation Theory of Learning	28 ADN students from a community college in North Carolina. Students were assigned clients on selected units in a community hospital.	Descriptive Comparative.	Concept maps- method of documenting cognitive processes, thinking patterns, and linkages among variables. Maps graded on hierarchy from general to specific. Scored on propositions showing relationships, hierarchy of problems, crosslinks between concepts, and examples of how concepts were applied. Interrater reliability was 85%. Intrarater reliability was 97% and 94%. (Two raters).	1. Concepts maps were useful in identifying linkages between pathophysiology, test results, assessment findings, nursing diagnosis, interventions, and evaluation of care. 2. Over time, cross link and total map scores significantly improved and demonstrated improvements in critically thinking. 3. Evaluators found concept maps were useful in identifying students' strengths and weaknesses. Some students had difficulty and experienced frustration with concept maps.

Baxter & Rideout (2006)	How clinical decisions are made, types of decisions made, and factors related to decision making need to be studied.	<p>Research questions:</p> <ol style="list-style-type: none"> 1. How did students determine the need to make a clinical decision? 2. How did students respond to a pending clinical situation? 3. What types of decisions did students make in the clinical setting? 4. What factors either enhanced or impeded students' decision making? 	<p>Concept:</p> <p>Clinical decision-making as described by multiple authors. Focused on experience, knowledge, locus of control, and confidence.</p>	<p>12 second year baccalaureate students in Hamilton, Ontario completing first year rotation with 12 7 hour rotations. Two clinical instructors.</p>	<p>Intrinsic qualitative study design.</p>	<p>Structured journaling by students and semi-structured interviews for instructor subjects.</p>	<ol style="list-style-type: none"> 1. Students identified the need to make a clinical decision based upon patient needs and what interventions would benefit the patient. 2. Students would seek guidance from clinical staff to validate patient care needs and clinical tasks. 3. Students made decisions to seek assistance from nursing staff or instructor to identify appropriate provisions of care. Students would make decisions to please patient even if contraindicated. 4. Students relied on previously learned knowledge. Staff encounters were positive, negative, intimidating, confusing and impacted student self perception of competence. Clinical faculty seen as source of information to establish priorities and figure out complex problems.
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Beckie, Lowery, & Barnett (2001).	Nursing education needs to incorporate methods to teach and evaluate critical thinking.	To determine if cooperative learning groups, Socratic questioning, learning contracts, reflective journal writing, actively caring for patients, case study research, self-evaluation, and peer-evaluations influenced critical thinking. Research questions: 1. What is the difference in critical thinking between those students who completed the old curriculum and those that completed the new? 2. Does critical thinking change over time?	Facione and Facione's definition of critical thinking. Assimilation theory of learning. Reflection as a component of critical thinking. Critical thinking over time.	Three student cohorts selected from a SON in central Florida. Cohort 1 (55) former curriculum (control group). Cohort 2 (55) and cohort 3 (73) new curriculum (experimental groups).	Pretest-posttest non-equivalent control research design.	Treatment (see purpose section). The California Critical Thinking Skills Test, Form A.	1. Cohort 2 showed significant differences in CCTST scores over cohort 1. Cohort 3 did not show significant differences compared to cohort 1, but was significantly lower than cohort 2. 2. CCTST scores over time showed cohort 1 remained unchanged, cohort 2 improved, and cohort 3 worsened.
Bowles (2000)	Clinical judgment skills are essential for safe practice, which requires nurses to have competency in critical thinking.	Evaluate relationship of critical thinking to clinical judgment of BSN students at completion of the program. Research questions: 1. Is there a relationship between critical thinking and clinical judgment? 2. Is there a relationship between clinical judgment and other demographic variables, such as age, years in college, and GPA?	Facione and Facione's definition of critical thinking skills.	65 nursing students from two colleges in Northern California.	Correlational design.	CCTST, Form A. Clinical Decision-Making in Nursing Scale (CDMNS).	1. CCTST and CDMNS scores were related. From the CCTST subscales, only inductive reasoning and inference were significantly related. 2. Only GPA was related to CCTST.

Daley, Shaw, Balistrieri, Glasenapp & Piacentine (1999)	Accepted measures of student performance fail to demonstrate validity in the measurement of critical thinking.	<p>Research questions:</p> <ol style="list-style-type: none"> 1. Can concept maps be used to teach and evaluate critical thinking in nursing students? 2. Can concept maps measure changes in critical thinking ability over time? 3. How do faculty and students evaluate the use of concept maps as a learning and assessment tool? 	Facione's (1990) definition of critical thinking. Ausubel, Novak, and Hanesian's (1986) assimilation theory of Learning.	54 senior BSN nursing students in Wisconsin.	Descriptive comparative	<p>Concept maps-A method of linking propositions together to document learners' understanding of conceptual relationships and subject matter knowledge. Maps were scored based upon hierarchical organization of content, progressive differentiation of concepts, and identification of relationships among concepts. Intrarater reliability was .82</p>	<ol style="list-style-type: none"> 1. Statistically significant increase in concept map scores over time, and demonstrated an increase in students' conceptual and critical thinking competencies. 2. Students believed they were time consuming and difficult. Other students thought concept maps were useful and should have been introduced earlier in the curriculum. 3. Faculty thought maps were useful in evaluating development of thinking process and identifying students' strengths and weakness.
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Giddens & Gloeckner (2005)	Critical thinking is a required outcome of nursing programs. Critical thinking skills should relate to NCEX-RN.	Determine relationship between critical thinking skills and NCLEX outcomes. Investigate if critical thinking changes over time, if instruments used to measure critical thinking could be used to predict NCLEX-RN outcomes, and if other demographic variables influence outcomes.	Critical thinking. Facione and Facione's definition of critical thinking and dispositions.	218 BSN students from the southwestern United States that had completed either the CCTST or the CCTDI and NCLEX-RN status was known.	Non-experimental ex-post-facto research framework.	CCTST CCTDI Other variables: age, gender, GPA, NCLEX-RN results.	CCTST scores upon entrance into program related to NCLEX-RN performance; CCTDI entrance scores not related. Exit CCTST and, to a lesser degree, CCTDI scores significantly higher for those subjects that passed NCLEX. Changes in critical thinking scores not related to NCLEX outcomes. GPA only other variable related to NCLEX outcomes.
Lasater (2007)	Clinical judgment is particularistic and situation specific, so the validity of self-report measures to assess clinical judgment is questionable.	Determine if high-fidelity simulation can be used to develop and assess clinical judgment. Purposes were to describe students' responses to simulation, develop rubric that describes levels of performance in clinical judgment, and pilot test rubric.	Benner, Tanner, and Chelsa's definition of clinical judgment. Conceptual framework is Tanner's four stages of clinical judgment.	48 third term junior level BSN students in Oregon.	Qualitative-quantitative design incorporated description-observation-revision-review method of data collection and analysis.	Lasater Clinical Judgment Rubric. Focus group interviews.	Focus group themes regarding simulation found strength and limitations, provoked anxious and stupid thoughts, increased awareness, generated student desire for feedback, debriefing encouraged learning. Rubric useful in identifying gaps in knowledge and facilitate discussion on rational for decision making.

Martin, (2002)	Critical thinking is thought process essential to clinical judgment.	Determine relationships between critical thinking, clinical decision making, and clinical expertise. Research questions: 1. Is there a difference in clinical thinking based upon Benner's Novice to Expert theory? 2. Does type of preparation influence competence in critical thinking or clinical decision making? 3. Is there a difference in quality of decisions made by students, graduates, and expert nurses? 4. What demographic variables influence critical and clinical decision making?	Benner's Novice to Expert theory. Paul's theory of Critical Thinking.	149 total subjects. 27 ADN students, 20 BSN students, 28 non-licensed ADN graduates, 20 non-licensed BSN graduates, and 54 expert nurses located in the Midwest.	Descriptive correlational study design to investigate critical thinking and the decision quality.	Elements of Thought Instrument (ETI) Self-developed instrument used to determine quality of decisions made.	1. ETI scores were significantly related to level of expertise. 2. Type of degree had no relationship to ETI scores. 3. Decision scores were correlated to ETI scores. As level of expertise increased, ETI and decision scores significantly increased, with students having lowest scores and experts having highest scores. 4. Subjects who had taken a course in critical thinking scored higher on measurement instruments. No other demographic data related to critical thinking measurements.
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Profetto-McGrath, (2003)	Knowledge of students' critical thinking skills and dispositions is important to the development and delivery of curriculum.	Determine if critical thinking skills are related to critical thinking dispositions. Research questions were: 1. What are the critical thinking skills and critical thinking dispositions of nursing students? 2. Do nursing students' critical thinking skills and dispositions differ based upon the number of years in the program? 3. Is there a relationship between critical thinking skills and dispositions?	Facione and Facione's definitions of critical thinking and dispositions.	268 full time BSN students in Alberta, Canada. Cohort 1 (n=38) was in year 1 of program. Cohort 2 (n=53) was in year 2 of program. Cohort 3 (n=57) was in year 3 of program. Cohort 4 (n=80) was in year 4 of program.	Non-experimental cross section design.	Opinion survey regarding perceptions towards critical thinking and logical reasoning. CCTST and CCTDI.	46% of subjects thought critical thinking and logical reasoning were "extremely important." 1 & 2. Mean CCTST scores increased years 1-4, except year 3. No significant difference otherwise between cohorts. Only CCTDI subscale significantly different between cohorts was systematicity. Higher scores achieved by cohorts 3 and 4. 3. CCTST and CCTDI scores significantly related.
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Stewart & Dempsey (2005).	Critical thinking essential to nursing education and clinical judgment.	Purpose: determine if critical thinking changes over time and its relationship to other measures of student competence. Research questions: 1. Does critical thinking change as students' progress through program? 2. Does critical thinking have a relationship to ERI-RN assessment scores and GPA? 3. Does critical thinking have a relationship to NCLEX-RN?	Facione and Facione's definition of critical thinking depositions. Critical thinking over time.	55 BSN students in Wisconsin.	Longitudinal descriptive design.	CCTDI. ERI-RN Assessment constructs of: Prioritizing, discriminating. Inferential Reasoning. Main idea and predicting outcomes. Application and knowledge. Evaluating predicted outcomes.	1. CCTDI scores over time significantly changed on Total Score and 5 of seven subscales. 2. CCTDI subscales and GPA showed significant relationships but varied. CCTDI showed a significant relationship to ERI-RN subscale of inferential reasoning. 3. CCTDI scores were not related to NCLEX-RN.
Stone, Davidson, Evans, & Hansen (2001).	Are definitions of critical thinking and measuring tools applicable to critical thinking for nursing?	To determine if the CCTST and the CCTDI measure nursing students' critical thinking ability. Research questions: 1. To what extent does the CCTST and CCTDI measure critical thinking in nursing? 2. Are critical thinking scores related to other clinical thinking outcomes?	Facione and Facione's definition of critical thinking and dispositions. Concepts included critical thinking and clinical judgment.	338 Deans or Department Chairs form SON's. 238 BSN students in Pennsylvania.	Qualitative design. Correlational design.	Survey that reflected skills and dispositions measured by the CCTST. CCTST, Form A. CCTDI.	Traits on CCTST and CCTDI were considered essential to critical thinking in nursing. CCTST was related to other measures of competency. CCTDI was not related to other measures of competency.

Walthev (2004)	A definition of critical thinking related to nursing lacks consensus.	Theories of critical thinking lack elements unique to nursing. Research was to define educators' conceptions of critical thinking?	Constructivism, as defined by Guba and Lincoln, (1994), which states "constructivism takes the ontological stance that social reality is assumed to be multiple and constructed, rather than singular and tangible, depending on the individuals understanding of the construct." (p. 409).	12 Bachelor program nursing educators in New Zealand.	Qualitative design.	Individual Semi-structured interviews, approximately one hour in length, conducted by the same researcher, and recorded for transcription.	Rational, logical thinking are essential for critical thinking. Logical thinking defined as information gathering, recognizing patterns, linking theory to practice, analyzing the situation, presenting arguments, and problem solving. Nursing attributes were curiosity and openness, subjective knowing and intuition, contextual knowing, and emotions, relationships, receptivity, and negotiation. Attributes not reflected in critical thinking definitions were listening, empathizing, sensing, and female ways of knowing.
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