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Effect of an Adaptive Thinking Training Methodology on Critical Thinking Disposition Using Human Patient Simulators: A Catalyst for Preparing Advanced Nursing Students

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EFFECT OF AN ADAPTIVE THINKING TRAINING METHODOLOGY ON CRITICAL THINKING DISPOSITION USING HUMAN PATIENT SIMULATORS: A CATALYST FOR PREPARING ADVANCED NURSING STUDENTS

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ABSTRACT

EFFECT OF AN ADAPTIVE THINKING TRAINING METHODOLOGY ON CRITICAL THINKING DISPOSITION USING HUMAN PATIENT SIMULATORS: A CATALYST FOR PREPARING ADVANCED NURSING STUDENTS

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Critical thinking decision making is the foundation for effective, safe, nursing practice. Nurses have to assess patient issues rapidly regardless of whether it is emotional, psychological, or physical, and then sort through "rapid fire" questions resulting in invisible sorting, discerning, and drawing of conclusions. Doing this "invisible sorting" well requires practice. Nursing education provides practice through preceptors or scenarios-driven human patient simulators to practice critical thinking. This study examines Adaptive Thinking Training Methodology with simulation exercises as a possible catalyst for growth in critical thinking disposition, and help in addressing the preparation-practice gap for novice nurses.

A class of advanced nursing students entered three simulations to develop critical thinking through scenario-based learning. The first simulation had no adaptive thinking intervention. During the second simulation, only one adaptive thinking intervention occurred. The final simulation had two adaptive thinking interventions. Interventions occurred at the point in which an appropriate critical thinking decision points were appropriate for practice. The three interventions defined for simulations two and three used an Applied Cognitive Task Analysis methodology for the development of cues. The aim of this research was to accelerate growth in critical thinking disposition for

professional caregivers to move further toward expertise in a shorter period. A Repeated Measures (RM) Analysis of One Way Variance (ANOVA) was used to determine effectiveness of treatment.

Keywords: critical thinking, adaptive thinking, nursing, education

This Dissertation is dedicated in loving memory of my parents, Robert J. Fitkin Sr. and Deloris E. Fitkin. I miss them dearly.

I also dedicate this dissertation to my wonderful, dear children
Trina, Robbie, and Juliette Fitkin:
While on your journey, may you hold on to the promise God gave me when I wanted to give up so desperately, "Patient endurance is what you need now, so that you will continue to do God's will. Then you will receive all that he has promised."
Hebrews 10:36 NLT

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CHAPTER 1: INTRODUCTION

Critical thinking decision making (CTDM) is the cornerstone of effective, safe clinical practice. The healthcare profession is a rapidly changing environment that requires critical thinking (CT) as an essential skill to make sound clinical judgments (Brudvig, Dirkes, Dutta, & Rane, 2013). Healthcare professionals (e.g. nurses) have to assess a client's illness rapidly regardless of whether it is emotional, psychological, and physical or a combination of all three (Gambrill & Gibbs, 2009). For example, a nurse practitioner may have questions regarding:

- What emotional, psychological, or physical information can I use?
- What criteria can I use to evaluate the information's accuracy?
- Can I trust my intuition?
- Should I consult with family members?
- What are the most effective methods I can use for treatment?

These "rapid fire" questions result in massive invisible sorting, discerning, and drawing of conclusions about patient needs. This causes a crescendo effect from the pressure to save lives or improve the quality of life.

Problem Statement

At the conclusion of baccalaureate nursing programs, novice nurses are expected to perform immediately at a higher level of CT than their level experience warrants (Berkow, Virkstis, Stewart, & Conway, 2008). Therefore, upon entering their first nursing assignment, there is an identified gap in novice nurses' real and expected CT ability (Levine, DeMaria, Schwartz, & Sim, 2013). This gap exists even though CT skills have been an emphasis in nursing curricula since 1996 (Bobo, Adams, & Cooper, 2002) and taught via validated instructional strategies approved by regional accrediting agencies.

The three most common CT errors made by novice nurses are: (a) giving incorrect medicine, (b) misconstruing physician orders, and (c) an inability to notice critical changes in patient health (Berkow et al., 2008). The authors of this study sent a questionnaire to novice nurse preceptors that asked them to grade graduate nurses' performance based on 36 core competencies (n = 3265). Nurse preceptors' satisfaction was less than 50% in all but two competencies (utilization of technology and patient rapport). Preceptors were least impressed with new nurses' ability to notice changes in patient health, conducting appropriate follow-up care, and their ability to take initiative (Berkow et al., 2008). Ebright, Urden, Patterson, and Chalko (2004) succinctly state the problem: "How to expedite the learning [critical thinking] for novices has been a key consideration for nurse administrators and nurse educators in the wake of focused attention on patient safety and recruitment of newly graduated nurses" (p. 2).

Theoretical Framework

Critical Thinking

The modern day concept of critical thinking (CT) has its antecedents in social sciences as a component of the educational process. Significant scholars in CT were educators who supported the process of intentional inquiry of knowledge (Paul, Elder, & Bartell, 1997). In the field of education, CT is emphasized as an essential educational process, an emphasis that dates back to the 1980s (Bailin, 1987; Lipman, 1987). All disciplines at all levels of education require the cultivation of effective CT (Chowning, Griswold, Kovarik, & Collins, 2012; Paul et al., 1997). However, what is critical thinking? How can CT be clearly defined and even quantified?

More than 20 years ago, Facione (1990) conducted a Delphi study in an attempt to provide a single definition of CT. Specifically he sought a standard definition that would be suitable for college-level teaching and assessment. Facione's work resulted in expert consensus by the American Philosophical Association's (APA) that defined CT in two domains: Skill and Disposition.

Though nursing programs began to utilize the CT APA definition, the profession and its education programs still lacked a standardized definition specific to nursing. Therefore, Scheffer and Rubenfeld (2000) conducted a second Delphi study that included the contributions of a panel of nursing experts in education, practice, and research. This Delphi refined the scope of the APA definition of CT by adding the two CT traits: creativity and intuition. The hope was to provide a standardized definition specific to nursing that would help educators train nurses to become competent.

Simulation

Nursing programs have sought effective ways to help students become competent nurses (Benner, 1984; Ebright et al., 2004). Nursing programs typically deliver education through classroom lectures, practicing of procedures and internships that pair students with preceptors (Nehring & Lashley, 2009). Simulation exercises are used to enhance CT beyond these methods. Simulation types include anatomical models, task trainers, manikins, games, computer-assisted instruction (CAI), standardized patients[1], virtual reality, and low-fidelity to high-fidelity manikins. Other than anatomical models, task trainers, and role playing, these types of simulations have been introduced to nursing education in the past 40 years. With increased numbers of student nurses and decreased

[1] Standardized patients are actors who mimic patient behavioral issues.

numbers of clinical sites for developing CT, the use of simulation for CT development has become even more important (Nehring & Lashley, 2009). Human patient simulators (HPS) are the most common simulation in nursing schools today (Schiavenato, 2009). Because of this wide acceptance, there is a need to examine more effective ways to use HPS in nursing education.

Purpose Statement

The purpose of this study is to determine the effect, if any, Adaptive Thinking Training Methodology (ATTM)[2] interventions have on CT disposition using Human Patient Simulators (HPS). Critical thinking includes both cognitive (i.e., nursing professional skills) and dispositional skills (i.e., willingness to act on critical thinking). The hope is to use adaptive thinking interventions to narrow the gap in critical thinking ability and expected abilities for students who are soon to enter the "real world." Students begin the process of CT skill acquisition during their junior year of college.

Skill Acquisition

Experience will determine skill acquisition and increase CT ability. The Dreyfus Model is the first model to describe skill development or the process of transitioning from novice to expert (Dreyfus & Dreyfus, 1980). This model effectively described skill acquisition, assessing knowledge and providing a road map of professional development activities (Marble, 2009). This model has five stages of skill acquisition development: (a) Novice, (b) Competence, (c) Proficient, (d) Expert, and (e) Mastery. From this model came the nursing model for skill acquisition authored by Patricia Benner (1984).

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[2] ATTM is a training strategy that uses interventions to reflect with the student(s) why a critical thinking decision did not occur at the point at which the student made a wrong decision. This is in the hopes that the intervention will then lead to successful completion of the simulation exercise.

The Benner Model for skill acquisition came from the Dreyfus model (Benner, 1982, 1984, 2004; Benner, Kyriakidis, & Stannard, 2011; Benner, Tanner, & Chesla, 1996). Hubert and Stuart Dreyfus were consultants for three studies in nursing to develop skill acquisition levels. These studies resulted in five skill levels: (a) Novice, (b) Advanced Beginner, (c) Competent, (d) Proficient, and (e) Expert.

The first study, occurring over a period of three years, was based on 21 paired interviews with recently graduated students and their preceptors (Benner, 2004). In addition, participant observations were conducted with 51 experienced nurses, 11 newly graduated nurses, and five senior student nurses. The interviews—small group and individual—occurred in six hospitals (Benner, 2004). The second study occurred from 1988 to 1994 (Benner, Tanner, & Chesla, 1992; Benner, Tanner, & Chesla, 1996). Data collection came from small group narrative interviews, individual interviews, and participant observation (Benner, 2004). Finally, the third study, conducted in 1996-97 also included interviews and observations in the critical-care areas of emergency departments, flight nurses, home health, the operating room, and post anesthesia care units. Benner used the results of these studies to create her Model of skill acquisition (Benner, 2004).

Research Questions

The research questions addressed are below:

1. Do advanced nursing students' critical thinking disposition, as measured by the California Critical Thinking Dispositional Indicator overall score, differ based on the Critical Thinking Instructional Strategy implemented?
2. Do advanced nursing students' critical thinking disposition, as measured by the California Critical Thinking Dispositional Indicator sub-scales, differ based on the Critical Thinking Instructional Strategy implemented?
3. What are the observed critical thinking disposition changes in advanced student nurses' abilities when the Critical Thinking Instructional Strategy is implemented?
4. Did students apply critical thinking disposition skill(s) discussed during the Critical Thinking Instructional Strategy in subsequent situations that required the use of that skill?

Research Design

This study was a mixed method, quasi-experimental design. The independent variable was the adaptive thinking training interventions. The two dependent variables included students' California Critical Thinking Skills Test (CCTDI) score along with Critical Thinking Behavioral Change observational instrument, which was an open-ended questionnaire that corresponds to the subscales of the CCTDI. An Applied Cognitive Task Analysis (ACTA) process was used to design the critical cues for determining when to intervene during the simulation exercise.

Significance of Study

The results of this study added to the body of scholarly research in the area of CT disposition assessment for new nurses and insights to the effectiveness of training methods used for scenario-driven simulations. While many educators agree that the simulations will never replace clinical practice, it proved to be an effective method to provide hands-on training in an environment that closely resembles an authentic healthcare setting. Training techniques such as scenario-driven simulation enhance CT, while preventing over utilization of limited human resources. Jeffries (2007) noted that the incorporation of simulation may allow nurse educators to work smarter, not harder.

Limitations

The participants in this study were chosen based on the upper-class nursing courses at Nurse University and based on recommendations by the Dean of Nursing at Nurse University (NU). This study included three scenario-driven simulations and occurred over the course of a traditional 16-week semester. The nursing course chosen for this study presumed a core level of knowledge that was essential for the treatment. This study focused on only the dispositional aspect of critical thinking as a self-limitation by the researcher.

Assumptions

Human Patient Simulators (HPS) offer students the ability to combine many of the competencies used in the clinical environment such as physical assessment, communication, technical skills, and critical thinking in a risk-free setting. Students can independently care for patients. If errors occur, the simulation can be redone without consequences; this practice could never take place in the real clinical environment.

Events can pause for reflection and problem-solving. Comparable experiences can occur for all students. The disadvantages include cost of the simulation system, maintenance, and ongoing upgrades. Faculty preparation time must be accounted for too. Once the simulator is available, faculty training and scenario/lesson planning occurs, which are often both extremely time consuming and costly (Issenberg & Scalese, 2008).

Student performance anxiety may have been a problem; thus, it was determined that the HPS experience was most beneficial with a small number of learners per session. Nehring and Lashley (2004) reported that several schools used HPS to provide up to 10% of the time in their curriculum (community college 18.8% of responding schools and undergraduate 31.3% of schools). At this time, sixteen states have permission for simulation to replace a clinical practicum. Five states and Puerto Rico have regulations about substituting simulation for clinical practice in nursing education. Florida has been the only state to determine the specific amount of simulation to replace clinical practicums (up to 10% of clinical time; Nehring, 2008).

Definition of Terms

Adaptive Thinking Training Model – training model to teach critical thinking, which enables the ability to modify decisions based on situational awareness. Students are taught to "adjust on the fly" in order to exploit the advantage or minimize the harm of the unanticipated events thus providing a greater potential for success.

Applied Cognitive Task Analysis – a method for identifying the cognitive skills or mental demands needed to perform a task proficiently in simulated environments. Specifically, this occurs by breaking a knowledge-based task into chunks, evaluating how experts solve a problem, and identifying the problems that non-experts are likely to encounter.

California Critical Thinking Dispositional Inventory (CCTDI) – a tool designed to measure one's willingness to act on critical thinking.

Critical Thinking Disposition – an ability to not only expend cognitive effort in correctly diagnosing problems, but also a willingness to act on what is known to solve them (Taube, 1997).

Critical Thinking – is defined in this study as, "Habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry." (Facione, 1990, p. 2).

Human Patient Simulator – mimics the reality of the clinical environment and designed to demonstrate procedures, decision making, and critical thinking (Jeffries, 2005).

Ill-structured Simulation Training Environment – a scenario developed within a simulation environment that emphasizes an authentic operational environment.

Interdelphi Period – the term "Interdelphi Period" has been created by this author to define the time between the APA Delphi study in 1990 and the Nursing Delphi study in 2000. The antecedent of "Interdelphi" came from the "intertestamental period," which referred to the time between the Old Testament writings and the New Testament writings.

Naturalistic Decision Making – a method experts use to decide in authentic environments. An authentic environment includes (a) ill-defined goals, (b) uncertainty, (c) ambiguity, (d) missing data, (e) competing goals, (f) changing conditions, (g) real-time feedback loops, (h) time stress, and (i) have high stakes (Klein, 2008).

Novice Nurse – a student nurse in their final two years of a Bachelor of Science in Nursing (BSN) program or their first year of a full-time assignment as a licensed nurse (Benner, 1984).

Recognition-primed Decision Model – the RPD model is also a blend of intuition and analysis. Pattern matching is the intuitive part, and the mental simulation is the conscious, deliberate, and analytical part of ill-structured situation (Klein, 2008). A process that identifies the problem, determines familiarity, seeks a single solution, acts to solve the problem while adjusting on the "fly," implements the solution, and evaluates its effectiveness.

Scenario – scenarios are stories constructed to predict future events in times of uncertainty. These stories describe possible future outcomes based on complex interactions.

Skill Acquisition – a term associated with both the Dreyfus and Benner models of professional skill. Dreyfus and Benner's model has five levels. The author uses Benner's model of skill acquisition for nurses; the five levels are (a) novice, (b) advanced beginner, (c) competent, (d) proficient, and (e) expert.

Well-Structured Simulation Training Environment – a problem that has only one linear path to solving with only one correct solution.

Nursing Skill Acquisition Rubric – used to measure nursing students' confidence in performance of core competencies.

Overview of Subsequent Chapters

The remainder of this dissertation has four chapters, a bibliography, and appendixes. Chapter two presents a review of the related literature regarding critical thinking, skill acquisition, and strategies for cultivating critical thinking and skill acquisition. Chapter three delineates the research design and methodology of the study including a detailed description of the instruments used to gather the data, the procedures followed, and determination of the sample selected for study. The analysis of the data and a discussion of the findings are in Chapter four. Chapter 5 contains a summary, conclusions, and recommendations of the study. The study concludes with a bibliography and appendixes.

CHAPTER 2: LITERATURE REVIEW

The aim of this study is to examine the effectiveness of Adaptive Thinking Training Methodology (ATTM) to enhance critical thinking (CT) disposition. Critical thinking includes both cognitive (i.e., nursing professional skills) and dispositional skills (i.e., willingness to act on CT). This literature review is reflective of the two major constructs of this study (a) critical thinking decision making and (b) methods of evaluating the quality of those decisions through skill acquisition.

Critical thinking decision making is at the heart of clinical practice. In the rapidly changing healthcare environment, CT is an essential skill that all healthcare professionals must have in order to make sound clinical decisions (Brudvig, Dirkes, Dutta, & Rane, 2013). Healthcare professionals have to deduce how to assess a client's illness whether it is emotional, psychological, and physical or a combination of all three (Gambrill & Gibbs, 2009). Questions that arise from their CT include:

- What information can I trust?
- When and to whom should I ask questions?
- Can I really trust my knowledge?
- Should I call a doctor?
- Are there guidelines regarding the most effective methods I can use?

Thus, information "flash floods" into the healthcare provider's brain that requires invisible sorting, discerning and drawing conclusions about patient needs. This has a crescendo effect that causes urgency to act or decide (i.e. dispositional attributes) to treat health issues on the patient's behalf that either saves their life or improves their quality of life. How a healthcare professional thinks through that and acts upon the patient's behalf is the difference between novice and expert healthcare providers.

Defining Critical Thinking

Critical thinking is an inward act of reflection, so capturing a single definition is nearly impossible (Gambrill & Gibbs, 2009). What is possible is to see how CT definitions have evolved over decades of time. From the Socratic era to the late 20th Century era, the definitions of CT have evolved. All definitions of CT use reflection about thoughts and actions (Gambrill, 2012).

Critical Thinking Movement in the 20th Century

The modern day concept of critical thinking has its origins in the social sciences as a component of the educational process. Core to the CT movement were educators who advocated a process of intentional inquiry of knowledge (Paul, Elder, & Bartell, 1997). General education literature describes CT as an essential educational process, which dates back to the 1980s (Bailin, 1987; Lipman, 1988). Critical thinking extends across all disciplines and all levels of education. Researchers determined that some aspects were universal to all disciplines, whereas other aspects were more discipline specific (Chowning, Griswold, & Collins, 2012; Paul et al., 1997).

Twentieth-century theorists whose writings have contributed significantly to CT theory in education are John Dewey, Edward Glaser, Jean Piaget, and Lev Vygotsky. Dewey (1916) theorized that critical thinking requires contextual student-centered learning, "We do something to the thing and then it does something to us in return" (p. 151). Because education and life are interrelated, Dewey believed that educators must design and carefully monitor positive educational experiences.

Glaser contributed significantly to CT research by developing the Watson–Glaser Critical Thinking Appraisal. He defined CT as (a) a conscious attitude to organize one's

thoughts to solve problems through previous experiences, (b) methods of logical inquiry and reasoning, and (c) skill in applying those methods (Scriven & Paul, 1987). Piaget's theory incorporates topics such as language, logical reasoning, moral judgments, and conceptions of time. He proposed that humans had mental schemes that become altered during a child's cognitive development through assimilation and accommodation of new thoughts and experiences. Piaget's view emphasized individual thought and autonomy. Thus, he believed that people are internally motivated and actively engaged to self-learn, and that cognitive development results from the social interactions in their physical environments.

In contrast to Piaget's view of learning as an individual endeavor, Vygotsky emphasized past experiences, prior knowledge, society, and culture for increased CT (Vygotsky, 1933). Whereas Piaget characteristics exhibited by children of a particular age were important for child development (Piaget, 1963), Vygotsky focused on the *process* of child development. His views included: (a) knowledge was developed through social interaction, (b) learning occurred through shared experience, and (c) play was the primary method for developing social interaction (Vygotsky, 1933). Vygotsky is most famous for the Zone of Proximal Development (ZPD). According to Vygotsky, the cognitive processes develop as a result of social interaction within different cultural norms. Social interaction occurs as children discuss and internalize these processes (Vygotsky, 1933). Though a child may not perform some tasks independently, their ZPD changes through the process of mentoring from those who know more; thus, children begin to reach optimum performance. Students' abilities grow as they master certain tasks, which prepare them to acquire more complex skills and problem-solving ability.

The term "critical thinking" became popular toward the end of the 20th century and describes an inward, invisible process. Scholarship from cognitive psychology has endeavored to provide concrete definitions of critical thinking (Chance, 1986; Ennis, 1992; Facione, 2000; McPeck, 1981; Paul, 1995; Paul et al., 1997; Scriven & Paul, 1987, Facione, 1990). In 1981, McPeck's book *Critical Thinking and Education* defined CT as "the skill and propensity to engage in an activity with reflective skepticism" (p. 2). McPeck was the first to define the importance of one's willingness on CT as an important component of CT. Five years later, Chance (1986) defined CT similar to the Socratic method, "...the ability to analyze facts, generate and organize ideas, defend opinions, make comparisons, draw inferences, evaluate arguments, and solve problems" (p. 6). In the 1990s, CT started to standardize as strictly a reflective process that only focused on the next decision becoming their best decision (Ennis, 1992). Traits of the 1990s view of CT included being mindful of choices, well-informed, and discerners of credible sources.

As with McPeck (1981), Facione (2000) was also concerned with disposition or habits of mind when defining CT. He maintained that cognitive skills (i.e., analysis, interpretation, inference, explanation, evaluation, monitoring, and reasoning) are at the core of critical thinking ability. Human beings must possess the CT skill, but they must also have the internal motivation to act upon CT. Facione believed that CT comes through practice and guidance because it is a complex, purposeful process. The next section describes the American Philosophical Association (APA) Delphi study led by Facione that actualized his beliefs into action. He gathered together scholars from many research fields of study to create a common definition for CT for undergraduate college students.

Many experts (e.g., McPeck, Facione, and Ennis) have sought to define CT, but it is too complex for a single definition. So to understand the complexity, two Delphi studies (i.e., APA and Nursing) divided the phenomenon of CT into chunks or attributes, which also allows for reviewing the thinking processes within various professional contexts.

American Philosophical Association Critical Thinking Delphi Study

Facione served as the lead investigator to find common definition for critical thinking (CT). Specifically, the goal was to determine a CT definition through the use of attributes that would be suitable for college-level teaching and assessment. This resulted in the American Philosophical Association (APA) Delphi Report that defined CT as both skill and dispositional-based. Participants included 46 men and women throughout the United States and represented a variety of scholarly disciplines.

Delphi detailed process. The research project included five rounds that lasted two years (Facione, 1990). Rounds one and two initiated the Delphi process. During the initial two rounds, panelists nominated other CT experts to join the project. Experts agreed that CT could be made operational by defining important traits of CT (Facione, 1990). Analysis began with the question, "What core elements of CT might one expect from a college freshman and sophomore in general education courses?"

For round three, the lead investigator invited experts to write their list of operations they conceived of as central to CT. Experts reviewed the final list in round four, which focused on the skill dimension of CT, not the dispositional dimension. Subsequently, CT aspects were developed in round five that included definitions, classifications, dispositional traits, and methods for assessing CT. Finally, round six

concretized a working draft that gave the CT experts an opportunity to express their views or make comments for inclusion in the final report (Facione, 1990).

The previous rounds resulted in consensus statements about CT skills described it as purposeful interpretation, analysis, evaluation, and inference. Delphi members also explained CT as evidential, conceptual, methodological, and contextual considerations for judgment (Facione, 1990). The Delphi panel further concluded that the ideal critical thinker has a dispositional dimension:

> Habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry. (Facione, 1990, p. 2)

In the following two paragraphs, a clearer explanation of these two aspects of critical thinking—cognitive and dispositional—will be explored.

Skills dimension. Facione (1990) defined the CT skill dimension as being comprised of many traits that together form clear, accurate, defensible thinking (e.g., the ability to interpret, analyze, and evaluate information). This CT dimension is reflective of core professional skills, which are required learning outcomes of every nurse baccalaureate program. These include interpretation, analysis, evaluation, inference, explanation, and self-regulation.

Dispositional dimension. In order to effectively understand CT disposition and its relationship to CT cognitive skills, an operationalized definition was needed. Critical thinking disposition is the consistent internal motivation to engage problems and make decisions by using CT (Facione, Facione, & Giancarlo, 1997). Interest in the dispositional aspect of CT has increased that some have speculated due to an over emphasis on CT

skills dimension (Ennis, 1996; Facione & Facione, 1992; Paul, 1995). Re-emphasis of the dispositional dimension means students are intentionally trained to visibly act or decide (i.e. clinical judgment) as a result of internal, invisible thinking. Experts in CT support the philosophical distinction between the skill dimension and the dispositional dimension of CT (e.g., Taube, 1997). Many scholars have included the dispositional aspect of CT in their definitions (e.g., Ennis, 1996; Esterle, & Clurman, 1993; Facione, 1990; Paul, 1995; for scholars who cite dispositional attributes of CT see Table 1).

Practical application of dispositional skills. Dispositional skills include the ability to decide what to believe and what to do (Facione, 2000). For example, humans may approach problems with confidence in their ability to reason through the issues associated with it while others mistrust themselves as decision makers, thinkers, or problem-solvers. Some may be open-minded about multiple ideas while others remain intolerant of other perspectives. Some can approach problems in systematic ways while some in disorganized ways (Facione, 2000). These are practical examples of those who have a disposition toward using CT, and others who need training in the will to act on what they critically think. The Delphi study caused a period of "wrestling" with CT, which this author entitled the *Nursing Interdelphi Period*.

Table 1

Scholars who most commonly cited CT dispositions (Facione & Facione, 1992).

Critical Thinking Dispositions	
Critical Thinking Dispositional Attributes	Researchers who use the defined depositional attributes
Open-Mindedness	Bailin et al., 1999; Ennis, 1985; Facione 1990, 2000; Halpern, 1998
Fair–Mindedness	Bailin et al., 1999; Facione, 1990
Seek Reason	Bailin et al. 1999; Ennis, 1985; Paul, 1992
Inquisitiveness	Bailin et al., 1999; Facione, 1990, 2000
Desire to be Well-informed	Ennis, 1995; Facione, 1990
Flexibility	Facione, 1990; Halpern, 1998
Respect for alternative viewpoints	Bailin et al., 1999; Facione, 1990

Nursing Interdelphi Period

The term "Interdelphi Period" has been created by this author to define the time between the APA Delphi study in 1990 and the Nursing Delphi study in 2000. The antecedent of "Interdelphi" came from the "intertestamental period," which referred to the time between the Old Testament writings and the New Testament writings. This was a time of preparation for God's people to believe in the need for the birth of Christ. In similar fashion, the decade of the nineties was a time of preparation in nursing to believe in their need for a specific nursing definition of CT (Blomberg, 2011; Carson & Moo, 2009). The following section tells the story of events that caused nurse practitioners to create a nursing definition for CT.

Discovering the extent of the inconsistency. The National League for Nursing (NLN) required nursing programs to define CT in their program objectives. Then

demonstrate student development of CT skills through outcome measures that matched their definition (O'Sullivan, Blevins-Stephens, Smith, & Vaughan-Wrobel, 1997).

Facione (1995) believed there was a large disparity in CT definitions in nursing education (Compare Ennis, 1995 and Paul, 1993 for an example). He emphasized his standards in nursing, which included habitually inquisitive, open-minded, flexible, fair-minded, honest, prudent, and clear regarding issues, orderly, reasonable, focused, persistent, and well informed. Subsequently, a number of studies were published that evaluated a variety of educational approaches to CT for undergraduate nursing education (See O'Neill & Dluhy, 1997; Rossignol, 1997). Results were mixed, leaving questions as to the appropriate educational approaches to training CT as well as the best method to measure CT (for a discussion of measuring CT, see the following section).

Tanner (1996) reported that there was a lack of research in nursing practice and the *role* of CT. This resulted in a collaborative effort between nursing practice and nursing education (Tanner, Benner, and Chesla, 1996). The work expanded the concepts originally presented by Benner in her book *From Novice to Expert* (1984), which introduced the notion of a gradual professional development of new nurses toward expert clinical nursing practice. This resulted in Fowler (1998), along with Bittner and Tobin (1998), attempting to shift evaluation of CT from the assessment of change among nursing students to evaluation of CT in clinical practice. These studies highlighted the strategies for development of CT in nursing staff, identifying enhancers and barriers to that process, and suggesting that the environment can constrain or motivate the nurse.

O'Sullivan et al. (1997) surveyed baccalaureate nursing schools to obtain CT definitions; only 70 of 237 schools responded. Researchers reported that 37% of the

respondents defined CT as linear problem-solving, while 12.8% thought of it as a "complex mental processes by which data are synthesized to make accurate nursing decisions" (p. 25). Other definitions of CT came from the National Council of Excellence (NCE) in Critical Thinking (12.8%), Watson-Glaser (8.6%), and Brookfield, Kurtiss, and Paul (5.7%). The NCE defined CT as "an active process of skillful conceptualization that guides beliefs and actions" (O'Sullivan et al., 1997, p.25). Watson-Glaser defined it as a "composite of knowledge and skills" that includes attitudes (O'Sullivan et al., 1997, p. 25). Finally, Brookfield defined it as "a process of active inquiry which combines reflective analysis with informed action and affective elements" (O'Sullivan et al., 1997, p. 25). This provided insight for the nursing community to the large disparity in standard definitions of CT.

Measuring critical thinking as a problem. O'Sullivan et al. (1997) research found that respondents had as much difficulty measuring CT as they had defining it. Only 148 of the 237 respondents answered a question about measurement. The other 89 indicated that they were not far enough along in the process to answer or left the space blank. Many programs used standardized tests (27.9%, n = 69) or individualized assessments (27.1%, n = 67), and very few used locally designed measures (1.6%, n = 4) or surveys (4.0%, n = 10). The most common standardized tests used were the Watson-Glaser Test of Critical Appraisal (22 of 69) and the California Critical Thinking Skills Test (CCTST; 23 of 69). The most common individualized assessment used was the case study (24 of 67) and the clinical evaluation or care plan (16 of 67; O'Sullivan et al., 1997). Although many programs still think of CT as linear problem-solving, others have developed a more complex definition of CT and note that it is served poorly by most

classroom instruction methods. Educational theorists and researchers have found that strategies that promote active processing of concepts and participation in the learning process are more likely to lead to the development of CT skills.

The Interdelphi period lasted for ten years and culminated with the Nursing Delphi study to begin the 21st Century (Scheffer & Rubenfeld, 2000). While the APA Delphi study had consensus on CT, hospital administrators, preceptors, and nurse educators believed a need existed for a standard definition in nursing. The new Delphi study would be the first step toward developing the ability to measure CT as a core competency in nursing education and ongoing professional training.

Nursing Critical Thinking Delphi Study

Because nursing education programs lacked a standardized definition of CT, Scheffer and Rubenfeld (2000) conducted a second Delphi study that included the contributions of a panel of nursing experts in education, practice, and research. The Delphi study of the nursing community refined the scope of the APA definition of CT by adding the two CT traits of (a) creativity and (b) intuition. The hope was to provide a standardized definition that would help educators train nurses to become more competent.

Delphi detailed process. The nursing Delphi study on CT had five rounds. Round one consisted of expert participants answering the question, "What skills and habits of mind are at the core of critical thinking for nurses in any setting: practice, education, and research?" The terms "Habits of Mind" (HOM) and "Skills" were chosen to capture the dispositional and cognitive aspects of CT (Facione, 1990).

Round two recorded expert recommendations regarding the common terms associated with CT. Afterward, the Delphi participants were asked to provide possible

definitions for the terms. Unfortunately, there existed no consistency in the definitions. The Delphi participants decided to postpone further discussion to round three.

Round three continued the quest to define the common terms associated with CT (Scheffer & Rubenfeld, 2000). The Delphi experts found dictionary definitions for Habits of the Mind CT terms were self-evident, so a collective agreement existed among them. The Delphi experts found dictionary definitions for skills were not self-evident, which resulted in disagreements among them. Therefore, skill CT terms were reorganized into skills and subskills (Scheffer & Rubenfeld, 2000). This debate reduced the number of CT Skills from 13 to seven in round four.

The Delphi leaders in round four sought to finalize the core definitions for HOM and Skills. The members created (a) set the terms, (b) numbered the attributes, (c) defined the characteristics, (d) identified the subskills for each attribute, and (e) formatted a consensus statement. The most difficult objective in round four was consensus on the subskills. The concerns by panel participants were that the subskills need further study (Scheffer & Rubenfeld, 2000).

The goal of this final round was to complete the study. The panel of CT experts concluded the Delphi study with a statement of consensus. The panelists were united that further Delphi studies should occur in the future. Participants in the nursing Delphi study created a common language for CT in hopes that nursing programs would use it for "designing learning activities and assessing students' CT outcomes" (Scheffer & Rubenfeld, 2000, p. 357).

Skills dimension. Cognitive skills as defined by the nursing Delphi study provide a standard definition that nursing programs can use to develop CT (see Table 1). Critical

thinking experts in nursing identified seven subskills for nursing practice: (a) analyzing, (b) applying standards, (c) discriminate, (d) information seeking, (e) reasoning, (f) predicting, and (g) transforming knowledge (see Table 2). These skills are the hallmarks and the core competencies of practitioners who use objective evidence to articulate and solve problems. By no means are these skills limited to advanced practice nurses or those who do large-scale clinical research. The core cognitive skills are best understood as students' ability to take charge of their thinking. This requires that students develop sound criteria and standards for analyzing and assessing their thinking and routinely using those criteria and standards to improve their quality of work.

Table 2.

Nursing Delphi Study Skill Definitions (Scheffer & Rubenfeld, 2000)

Cognitive Skill	Definition
Analyzing	Separating or breaking a whole into parts to discover their nature, function and relationships.
Applying Standards	Judging according to established personal, professional or social rules or criteria.
Discriminating	Recognizing differences and similarities among things or situations and distinguishing carefully as to category or rank.
Information Seeking	Searching for evidence, facts or knowledge by identifying relevant sources and gathering objective, subjective, historical, and current data from those sources.
Logical Reasoning	Drawing inferences or conclusions or justified by evidence.
Predicting	Envisioning a plan and its consequences.
Transforming Knowledge	Changing or converting the condition, nature, form, or function of concepts among context.

Habits of the mind dimension. The phrase "Habits of the Mind" replaced "Disposition" after consultation with Pete Facione and his wife, Noreen Facione (Rubenfeld & Scheffer, 2010; for a comparison of the two Delphi studies see Appendix C). Habits of the mind (HOM) are visible attributes of action that represent invisible cognitive CT skills (see Table 3). Nursing scholars did not want some of the stereotypical views of dispositions being static (see Table 3 for Habits of the Mind definitions). On the other hand, habits were believed to be more dynamic in the nurses' natural environment (Rubenfeld & Scheffer, 2010).

Table 3.

Nursing Delphi Study Habits of the Mind Definitions (Scheffer & Rubenfeld, 2000)

Habits of the Mind	Definition
Confidence	Assurance of one's reasoning abilities.
Contextual Perspective	Considerate of the whole situation including relationships, background and environment relevant to some happening.
Creativity	Intellectual inventiveness used to generate, discover, or restructure ideas; imagining alternatives.
Flexibility	Capacity to adapt or accommodate, modify or change thoughts, ideas, and behaviors.
Inquisitiveness	Eagerness to know by seeking knowledge and understanding through observation and thoughtful questioning in order to explore possibilities and alternatives.
Intellectual Integrity	Seeking the truth through sincere, honest processes, even if the results are contrary to one's assumptions and beliefs.
Intuition	Insightful sense of knowing without a conscious use of reason.
Open-Mindedness	Viewpoint characterized by being receptive to divergent views and sensitive to one's biases.
Perseverance	Pursuit of a course with determination to overcome obstacles.
Reflection	Contemplation upon a subject, especially one's assumptions and thinking for the purposes of deeper understanding and self-evaluation.

Dispositional or HOM attributes actualize the critical thinking skill dimension into action, and they become a catalyst toward becoming an expert professional. These attributes are foundational to help novices make difficult decisions under stress. The next section explores the concept of Critical Thinking Decision Making (CTDM).

Critical Thinking and Decision Making

Critical thinking is a synonym for clinical reasoning (Gambrill, 2012), and decision making is a synonym of clinical judgment (Tanner, 2006). Both are two sides of the same "coin." The first aspect is CT or the professional's ability to analyze effectively or critically think through a presented situation. The second aspect references the professional's willingness to use critical thinking analysis (i.e., act on the critical situation). The APA Delphi study also inferred this by associating cognitive skill as an inward, invisible critical thinking process as well as an external attitude. This is the visible component of critical thinking (Facione, 1990; Rubenfeld & Scheffer, 2010). Since critical thinking and decision making are the same "coin," the term critical thinking decision making (CTDM) will be used in this study to refer to both aspects of the Delphi study's definition. Professionals within the interdisciplinary fields have developed common theories about how one visibly acts on invisible critical thinking. Critical thinking decision making has two categories—novice and expert (Dreyfus uses the term mastery in lieu of expert)—along with three intermediary levels (Benner, 2004; Dreyfus & Dreyfus, 1980). The continuum between novice and expert describes the journey that occurs as one becomes an expert (e.g., the Benner model suggests becoming an expert requires approximately five years; Benner, 1984).

Novices characteristically have conceptual knowledge regarding what to do in a situation, but they lack experience to contextualize their decisions. As novices gain experience, they begin to transform into experts through the intermediary steps (see Table 7). Eventually, through time and practice, CTDM becomes intuitive based on multiple, different experiences. Ultimately, an expert's capability expands from making decisions only within routine, recurring CTDM environments to making effective decisions within nonroutine, nonrecurring, and uncertain environments.

The Need for Critical Thinking Decision Making in Clinical Practice

Expertise develops when nurses can effectively manage many bits of patient information coming all at once as well as managing the emotionality of caring for patients in life-threatening situations (Thompson, 2010). Without the aid of experience, a nurse could become overwhelmed with invisible sorting, discerning, and drawing conclusions about patient needs. The method regarding how information is thought through and acted upon is the difference between novice and experts.

Differences between Novices and Experts

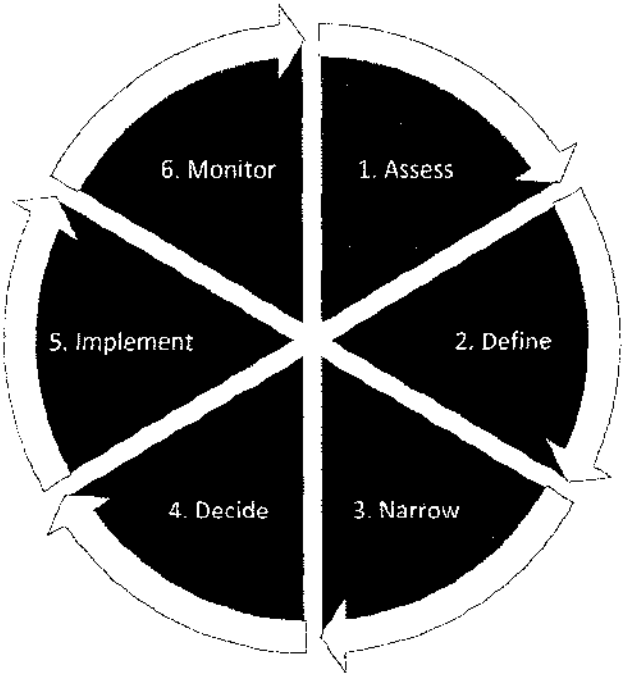
Novices are more linear, rational thinkers who require high mental effort to analyze, accept, and reject patient information. Experts are non-linear, intuitive thinkers who require low mental effort to decide (Benner, 1984). Cognitive psychologists have described expert thinking as subconscious, automatic, and quick thinking while conscious, effortful, and methodical thinking to describe novice thinking (Thompson, 2010). These differences also mean that novices and experts have different criterion for decisions they make.

Rational Decision Making (RDM) and Naturalistic Decision Making (NDM) are the two primary theories taught to students today. Each is important in order to understand the theoretical reasons underlying how novice and experts decide on specific courses of action.

Rational Decision Theory. The RDM strategy is a logical, sequential, analytical, conscious process and typically involves consultation with others (Facione, n.d.). A practitioner using rational decision making generates and compares multiple options, then chooses the best option for implementation. The sequential process ensures that the decision maker considers all data, generates appropriate alternatives, and then evaluates those alternatives before a solution is chosen and implemented (Chapter 4, n.d.; see Figure 1). For example, RDM is used for strategic planning. The goal of a strategic planner is to identify all of the possibilities, weigh the consequences, and then choose the best plan that provides the greatest chance of success. This type of planning tends to be relatively complex, mostly nonroutine, and requires months to complete. A similar process is also used when purchasing a car, refrigerator, cell phone, or any item where there are several options from which to choose (Chapter 4, n.d.).

Figure 1

Rational Decision Making Process (Facione, n.d.).



Naturalistic Decision Theory. Naturalistic Decision Making describes how people decide in authentic, real-world settings (Klein, 2008; Klein & Klinger, 1997). Naturalistic environments have many factors such as continually changing conditions, real-time reactions to these changes, ill-defined tasks, time pressure, and significant consequences for mistakes. These task conditions naturally exist in operational environments and therefore are essential to replicate in training (Klein & Klinger, 1997).

Naturalistic models describe what information decision-makers process. For example, one might want to understand the decision makers' perception of what information they seek, how experts interpret that information and, subsequently which decision rules they actually use. Decision making uses matching rather than choice. Matching differs from optimal decision making with regards to how experts perceive their options (Klein, 2008):

1. Evaluate Options sequentially. Decision-makers rapidly screen most choices by comparing them against a known standard in the expert's experience.
2. Options are selected or rejected based on their compatibility with the situation, or the decision maker's values rather than on their relative merits.
3. Options rely on pattern matching and informal reasoning (Klein, 2008; Lipshitz, Klein, Orasanu, & Eduardo, 2001).

Naturalistic research found that experts trust their instincts, and they act immediately; in other words, they do not concurrently choose from many options in authentic circumstances. This led to the development of the Recognition-Primed Decision Model that explains the rapid decisions that humans make under stress.

Recognition-Primed Decision Model. The recognition-primed decision model (RPD) is one of the best known and most studied decision making models (Klein, 2008; see Appendix F). This model was developed by Gary Klein for studying decision making in real time. He lived on aircraft carriers and in firefighter camps, and has participated in military exercises that require rapid decision making. Klein's focus is on intuitive decision making, where leaders use their experience to evaluate the situation quickly and make fast decisions. His research indicates that in fast-moving, dynamic environments like firefighting, police work, military combat, or critical care nursing, are made in less than 60 seconds. As Klein continued to collect data and study how decisions occur under time constraints, he developed the RPD model. The important aspects of RPD include the following:

- First option is the best option
- Linear generating of other options is dependent on the first options

- Satisficing not optimizing
- Evaluation through mental simulation
- Focusing on improving options (i.e., modify first option "on the fly")
- Focus on situation assessment not decision events
- Decision maker primed to act not waiting for a complete analysis

Adaptive Thinking Training Methodology. The skill required by nurses to succeed in critical patient care is adaptive thinking. This form of Recognition-Primed Decision Making (RPD) has been emphasized by the Army since the terrorist attack on 9/11 (Lussier & Shadrick, 2004). The Army defines *Adaptive Thinking* as someone, "...who is confronted by unanticipated circumstances during the execution of a planned military operation" (Lussier, Ross, & Mayes, 2000, p.1). Army commanders use Adaptive Thinking Training Methodology (ATTM) to learn decision making based on maintaining *situational awareness*. In essence, the commander learns to "adjust on the fly" in order to exploit the advantage or minimize the harm of the unanticipated events thus providing a greater potential for success. Whether a commander or a critical care nurse, there is a requirement to make rapid decisions that solve problems. The decision-maker is diligent in reassessing the situation, and then either modifying the decision or continuing with the Plan of Attack (POA; Lussier, Shadrick, & Prevou; 2003). The goal of the decision-maker using the ATTM is to monitor situational awareness for unanticipated events continually; these events then require further rapid decisions in order to save lives or win a battle.

Assessing the conditions tasks under which ATTM must occur is an important training aspect of Adaptive Thinking Training Methodology. The thinking that underlies

Army battlefield decisions is that decisions do not occur in isolation or a calm, reflective environment, it occurs in a chaotic environment (Lussier, Shadrick, & Prevou; 2003). Commanders are trained to (a) assess the situation, (b) scan for new information, (c) manage individuals under stress, and (d) monitor progress of multiple activities of a complex plan. Though adaptive thinking uses low cognitive resources, Commanders may feel hurried or busy; so the challenge is to find ways to free resources needed to accomplish the mission (Lussier, Shadrick, & Prevou; 2003).

Typically, U.S. Army officers develop a good conceptual understanding of the elements of tactical decision making. However, knowledge alone will not guarantee good CTDM in crisis (Lussier & Shadrick, 2004; Lussier, Ross, & Mayes, 2000). For example, if officers know how the enemy has performed various actions on the battlefield and they are asked to infer the enemy's intent, then they can do this well. Leaders on the battlefront must have both the knowledge and the reasoning ability to solve real-time problems. Nevertheless, when officers train in an ill-structured authentic combat environment, they will not necessarily act on the taught behavior. Adaptive thinking under stressful performance conditions requires considerable training and extensive practice in realistic tactical situations until thinking processes becomes largely automatic (Lussier, Shadrick, & Prevou; 2003). The Army research examples demonstrate the need to train within ill-structured, high stakes professional environments to help learners progress through various stages of skill acquisition. The next section delves into the two primary models that define the five stages of skill acquisition.

Models of Novice to Expert Skill Acquisition

Human beings who desire to acquire new skills have two options: (a) trial-and-error or (b) seeks help from an instructor and or some instructional material. Of course, humans prefer the more efficient approach (i.e. instructional materials or an instructor who already has the skill). Described in the next few paragraphs is the Dreyfus Model for skill acquisition.

Dreyfus model of novice to expert skill acquisition. The Dreyfus model is a useful tool to assess knowledge (Phillips, Shafen, Ross, Cox, & Shadrick, 2006) and the effect of professional development activities (Marble, 2009). Specifically, the model was useful in describing stages of skill acquisition, assessing knowledge, and providing a road map of professional development activities for the individual seeking to reach a new level of knowledge and skill. The Dreyfus model has five stages of skill acquisition development (a) Novice, (b) Competence, (c) Proficiency, (d) Expertise, and (e) Mastery.

Novice. Novices' education begins by decomposing the task environment into context-free features which the beginner can recognize without benefit of experience (Dreyfus, 1980). Dreyfus calls education for students without experience non-situational learning. The beginner is given rules for determining an action on the basis of these features. Novices need monitoring, either by self-observation or instructional feedback; this brings behavior into conformity with each rule.

Competence. Skill comes only after considerable experience coping with real situations in which the student notes, or an instructor points out repetitive meaningful component patterns (Dreyfus, 1980). Situational components regarding what a competent student understands in his or her environment are no longer the context-free features used

by the novice. Dreyfus labels these recurring patterns as aspects of the contextual situation. Aspect recognition cannot be created by calling attention to frequent sets of features, but only by singling out specific examples.

Proficient. Increased practice exposes the human being to a variety of typical whole situations. Each holistic situation has a meaning to the achievement of a long-term goal (Dreyfus, 1980). Aspects now appear to be more important depending upon their relevance to this goal. The professional is experiencing the entire situation from a particular perspective that becomes organized and stored in long-term memory. This provides a basis for future recognition of similar scenarios. Given a set of situational aspects, the professional can use principles stored in long-term memory, which Dreyfus calls a maxim that determines the appropriate action.

Expertise. The expert professional in a particular task environment has reached the final stage in the step-by-step improvement of mental processing (Dreyfus, 1980). Up to this point, the performer required an analytical principle (rule, guideline, or principle) to connect his or her grasp of the general situation to the appropriate decision. Now the professional has a repertoire of experience to draw upon in other situations so that a particular situation immediately dictates an intuitively appropriate action. Intuition is possible because the person has associated an experience with a particular response.

Mastery. Mastery is the highest level of professional capability. This higher-level expert is capable of transcending expert performance to unusually high levels (Dreyfus, 1980). People who are at mastery level no longer need to think consciously about decisions; instead, they use their unconscious. Performing at this skill level requires very little mental effort and produces instantaneous, intuitive action.

Benner model of novice to expert skill acquisition. As the Dreyfus model focuses on situated performance, so does the Benner model. In fact, the Dreyfus model is the antecedent of the Benner model. The Dreyfus model influenced three nursing studies of skill acquisition (Benner, 1982, 1984; Benner, Hooper-Kyriakidis, Stannard, 1999; Benner, Tanner, & Chesla et al. 1992, 1996). Hubert and Stuart Dreyfus served as consultants in each of these three studies.

The first study occurred over a period of three years (Benner, 2004). This research conducted 21 paired interviews with recently graduated students and preceptors. In addition, participant observations were conducted with 51 experienced nurses, 11 newly graduated nurses, and five senior student nurses. The purpose of this was to delineate more clearly and describe characteristics of nurse performance at different levels of education and experience. The meetings—small group and individual—occurred in six hospitals (Benner, 2004). These hospitals included two private community hospitals, two community teaching hospitals, one University medical center, and one urban general hospital.

The second study of skill acquisition was an extension of the first study, which occurred from 1988 to 1994 (Benner, Tanner, & Chesla, 1992; Benner, Tanner, & Chesla, 1996). One hundred and thirty nurses practiced skill acquisition development in intensive care units and general floor units in eight hospitals. Data collection came from small group narrative interviews, individual interviews, and participant observation (Benner, 2004). There were two aims of the study (a) to describe skill acquisition in nursing practice and (b) to delineate the intuitive knowledge embedded in expert practice.

The third study occurred from 1996 to 1997. This study was an extension of the second study in order to include critical-care areas of emergency departments, flight nurses, home health, the operating room, and post anesthesia care units ($n = 75$). The result of these three research studies became the Benner model (Benner, 2004). Benner (2004) proposed five levels of skill acquisition.

Novice. The novice stage of skill acquisition occurs when students have no experience on which to base a treatment approach or understand the unseen complexity of the clinical situation (Benner et al., 1996). Teachers must provide recognizable descriptions of the clinical situation because novice decision making is rule-based, which makes nurses inflexible to change. Students are coached to compare and match textbook examples with actual clinical cases. Instructors select patient care situations that are relatively stable and that provide coaching and mentoring on the possible changes in the patient's condition. For example, instructors provide advanced organization to prepare students for applying conceptual understanding.

Advanced Beginner. According to Benner et al. (1996), newly graduated nurses are advanced beginners. A significant change occurs when a new nurse becomes licensed (i.e., entirely responsible for patient care). This new level of responsibility changes the way nurses view themselves and the practice environment. The nurse develops a sense of comfortableness with having professional responsibility that begins to heighten their situational awareness of the clinical setting. This new level also causes them to increase their recognition of features and relevant situational cues. Nevertheless, CT decision making evaluation is accomplished in isolation that prevents integrating multiple signs and symptoms that may be occurring in the patient.

Competent. The competent stage of skill acquisition includes heightened planning for what are now more predictable responses to patients (Benner et al., 1996). Decisions are judgments of what is important based on heuristics or "mental shortcuts" from past experiences with other patients (for more information on heuristics, see Tversky & Kahneman, 1974). Competent nurses limit the unexpected through planning, analysis, and by trying to predict the needs of the immediate future; but they realize that there are heuristics that will help. Anxiety is now more tailored to the situation than it was at the novice or advanced beginner stage when a general concern exists over learning and performing well without making mistakes. The result is an experience of being in the wilderness. Moving from a competent to a proficient nurse is predicated upon doing what is necessary without "rules of thumb" to guide them. A foundation of experiences causes emotional reactions that act like fuzzy recognition of similar or dissimilar situations.

Proficient. At this stage, nurses are synthesizing the meaning of patients' responses over time (Benner et al., 1996). This level of proficiency uses patient reports and medical tests. However, a proficient nurse is starting to recognize the assessment of the patient is contextually-based along with a practical understanding of how the patient physically and emotionally responds over time. When the nurse has trouble grasping the patient's normative clinical situation, the proficient nurse searches for a new interpretation, which results in experiential, clinical learning. According to Benner et al. (1996, 1999), nurses describe the frustrating situation of "chasing a problem" and never feeling "in synch" with the situation. Transitioning from a proficient to an expert nurse requires a developed ability to reason through transitions by being open to correction and disconfirming patient information. These nurses are no longer prone to confusion but are

guided by perceptual sensitivity and responsiveness to changes in the patient situations that are similar or dissimilar to past cases. If unusual events occur that are unfamiliar to the nurse practitioner, then the nurse tries to figure out why and how this situation is different. (Benner et al., 1996).

Expert. An expert has a unique ability to discriminate accurately among similar situations. Nurses of this caliber can see the needs and how to achieve it. The expert nurse decides on intuition that is based on technique and prognosis (Benner et al. 1996, 1999; Benner, 2004). Theories and practice integrate together, which provides the opportunity for creative possibilities for treatment in the patient care situation. These choices seem intuitively obvious to the practitioner. This is why observation and informally interviewing in real-world situations are required to discover and describe all levels of practice. The decisions made in practice typically make sense to experts as the most effective response to the contextual situation. Intuition becomes the tool of choice when seeing and responding to the situation.

Table 4

Description of Benner's Model of Skill Acquisition (Benner, 1984).

Benner Model of Skills Acquisition	Description
Novice	Focuses attention on the objective, measurable attributes such as vital signs, and then uses heuristics from the classroom to decide. The nurse may not understand how to apply that knowledge within the context of a real life situation.
Advanced Beginner	Demonstrate marginally acceptable performance because they have had little practical experiences, but rely on experience to gain confidence in their clinical skills. Instructors and preceptors can facilitate learning by providing general guidelines to the advanced beginner. More knowledge and time is necessary for the application to occur.
Competent	Understands the impact nursing actions have in relation to other patient care issues. Preceptors may be able to facilitate learning by playing decision making and prioritization games.
Proficient	Ability to understand situations as wholes rather than in terms of tasks. Nursing experiences help them recognize the most important attributes of the situation. Rather than clinical guidelines and protocols, action is determined by reading a situation Benner (1984) suggests that proficient nurses learn best with the use of case studies.
Expert	Decision making no longer relies on analytic principle (heuristics) to determine understanding of the situation to the appropriate action. The expert has an "intuitive grasp of each situation" (Benner, 1984, p. 32). Benner suggests expert nurses perform evaluation by asking them to serve as consultants to other nurses and or through story telling.

These levels of skill acquisition, whether one uses the Dreyfus or Benner Model, describe skill enhancement over time. Nurses either perform these skills or they must continue to practice to achieve higher levels of excellence as a nurse practitioner. Strategies for developing CT must be intentional, however. In the next section, the three most common strategies for cultivating CT are reviewed: (a) concept mapping, (b) case studies, and (c) simulation.

Strategies for Promoting Critical Thinking Decision making

Concept Mapping. Concept Mapping (CM) is a useful method for developing logical thinking because it provides a visual display of connections between individual ideas that form a larger whole. Disciplines including medicine, science education, and educational psychology use concept mapping in the classroom (Beitz, 1998; Heinze-Fry & Novak, 1990; Horton et al., 1993; Rooda, 1994). Mapping concepts helps students to learn the relationships between ideas, images, or words similar to the way that a sentence diagram represents the grammar of a sentence. This method is ideal to solve ill-structured, critical problems (Gul & Boman, 2006; Novak & Canas, 2010).

Wheeler and Collins (2003) used a quasi-experimental, pretest-posttest design method to determine if concept mapping was useful in preparing nursing students for clinical experiences. The posttest scores of the control group did not significantly differ ($p < .52$), but the experimental group had higher posttest scores that were statistically significant ($p < .02$). Chen et al. (2011) found similar results in a quasi-experimental, pretest-posttest design using the Approaches to Learning and Studying Inventory (ALSI). The experimental group had statistically significant differences in three of the five ALSI subscales (a) the deep approach ($t = 4.70, p < 0.001$), (b) the surface approach ($t = 3.02, p < 0.004$), and (c) organized study ($t = 2.30, p < 0.03$). Lee, Chiang, Liao, Lee, Chen, and Liang (2013) also found similar results using a Hierarchical Linear Modeling (HLM) analysis. The experimental group had statistically significantly higher scores ($p < .05$) in CT than that of the control group. An intraclass correlation accounted for 61% of the variance in this study. These experiments support the notion that CM is an effective way

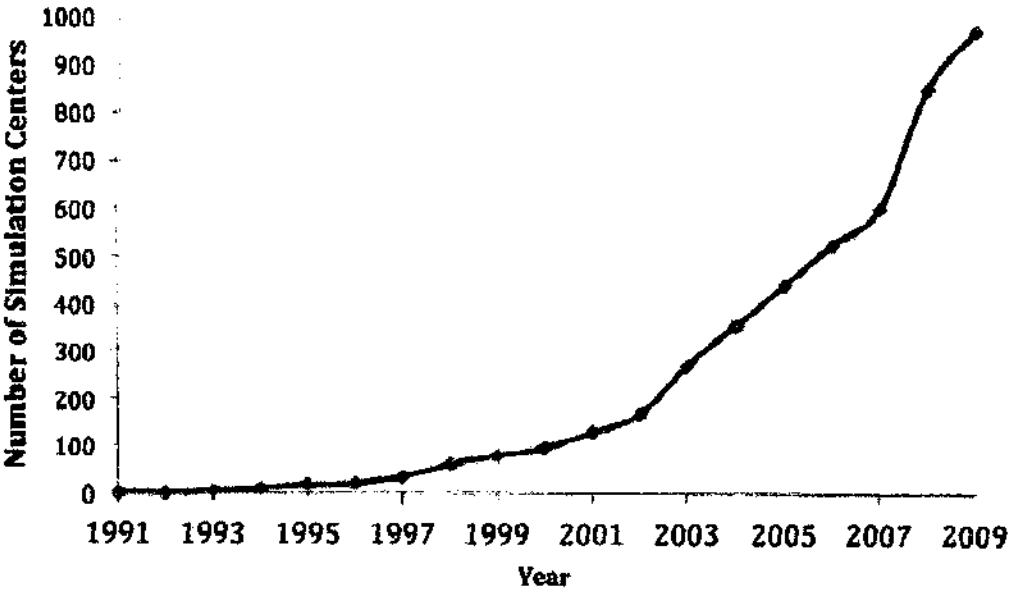
of developing CT. Concept maps facilitate meaningful learning through deductive reasoning (Novak, 1998).

Case Studies. Educators use case studies to help students develop abilities to solve problems. An important feature of case studies (CS) is that they emphasize an analytical frame for the study of complex, ill-structured situations (Thomas, 2011). Case studies also provide an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular problem in "real life" context. Thus, a CS is a viable method to develop CT. Critical Thinking case studies help students integrate multiple sources of data; solve clinical problems, make sound clinical judgment and provide logical scientific rationale for their decision making process (Gentner, Loewenstein, & Thompson, 2003).

Simulation. Use of simulation permeates all modern healthcare professions to include nursing for clinical training (Okuda et al., 2009; Sherwin, 2012). The ultimate goal of simulation in healthcare is to master performance through practice (Okuda et al., 2009). Because simulations have become an accepted viable option, healthcare simulation centers have quickly emerged across the United States. Since 1991, over one-thousand new simulation centers have been built for American healthcare practice (Sherwin, 2012; see Figure 2).

Figure 2

Growth of Simulation Centers in the United States (Sherwin, 2012).



Human patient simulators (HPS) have become synonymous with the word *simulation* in nursing education (Schiavenato, 2009). These manikins offer repetitive practice for student nurses to develop CT abilities. Human Patient Simulators also help nursing education develop outcomes of: (a) Learning Knowledge, (b) Skill Performance, (c) Self-Confidence, (d) Learner Satisfaction, (e) Critical Thinking (Jeffries, 2007; Levine, DeMaria, Schwartz, & Sim, 2013). The following empirical research shows that HPS is mostly useful for the development of clinical skills, confidence, and critical thinking.[3]

[3] Learner knowledge and skill performance research are often used in conjunction with one another in quantitative research in nursing education. Learner Satisfaction was not a subject of interest in research for this study.

Methods used in Support of Human Patient Simulators

Effectiveness of Human Patient Simulators (HPS) is an important area of concern due to the time and expense required to purchase, maintain, and build curricula for their use. HPS incorporates computer technology that ranges from partial pieces from a full-sized mannequin to partial manikins. Manikins simulate human breathing, pulses, heart and lung sounds, pupillary reaction, and the ability to produce urine. Human Patient Simulators are also programmed to respond authentically to medications and other treatments. The germane research here provides insight that HPS is predominantly a useful tool for training. Regardless, HPS is embedded in nursing education for the foreseeable future.

Methods used in support of developing knowledge/performance in nursing. Nehring and Lashley (2004) research results indicated that students felt HPS helped them develop clinical skills; in fact, students preferred the use of HPS to other skills training such as role-playing and task trainers. Nehring and Lashley also found that faculty members unanimously believed that the skills taught through HPS would transfer to a "real world" situation. Only half of the students in the survey believed this to be true. Many other researchers have also found that instructors and students have strong beliefs that HPS is useful in developing clinical skills (Kuznar, 2007; Feingold, Calaluce, & Kallen, 2004). Specifically, nursing students have high satisfaction with the use of HPS for the development of clinical skills.

Two studies (Alinier, Hunt, Gordon, & Harwood, 2006; Radhakrishnan, Roche & Cunningham, 2007) evaluated the effect of HPS on performance of student nurses' clinical skills. In a study by Alinier et al. (2006), students were assessed pre-intervention

by using the Objective Structured Clinical Examination (OSCE) to determine the students' baseline clinical and communication skills. The OSCE is composed of 15 stations (psychomotor skills, $n = 11$; cognitive skills, $n = 4$; Alinier et al., 2006). The experimental group used HPS, while the control group followed the normative education practice. The baseline OSCE scores between the two groups were very similar (control = 49.59, experimental = 50.19). After six months, outcomes were assessed again using the OSCEs for both groups. The experimental group scores improved by 13.4%, and the control group improved 6.76% with a statistically significant difference between the two ($p < .05$; Alinier et al., 2006). The study by Radhakrishnan, Roche and Cunningham (2007) used a faculty-developed Clinical Simulation Evaluation Tool (CSET) to measure the effect of training with an HPS on various skill levels, including the clinical practice parameters of safety, primary assessment, focused assessment, interventions, delegation, and communication skills. Students' scores increased as they observed correct behavior and if the observations occurred in the CSET checklist (Radhakrishnan et al., 2007). Students in the experimental group practiced with the HPS in addition to e-learning modules for the care of complex patients. The control group used the e-learning modules alone. The results of this quasi-experimental study found statistically significant improvements in the intervention group's ability to (a) identify deteriorating patients (a subcategory of the safety category; $p < .001$) and (b) assess vital signs (a subcategory of the primary assessment category; $p < .009$). The control and intervention group performance did not show any statistically significant differences in any other categories ($p < .05$; Radhakrishnan et al., 2007). What detracts from Radhakrishnan et al. evidence is that the experimental group had extra instruction with HPS versus the control group.

Nehring, Ellis, and Lashley (2001) evaluated 42 undergraduate students in their study of the effects of HPS on learning in medical-surgical nursing content. Eight groups of five to six students received one-hour training via lecture. Participants completed a pretest and presented three simulation scenarios using HPS. The students had to assess, plan, intervene and evaluate actions to prevent a fatal outcome. Students completed a posttest after completing the simulation exercise. Using the Wilcoxon signed ranks CT test for two related samples, a statistically significant difference existed between the pretest and the first posttest scores ($t = -5.84, p < .05$). Unfortunately, the researcher did not state the post-test results. Hoffman, O'Donnell, and Yookyung (2007) had similar research when they compared nursing students' core knowledge in critical care nursing teams following 7-weeks of traditional clinical experience, and then 7-weeks of HPS experiences. A repeated measures pre and posttest design used paired sample t-tests to analyze the data, and then three months later the BKAT-6 was used to measure clinical knowledge again. The analysis showed a significant improvement in core clinical knowledge at the three-month post-HPS mark ($t = -7.77, p < 0001$). Both studies attributed the statistically significant gain in surgical critical care nursing core knowledge skills to the use of HPS. Brannan et al. (2008) found HPS increased skill development as measured by the Acute Myocardial Infraction Questionnaire (AMIQ) Cognitive Skills Test posttest scores ($p < 0.002$). These studies showed statistically significantly increases in clinical skills using HPS as measured by two well-known clinical skills instruments (i.e., BKAT and AMIQ). One can infer from these studies that HPS repetition could help in the development of nursing skills (see also Fero et al., 2010). The following research supports the use of HPS to build confidence levels in new nurses. It is important to note

that in the nursing profession, the term confidence and self-efficacy are synonymous with one another.[4]

Methods used in support of developing confidence in nursing. Feingold, Calaluce, and Kallen (2004) found that a majority of faculty ($M = 75$) and students ($M = 92.3$) had more confidence in their professional skills after their HPS experience. Nevertheless, only 51% of students ($M = 50.8$) felt that the skills taught by HPS could transfer to the "real world." Lack of experience in an operational professional environment probably contributed to students' greater distrust in their ability when human lives may be at risk (Benner, 1984). Similar to the work of Feingold, Calaluce, and Kallen (2004), researchers Luctkar-Flude, Wilson-Keates, and Larocque (2012) found students had increased confidence from the use of HPS. This study was unique because it compared the effectiveness of HPS, standardized patients (SP) and community volunteers (CV) on ability to build confidence in students. The results of this comparison of training modality (i.e., HPS, SP, and CV) found students least preferred HPS to help them build confidence in clinical skills. A HAEME has a total possible score of 30; the results showed CV was most preferred ($M = 21$), then SP ($M = 19.50$), and last was HPS ($M = 18.79$). There was no statistically significant differences between the three modalities, but the study did find that HPS had a statistically significant effect on building self-confidence for the HAEME clinical preparation subscale ($M = 4.0$; $p < .05$).

Alinier et al. (2006), Brannan et al. (2008), and Jeffries and Rizzolo (2006) examined self-reported levels of confidence related to developing nurse core

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[4] According to Social Cognitive Theory, self-efficacy is a level of certainty to attain specific goals, while confidence has more to do with a cognitive belief in one's ability to do something, or in extreme cases, anything.

competencies using HPS. Jeffries and Rizzolo (2006) research measured students' (n = 357) level of confidence in performance for a postoperative adult patient simulation. An eight item self-efficacy scale measured students' self-reported levels of confidence. Students that learned with HPS had statistically significantly higher increases in confidence regarding their ability to care for a postoperative adult patient (Jeffries & Rizzolo, 2006).[5] Opposed to Jeffries and Rizzolo's research findings is the work of Alinier et al. (2006) and Brannan et al. (2008) that reported HPS did not increase confidence in skill performance. Alinier et al. used a five-point Likert scale to measure student confidence (Experimental Group = 3.48, Control Group = 3.50). These researchers believed that no statistically significant change in confidence was due to students' stress working in an unfamiliar technological environment. A majority of these reported studies and the larger body of research show HPS is effective in the development of student confidence in patient care with a caveat that technology stress should be taken into consideration when designing research (Levine, DeMaria, Schwartz, & Sim, 2013).

Methods used in support of developing critical thinking. Human Patient Simulators were used to assess student effectiveness in team environments (Hoffmann, O'Donnell, & Kim, 2007; Marken, Zimmerman, Kennedy, Schremmer, & Smith, 2010). Both research efforts used role-play in conjunction with high-fidelity patient simulators for learning effective communication. In Marken et al. (2010) study, students remained in their role throughout the simulation. In Hoffmann et al. (2007) study, team members switched positions to gain perspective from other first responder roles. Hoffmann et al.

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[5] Jeffries and Rizzolo (2006) did not report self-confidence data.

were innovative because they identified the unique challenges of first responders in horrific life events. Hoffmann et al. (2007) and Marken et al. (2010) found increased group communication occurred through the practice of appropriate intervention. Reising, Carr, Shea, and King (2011) performed a qualitative study that supports the findings of Hoffmann et al. and Marken et al. The results indicated that nurses believed the HPS scenario was a helpful, useful tool for teaching interprofessional communication skills (100%), and that they had a better sense of their role on the clinical team (98.3%). Effective communication in interprofessional teams is essential in order to make inferences for accurate decision making, which also infers good critical thinking (CT).

Three studies (Howard, 2007; Ravert, 2008; Schumacher, 2004) examined the effectiveness of using HPS to develop CT abilities in undergraduate nursing students. The authors reported mixed findings on whether HPS improved the CT abilities of students. Two of the three studies (Howard, 2007; Schumacher, 2004) showed significant improvement post-simulation. Schumacher (2004) examined the CT abilities of beginning baccalaureate undergraduate students by comparing the effectiveness of three different educational interventions: (a) classroom instruction, (b) HPS, and (c) a combination of classroom teaching and simulation. The researchers used a 60-item customized Health and Environmental Sciences Institute (HESI) examination as a pretest for all study participants. The items on the HESI examinations were developed to test and measure application and analysis on the cognitive level. Each group rotated through three learning activities that illustrated the nursing care of patients experiencing an emergent cardiovascular or respiratory event. After the completion of each activity, CT was measured using the HESI exam. Bonferroni post hoc comparisons were employed to

evaluate significant differences between the groups following the educational intervention (Schumacher, 2004). Examination scores were significantly higher for nursing students when HPS or a combination of simulation and classroom instruction occurred ($p < .002$; Schumacher, 2004). Howard (2007) conducted a randomized, multisite, quantitative, two-group pretest/posttest design with 49 students enrolled in baccalaureate nursing programs at two different universities. The control group participated in an interactive case study, and the experimental group participated in an HPS educational intervention. A custom designed HESI based on the HPS and interactive case studies for pre and post testing, and also used to measure CT ability of the participants. The results indicated that the experimental group using the HPS had a statistically significant increase in CT when compared with the interactive case study group ($p < .051$; Howard, 2007). Ravert (2008) also assessed CT using similar categories as Schumacher (2004). The two groups consisted of a non-HPS group ($n = 13$) that participated in five enrichment sessions that involved 1-hour small-group discussions and a second group ($n = 12$) that was exposed to HPS and five enrichment classes. The control group ($n = 15$) participated in the regular nursing curriculum with no enrichment courses (Ravert, 2008). The researchers used the California Critical Thinking Disposition Inventory (CCTDI) and the California Critical Thinking Skills Test (CCTST) to assess CT (Ravert, 2008). The results demonstrated statistically significant improvement in both the CCTDI and CCTST scores for all three groups (Ravert, 2008).

Human Patient Simulator research presented above is not conclusive evidence that it is effective; rather, it provides hope that training will narrow the preparation-practice gap in the nursing profession. One reason that evidence is inconclusive could be nurses'

inexperience in the area of clinical research (Nooney, Glos, & White, 2014). Another may be the use of mainly low-stress simulations that do not require high-pressure, time-critical decision making; nevertheless, novice nurses are often placed in emergency critical care environments without any previous training. On the other hand, medical schools and the military use HPS primarily for the practice of critical care of patients in emergency settings. Simulation-based medical education (SBME) expands the use of HPS as part of a far more rigorous preparation for their first assignment as a licensed practitioner.

Expanded Scenario Complexity using Human Patient Simulators

The military community leads in the use of sophisticated simulation environments.[6] Don Johnson works for the Department of the Army and has conducted complex scenario HPS research in the armed forces nursing community (Johnson, Flagg, & Dremsa, 2008; Johnson, Corrigan, Gufickson, Holshouser, & Johnson, 2012; Johnson & Johnson, 2014). Johnson et al. (2008) used sophisticated HPS scenarios to increase Lower-Level cognition (LLC), Higher-Level Cognition (HLC), and CT of active and reserve Army nurses. The author compared the HPS instructional strategy with Interactive Laptop Simulations (ILS) and a control group with no additional simulation education (i.e. group did not participant in either HPS or a laptop simulation). The manikins used three patient scenarios: (a) nerve agent with an abdominal wound and hypovolemic shock, (b) exposure to only nerve agent, and (c) exposure to mustard gas. The ILS scenario used PowerPoint slides covering the same material as the HPS scenario. For this experiment, a new Cognitive Performance Instrument (CPI) was developed that

[6] Simulation complexity comes as more authentic and realistic elements are introduced to the scene.

contained 66 expert validated questions with a reliability coefficient of .80. This test measured changes in participants' LLC, HLC and CT within each group ($n = 30$) and for comparison between groups. The researcher analyzed the pretest/posttest scores via a multivariate analysis of variance (MANOVA). Results found no statistically significant differences between the HPS and ILS groups in LLC CPI scores. On the other hand, there were significant differences between HPS and ILS groups in HLC and CT CPI scores (HLC = $p < 0.021$; CT = $p < 0.038$). As expected, students who participated in HPS performed significantly better than the control group (LLC = $p < 0.017$; HLC = $p < 0.011$; CT = $p < 0.010$). This study found no statistically significant differences in test scores between ILS and control group, which was unexpected. A similar study was conducted by Johnson et al. (2012) to measure nurses' ability to treat patients in a combat environment with injuries that included tension pneumothorax, cardiac tapenade, and hypovolemic shock. This study was a pretest/posttest design that compared within and between subjects in three groups (HPS, ILS, & Control) and focused on performance rather than cognition levels. The independent variable (IV) was the expert validated Combat Performance Measure (CPM) designed by the researcher with good interrater reliability ($r = 0.96$). This study found that the HPS group performed significantly better than both the ILS and Control groups (HPS vs. ILS, $p < 0.001$; HPS vs. Control, $p < 0.0001$). As in the study in 2008, there was no statistically significant difference between the ILS and Control groups; this was also unexpected. Both of these studies concluded that the HPS method of instruction was a more efficient way to prepare for combat. The final study by Johnson and Johnson (2014) again compared effectiveness of HPS as an instructional tool versus an ILS. This study was a pretest/posttest, RMANOVA design

that measured military medical personnel treatment of combat wounds in a front-line simulated field hospital. As in the previous two studies, students outperformed other groups when HPS teaching occurred within authentic, combat situations as measured by the CPI (HPS vs. ILS, $p < .0001$; HPS vs. Control, $p < .0001$). On the other hand, this study found CT was only significant between HPS and Control groups (HPS vs. Control, $p < .003$), but no difference when HPS was compared to the ILS and Control groups. This surprising result could be due to the new CT measurement tool created, though the CT instrument had a strong reliability ($r = 0.89$). All three experiments found no significant differences between the ILS and the control group and concluded that HPS is a more efficient teaching tool than ILS. The more necessary inference from these studies is that HPS is more effective when used with authentic, high-stress situations.

Conclusions regarding Methods and Evidence for using Human Patient Simulation

Without justifying the cost of HPS, this literature review of empirical evidence reveals HPS is predominantly a useful training tool for repetitive practice. The use of HPS improves clinical knowledge and performance, self-reported levels of confidence, and critical thinking attitudes and skills. This research along with the fact that simulation centers have grown over 1,000% over the last decade gives strong credence that the simulation is here to stay.

However, there is more than can be accomplished using HPS to enhance and deepen students' CT ability. Human patient simulators in nursing do not use authentic, high-stress situations; for this reason, they are underused (Levine, DeMaria, Schwartz, & Sim, 2013). Research in other domains could be integrated to help HPS reach the tool's potential. These research domains include Naturalistic Decision making (NDM),

Recognition-Primed Decision making (RPD) Model, and/or the use of Adaptive Thinking Training Methodology (ATTM). All three focus on the importance of training in high stress, time-pressured authentic environments for the development of CT. One medical healthcare profession that has leveraged high-stress authentic environments for students is the field of anesthesiology. When using HPS to train students in a simulated operating room (OR), the instructors incorporate a fire in the scenario so that the students learn to manage authentic situations like it. Students must use CT to stop the excess oxygen, remove burning drapes, ensure the fire is out, activate a call for help, and subsequent caring for any injuries to the patient (Levine et al., 2013). As a result of these types of crisis conditions, richer discussions often ensue that provide greater opportunity for CT development.

Current standards in nursing schools do not allow students to learn in stressful, authentic simulated environments; these environments require higher levels of CT. Though presently used nursing scenarios are genuine, they merely summarize a story with straightforward sequential actions. In the "real world," novice nurses are routinely placed in combat-like critical care situations. These are not sequential and require adaptive thinking to be successful. Thus, it is not surprising why faculty and employers are concerned about the "gap" in critical thinking performance (Levine et al., 2013).

This researcher is interested in the effect on advanced nursing students' CT development if NDM, RPD, or ATTM methods integrate simulated clinical experience. Unfortunately, this would cause too much disruption for the faculty and staff at the approved research venue. So to start the process of integrating new methods for using HPS, and to help close the gap regarding expected CT ability upon graduation, this

researcher proposes beginning with the introduction of ATTM; a methodology was developed after 9/11 to help military leaders become more effective critical thinkers. The proposed experiment in chapter three has two aims: (a) lessen the gap in critical thinking disposition for advanced nursing students and (b) to begin the process of fulfilling HPS potential.

Overview of Subsequent Chapters

The researcher presents the study that occurred in Chapter 3 and then the results in Chapter 4. Based on findings from Chapter 4, a discussion about future implications and directions for research will be explored in Chapter 5.

CHAPTER 3: METHODOLOGY

The purpose of this study was to examine the effectiveness of Adaptive Thinking Training Methodology (ATTM) in developing critical thinking (CT) disposition for advanced nursing students. Specifically, ATTM uses cue points to determine when to intervene for the development of CT.

Research Design

This study was a mixed method quasi-experimental design. The independent variable was the Critical Thinking Instructional Strategy (CTIS) used throughout the course of instruction. This strategy incorporated both the traditional simulation debrief for all simulations and ATTM interventions for simulations exercises two and three. There were two dependent variables (a) the California Critical Thinking Dispositional Indicator (CCTDI) and (b) the observations of CT disposition development during the simulation exercises. The comments were used to triangulate the CCTDI CT measure to support or refute the effectiveness of the CTIS. The following research questions were answered:

1. Do advanced nursing students' critical thinking disposition, as measured by the California Critical Thinking Dispositional Indicator overall score, differ based on the Critical Thinking Instructional Strategy implemented?
2. Do advanced nursing students' critical thinking disposition, as measured by the California Critical Thinking Dispositional Indicator sub-scales, differ based on the Critical Thinking Instructional Strategy implemented?

3. What are the observed critical thinking disposition changes in advanced student nurses' abilities when the Critical Thinking Instructional Strategy is implemented?
4. Did students apply critical thinking disposition skill(s) discussed during the Critical Thinking Instructional Strategy in subsequent situations that required the use of that skill?

Participants

Nurse University (NU)[7] is a small-sized rural school in the mid-Atlantic United States. It serves nearly 4,500 undergraduate students and offers a Bachelor of Science in Nursing (BSN) degree. Students enrolled in the nursing program are prepared for simulation exercises through their core curriculum occurring during their freshmen and sophomore years. The University's application of the core curriculum is accomplished using 300-level and 400-level advanced nursing courses to foster CT, cited by practitioners as important to develop (Benner, 1984; Tanner, 2006). This course enrolled 25 students and was the target population for this study.

Instrumentation

There were two instruments used in this study to measure the effectiveness of the ATTM in the development of CT disposition: (a) the CCTDI and (b) the Critical Thinking Behavioral Change (CTBC) instrument. The CTBC is an observational open-ended questionnaire associated with the seven subscales of the CCTDI. The CCTDI was the first CT instrument designed to measure the seven aspects of critical thinking disposition from the APA Delphi Report (Facione & Facione, 1992). This tool has seven

[7] A pseudonym used for the name of the institution.

subscales: (a) inquisitiveness, (b) systematicity, (c) analyticity, (d) truthseeking, (e) open-mindedness, (f) self-confidence, and (g) maturity in judgment (see Appendix K).

The seven dispositional subscales are discipline neutral. This allows the instrument to be interpreted within various professional disciplines. The CCTDI was developed by synthesizing 19 phrases of critical thinking disposition that resulted in 10 to 15 pilot items being written for each of the dispositional statements (i.e., 250 question prompts). The items were scored on a six-point Likert scale, and these items were worded to find a balance between positive and negative responses. The resulting items were screened by college level critical thinking professors for discrepancies. One-hundred and fifty items with the highest validity were kept, and the experimental instrument was then piloted at two universities in the United States and one in Canada (Facione & Facione, 1992). This sample was 164 college students, which included a group of Midwestern United States baccalaureate nursing students. A factor analysis of 150 items resulted in the retention of 75 items loading the highest on the seven factors, resulting in the final CCTDI instruments seven subscales.

California Critical Thinking Disposition overall scores range from 70 to 420 (Facione & Facione, 1992). Each subscale score ranges from 10 to 60. Reliability has been established with a median Chronbach's alpha coefficient of .91 for the overall score and the subscale coefficients scores ranging from .71 to .80 (Facione & Facione, 1992). For each subscale, a score of 30 or below indicates weakness in relation to a disposition. A score of 40 indicates minimal ability of the disposition. Scores above 50 indicate a strength in the particular disposition (Facione & Facione, 1992; for an example CCTDI report, see Appendix K).

The Critical Thinking Behavioral Change Instrument (CTBC) was used to record students' behavioral change during simulations two and three. This instrument used the seven open-ended questions that correspond to the CCTDI seven subscales. These included (a) inquisitiveness, (b) open-mindedness, (c) systematicity, (d) analyticity, (e) truth-seeking, (f) self-confidence, and (g) maturity (see Appendix E).

Procedures

Prior to being able to implement the CTIS adaptive thinking interventions to foster CT development, cue points were defined (see Appendices H, I; and J). The cue points clearly indicated when a simulation should end to implement ATTM reflection techniques that facilitated CT development (see Appendix P). Once the cues had been identified, the CTIS was implemented. The first CTIS was a traditional debrief following simulation one. In simulation two, a single ATTM intervention was used along with a traditional debrief in the end. The final simulation used two ATTM interventions as well as a traditional debrief.

An ATTM intervention occurred only at identified cue points; the simulation nurse immediately stopped the simulation and entered the room with the participants. The simulation nurse then asked each student to explain the critical thinking for their decision(s) (see Appendix O). Once the students explained their reasoning, the simulation nurse and students collaborated to determine the critical thinking that may have caused the critical thinking error. The simulation nurse then made a comparison between the students' critical thinking and the critical thinking of an expert performing the same scenario. A dialog ensued that allowed the students to think aloud with the simulation nurse on how they would act differently. Then the instructor provided the students with

final corrective feedback to apply when the scenario started again. The simulation nurse then restarted the scenario at a predetermined point in time to practice expert critical thinking.

Appropriate cues for interventions were created using a type of expert interview called an Applied Cognitive Task Analysis (ACTA). This analysis provided expert probing around issues such as the situation assessment, how situation assessment affects a course of action, and potential errors that a novice would likely make given the same situation. The result of an ACTA interview process was three cognitive demands tables that consolidates and synthesizes the data into cue points (see Appendices H, I, & J). These cues defined student decision points that would merit an adaptive thinking intervention.

The ACTA was developed for the United States Navy Personnel Research and Development Center. Typically, the interview is a three-phase technique that moves from general information to more concrete, specific, and detailed information for making authentic decisions in crisis environments. The ACTA interviews discover why a scenario is so difficult for inexperienced individuals to perform. In the first interview phase, a task diagram is created that highlights the most complex cognitive aspects of the scenario (see Appendix R). The second interview results in a knowledge audit table that identifies concrete examples of performance for successful scenario completion. The third interview provides the researcher with the ability to probe the cognitive processes within the context of a particular scenario for use in a simulation called a Cognitive Demands Table (see Appendix G). The researcher only created a Cognitive Demands Table to use for adaptive thinking interventions for two reasons: (a) scenarios were

already well established and (b) two of three interviews were more appropriate for high stress, time-sensitive crisis environments.

Data Collection

During the first week of the semester, the researcher met with the advanced nursing class at Nurse University to provide an oral and written overview of research. The oral brief included a handout that gave permission to use the advanced nursing class to investigate CT development. Permission was also granted by the Chairman of the Nursing Department, Old Dominion University's Institutional Review Board (IRB), and Nurse University's IRB (see Appendices A, B, & D). A written brief was also distributed to each student participating in the study. It contained an explanation of the experiment, its purpose, and an informed consent form (see Appendix C).

The CCTDI was conducted during week two of the semester to establish the participants' baseline CT disposition. Then the instrument was administered immediately following the completion of simulation scenarios two and three debriefs in cooperation with the simulation nurse. All administrations of the CCTDI used paper and pencil.

The Critical Thinking Behavior Change (CTBC) instrument was used to collect observed CT disposition behavioral changes (see Appendix L). Including the researcher, three observers independently wrote their observations in the space provided in the CTBC. This information was used later for independent analysis.

Data Analysis

Research questions one and two were analyzed using a repeated measures one-way analysis of variance (RM ANOVA) of the CCTDI measures of CT disposition. When performing the repeated measures analysis, the assumption of sphericity was

checked using Mauchly's test. If violation of sphericity occurred, corrections were made using the Greenhouse-Geisser correction method.

Observational data was used to answer research questions three and four. An inductive analysis approach was taken that identified emerging changes in CT disposition. The first step began with three observers independently watching the digital recordings (DR) simulation exercises. Independent observers watched nine recorded videos that combined to represent the 25 students who participated in the simulation. Two observers watched the DR following each simulation exercise that used the ATTM, while the third observer watched the DR at the end of the last simulation. All observers used the CTBC instrument to write their comments on paper. The researcher combined the written observations into a single document, and then a copy was provided to each observer. Each observer then reviewed the combined written notes to identify keywords, themes, and/or categories that naturally arose from the written comments. Upon completion of this review, 10% of the observations were selected to compare how each observer coded them to ensure consistency in coding. If observers were at a minimum of 80% agreement, then the coding was complete. If observers were not at a minimum of 80%, then observers met to talk through the categories/themes used to determine if there was a better method of coding. At the conclusion of this dialog, each observer went back through their written notes to recode without looking at previous coding. These steps repeated until the minimum 80% interrater reliability threshold was met. Finally, the researcher compared the themes observed with the reported CCTDI subscales quantitative measure.

Once the inductive analysis had finished, the researcher reviewed all of the DR simulation exercises again in order to answer the research question number four.

Specifically, the researcher examined the DR to determine if changes in CT disposition, if any, were applied in subsequent situations that required the same CT skill.

Limitations

Sample size was a limitation of this study, which affected generalizability. For this reason, an RM ANOVA was chosen because this type of analysis is useful for smaller target populations (Field, 2009). Attrition had the potential to compromise generalizability further. Reasons for attrition included students dropping for personal challenges or academic performance. This study also used observation analysis to triangulate the data, which further validated the results.

Investigator effects were a limitation of this study. The presence of the researcher may have caused students to respond differently to the simulation exercises. While there was no way to predict the possible effects of the researcher's presence, steps were taken to reduce this risk such as the researcher remaining out of sight to the students throughout the simulations. The researcher also provided encouragement for the participants to relax and do their best during the initial research presentation.

Instructor bias was a limitation of this study. During the simulation exercises, the instructor could be compelled to customize the script for the participating students that were not the same for other groups brought through the same scenario. A non-standardized approach could have created variability in the outcome that detracted from the internal validity of the ATTM intervention. To minimize this bias, the researcher met with the simulation nurse before each scenario exercises to reaffirm the importance of consistency.

The simulation instructor role as both teacher and observer was a limitation of this study. As an instructor, her role was to administer the simulation exercises while simultaneously teaching during their execution. This may have caused instructor bias in the observation of CT dispositional changes. Also, the simulation instructor observed consecutive DRs versus viewing the recordings following each simulation exercise. Observing so many, one after another, could have caused fatigue while assessing CT dispositions. To minimize fatigue from viewing consecutive DRs, the instructor watched no more than three simulation exercises within a twenty-four hour period. Ideally this provided the necessary distance from each simulation which fostered a more neutral perspective when returning to watch the other scenarios.

Carryover effects were a limitation of the study. A different group of three students went through the same simulation exercise every other day until all the students completed the scenario. Though students were told not to speak with others about their simulation experience, there was no way to ensure this did not occur. There were at least two weeks between simulation exercises one and two, and simulation scenarios two and three, so there was no anticipated carryover effect during the semester study.

Ethical Considerations

The researcher took several steps to maintain the confidentiality of the participants. A unique ID was assigned to participants that protected their names. Completed assessments of the CCTDI instrument were kept in a locked file cabinet until they were sent to Insight Assessment for scoring. Hardcopy score reports were in a locked drawer by the researcher, and electronic score reports were stored in a password-protected file for the duration of data collection and analysis.

Summary

Chapter three described the procedures and data analysis that was conducted to answer the study's research questions. In addition, the methods to secure confidentiality of the participants' information were discussed. The chapter concluded with a review of the internal and external threats to the study's validity.

Overview of Subsequent Chapters

The researcher presents the study's results in Chapter 4. Based on findings from Chapter 4, a discussion about future implications and directions for research is provided in Chapter 5.

CHAPTER 4: DATA ANALYSIS

The goal of this research was to determine if Adaptive Thinking Training Methodology (ATTM) was a practical method to increase critical thinking disposition for advanced nursing students. The results provide knowledge about critical thinking (CT) development in the hopes of identifying a way to help close the existing preparation-practice gap for nurses. This chapter presents the results of this study.

Profile of Participants

A total of 25 advanced nursing students participated in this study.[8] Participants had completed core curriculum courses that occurred during their freshmen and sophomore years. The application of the core curriculum was accomplished using 300-level and 400-level advanced nursing courses using simulation scenarios that foster CT. Ethnicity of the sample consisted of one Latino, one African American, and 23 Caucasian subjects. The group was comprised of 24 female students and one male nursing student ranging in ages from 20 to 22 years of age.

Research Questions

Field (2009) recommends using SPSS tables entitled Multivariate Tests and Tests of Within-Subjects Effects differently based on whether sphericity was assumed. The *Multivariate Tests* were reported if sphericity occurred ($p > .05$). The *Tests of Within-Subjects Effects* was reported if the assumption of sphericity was violated ($p < 05$).

The descriptive statistics confirm that 25 students completed four measures of the California Critical Thinking Disposition Indicator (CCTDI; $n = 100$). One-hundred

[8] The term "advanced nursing student" is a unique identifier of students who are enrolled in 300 or 400 level courses at Nurse University.

reports were completed and analyzed using SPSS 22 (see Table 5). Data cleaning was not required after reviewing z-score residuals.

Research Question 1

Do advanced nursing students' critical thinking disposition, as measured by the California Critical Thinking Dispositional Indicator (CCTDI) overall score, differ based on the Critical Thinking Instructional Strategy implemented?

Mauchly's test indicated that the assumption of sphericity had been violated: χ^2 (5) = 11.28, $p < .05$. For this reason, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .74$; see Table 5). The Repeated Measures Analysis of One Way Variance (RMANOVA) showed that Adaptive Thinking Training Methodology (ATTM) had no statistically significant effect on CT disposition as measured by the CCTDI (see Table 6). Results from the experiment infer that this small ATTM implementation was not sufficient for CT development. Lack of statistical significance could have been caused by the limited use of ATTM versus the use of ATTM throughout the entire simulation exercise process. In addition, the simulation scenario did not incorporate a complete Naturalistic Decision making (NDM), which may have influenced the results.

Table 5

Descriptive Statistics for CCTDI Overall Measures.

CCTDI Measures	M	SD	N
Baseline	308.72	31.77	25
Simulation 1	308.28	35.14	25
Simulation 2	310.48	35.31	25
Simulation 3	309.68	32.35	25

Table 6

Mauchly's Tests of Sphericity.

CCTDI Measures	Chi-Square	df	Sig.	ε
Overall	11.283	5	.046	.743
Truthseeking	13.636	5	.018	.708
Openmindedness	14.511	5	.013	.691
Inquisitiveness	3.538	5	.618*	.903
Analyticity	8.120	5	.150*	.810
Systematicity	3.676	5	.597*	.909
Confidence	4.480	5	.483*	.899
Maturity	12.458	5	.029	.784

*Sphericity Assumed

Table 7

Multivariate Tests.

CCTDI Measures	V	F	df	Sig.
Overall	.029	.219	3(22)	.882
Truthseeking	.222	2.094	3(22)	.130
Openmindedness	.157	1.367	3(22)	.279
Inquisitiveness	.074	.583	3(22)	.633
Analyticity	.117	.972	3(22)	.424
Systematicity	.188	1.695	3(22)	.197
Confidence	.152	1.319	3(22)	.293
Maturity	.105	.857	3(22)	.478

Table 8

Tests of Within-Subjects Effects.

CCTDI Measures	SS	df	df	Sig.
Overall	72.83	2.228	3(22)	.876
Truthseeking	110.99	2.124	3(22)	.027
Openmindedness	.157	1.367	3(22)	.175
Inquisitiveness	.074	.583	3(22)	.578
Analyticity	.117	.972	3(22)	.283
Systematicity	.188	1.695	3(22)	.136
Confidence	.152	1.319	3(22)	.222
Maturity	.105	.857	3(22)	.336

Qualitative results. In the interest of validating the quantitative results, three independent observers watched digital recordings of advanced nursing students' scenario participation. The observations were amalgamated into a single Critical Thinking Behavioral Change (CTBC) Instrument, and then independently coded. Results indicated that the interrater reliability was in 98% agreement when compared with one another. This allowed the triangulation with the quantitative data.

The coded observations were in agreement with the non-significant statistical results (see Appendix L). Observers were looking for students to demonstrate the seven CT disposition subscales: (a) Truth-Seeking, (b) Inquisitiveness, (c) Systematicity, (d) Reasoning, (e) Judgment, (f) Analyticity, and (g) Open-mindedness. Each research observer wrote a simple statement of observation every time one of the participants executed a CT disposition subscale. The expectation by the primary investigator was that CT disposition statements would increase as simulations one, two, and three occurred. This expectation was mostly false. Trusthseeking was the only trait that increased over time. This confirms the initial RM ANOVA analysis and contradicts the pairwise comparison posthoc analysis. Analyticity and Reasoning observations increased from simulation one to simulation two, but CT observations decreased in simulation three (see Table 9). Critical Thinking observations for Systematicity and Open-mindedness had a steady decline in CT disposition during the semester. Inquisitiveness was the only CT disposition subscale to decline after simulation one, and then increase during simulation three. Judgment was the only CT disposition that had the same number of observations between simulation one and two, but then the number of observations increased during simulation three. The decline of CT observations during simulation three was a pattern

for most CT disposition subscales. The cause may be due to the third simulation occurring at the end of the course, which was right before the holiday season. The students were eager to complete their last simulation as they prepared for their final exams (see Table 9).

Table 9

Number of subscale observations for each simulation.

	Simulation 1	Simulation 2	Simulation 3
Truth-Seeking	19	24	28
Inquisitiveness	24	22	39
Systematicity	26	21	13
Reasoning	18	21	19
Judgment	15	15	20
Analyticity	14	18	11
Open-mindedness	9	7	5

Research Question 2

Do advanced nursing students' critical thinking disposition, as measured by the California Critical Thinking Dispositional Indicator sub-scales, differ based on the Critical Thinking Instructional Strategy implemented?

Mauchly's test indicated that the assumption of sphericity had been violated for three of the seven subscales (i.e. Truthseeking, Openmindedness, and Maturity). Therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity for those sub-scale CT dispositional traits (see Table 6).

The CT disposition sub-scale of Truthseeking showed a statistically significant effect from using Adaptive Thinking Training Methodology (ATTM) on advanced nursing students' CT disposition ($p = .027$; see Table 8). These results suggest that ATTM helped to develop this CT subscale. Unfortunately, there were no significant effects in subsequent pairwise comparison (see Table 9). The conflicting statistical reports were caused by one measure being more sensitive than the other (i.e., ANOVA detects lower variability around the mean than the pairwise comparison test). The pairwise comparison does not distinguish between the two mean's average.

The Critical Thinking Disposition sub-scales of Openmindedness, Inquisitiveness, Analyticity, Systematicity, Confidence, and Maturity had no significant change (see Table 8 for Openmindedness and Inquisitiveness; see Table 7 for the remaining subscales).

Table 10

Descriptive Statistics for CCTDI Subscale Measures.

	Truthseeking		
CCTDI Measures	M	SD	N
Baseline	37.00	6.08	25
Simulation 1	38.68	6.92	25
Simulation 2	39.60	6.54	25
Simulation 3	39.56	6.92	25
	Openmindedness		
CCTDI Measures	M	SD	N
Baseline	45.48	5.42	25
Simulation 1	44.76	4.58	25
Simulation 2	44.24	4.45	25
Simulation 3	43.64	5.11	25
	Inquisitiveness		
CCTDI Measures	M	SD	N
Baseline	47.64	8.25	25
Simulation 1	47.84	7.83	25
Simulation 2	46.92	8.43	25
Simulation 3	47.08	8.04	25
	Analyticity		
CCTDI Measures	M	SD	N
Baseline	45.28	4.35	25
Simulation 1	44.52	5.16	25
Simulation 2	44.84	5.44	25
Simulation 3	43.80	4.75	25

Table 10 Continued

	Systematicity		
CCTDI Measures	M	SD	N
Baseline	41.48	6.55	25
Simulation 1	40.96	7.64	25
Simulation 2	41.72	7.39	25
Simulation 3	42.72	7.06	25
	Confidence in Reasoning		
CCTDI Measures	M	SD	N
Baseline	44.32	5.54	25
Simulation 1	45.76	5.81	25
Simulation 2	46.20	7.30	25
Simulation 3	46.00	6.54	25
	Maturity in Judgment		
CCTDI Measures	M	SD	N
Baseline	47.72	5.98	25
Simulation 1	46.08	6.42	25
Simulation 2	47.16	5.82	25
Simulation 3	46.92	5.39	25

Table 11

Truthseeking Pairwise Comparison.

(I) ATTM Effect	(J) ATTM Effect	Mean Difference (I-J)	Std. Error	Sig.
1	2	-1.680	.745	.202
	3	-2.600	1.05	.122
	4	-2.560	1.14	.207
2	1	1.680	.745	.202
	3	-.920	.787	1.00
	4	-.880	.780	1.00
3	1	2.600	1.04	.122
	2	.920	.787	1.00
	4	.040	.711	1.00
4	1	2.560	1.14	.207
	2	.880	.780	1.00
	3	-.040	.711	1.00

The two most significant factors that may have contributed to the lack of statistical significance include: (a) brevity of the study or (b) an ineffective instructional strategy. The first has to do with actual time spent in the scenario, and the second has to do with the instructional approach.

The short duration of the treatment could have caused the lack of statistically significant increases in CT disposition. Only two of the three simulation exercises had interventions. The first scenario had no interventions; the second scenario had only one intervention; the third had two interventions. As a result, there were three interventions that were 20 to 30 minutes in length, which totaled 60 to 90 minutes over the semester. This limited, systematic approach was intentionally designed to be the first step toward

incorporating every aspect of an adaptive thinking environment normative in military training.

The Army and Marine Corps use ATTM throughout their simulation exercises as they believe that repetitive performance causes better CT. The military and Nurse University are alike with regards to this philosophy, but also differs because it firmly believes that practice alone is not enough for developing Critical Thinking Decision Making (CTDM; Cojocar, 2011). Battle command is too complex to practice CTDM without providing the NDM environment for its training scenarios. This author also believes this is also true for simulation exercises at Nurse University.

Changing the current instructional strategy toward one more in line with the ATTM approach may lead to better results. Gagne's theory advocates an approach very similar to the intent of adaptive thinking interventions. His nine events of instruction represent a practical design for Nurse University's use of Human Patient Simulators (HPS). Gagne's nine events of learning are:

1. Gaining the attention (reception)
2. Informing learners of the objective (expectancy)
3. Stimulating recall of prior learning (retrieval)
4. Presenting the stimulus (selective perception)
5. Providing learning guidance (semantic encoding)
6. Eliciting performance (responding)
7. Providing feedback (reinforcement)
8. Assessing performance (retrieval)
9. Enhancing retention and transfer (generalization)

Gagne's nine events of learning is a standard approach in instructional design to facilitate classroom learning objectives. Adaptive thinking incorporates every aspect of the nine events of instruction. Using the nine events for such a short duration hindered the advantage of Gagne's nine events of learning. These nine events that occurred during the adaptive thinking interventions was in contrast to the instructional strategy typically implemented called the experiential approach to instruction.

Principles of the experiential approach to learning include: (a) framing the experience, (b) activating the prior experience, (c) reflection on the experience (Reigeluth & Carr-Chellman, 2009). Framing the experience communicates the objectives, the assessment, and expected the behavior of participants prior to entering the simulation. This was accomplished by providing Advanced Nursing students with a simulation ticket (see Appendix M, N, & O). The second aspect of the experiential approach occurred during the simulation. The students were immersed in an authentic scenario with a problem to solve on their own. The third component of the experiential approach was implemented through a debrief. After the simulation exercises, the students participated in reflection to challenge assumptions made during the scenario. Ultimately, the students were coached during the debrief to understand what happened, why, what was learned, and how to apply the learning in the future (Reigeluth & Carr-Chellman, 2009).

Each of the scenarios began with a pre-brief that came from a simulation ticket provided to the students from their classroom instructor. During the pre-brief, the simulation nurse reviewed the student objectives before the actual simulation started. The students were provided time to complete the simulation objectives on their own so that they could develop new knowledge during the simulation process through their

experience of it. When the last objective was achieved, or if it was obvious to the simulation nurse that the students could not achieve the objectives, the students gathered together for a simulation exercise debrief. Typically, the debrief is where the "lessons learned" could be cultivated while viewing the videos.

Nurse University believed it was important to keep all aspects of the simulation the same except for the intervention during simulation two and the two interventions in simulation three. Reasons for limiting the use of ATTM that used Gagne's instructional strategy were: (a) determine the point of when ATTM became effective and (b) minimize the disruption for students who had become accustom to the experiential instructional method. Nurse University has no plans to implement ATTM in the future due to time and personnel constraints.

Research Question 3

What are the observed critical thinking disposition changes in advanced student nurses' abilities when the Critical Thinking Instructional Strategy is implemented?

The Investigator of this research effort reviewed the digital recordings to determine if the advanced nursing students were developing CT disposition skills (i.e., Simulation 2 & 3). Overall, there was no conclusive evidence that the Advanced Nursing students' CT disposition increased during the semester. This was also supported by the non-significant quantitative data and the triangulated observational data.

Research Question 4

Did students apply critical thinking disposition skill(s) discussed during the Critical Thinking Instructional Strategy in subsequent situations that required the use of that skill?

Students' core critical thinking disposition ability did not significantly increase, nor did students apply their skills training in the next simulation exercise. Advanced nursing students were observed applying the clinical skill upon scenario restart. Possible reasons for a lack of practical application include (a) lack of practice and (b) students did not prioritize simulation exercises because scenario performance was not graded.

Summary

Chapter four reported the results of the data analysis which showed no significant evidence that the ATTM intervention caused increases in CT disposition except for the CCTDI subscale Truthseeking. Nevertheless, the pairwise comparison reduced this finding to non-significance due to increased sensitivity. Chapter five provides a summary of the study as well as significant findings, surprises, and possible future research.

CHAPTER 5: SUMMARY OF STUDY

This chapter presents a summary of the study and the researcher's interpretations drawn from the data presented in Chapter 4. In addition, information in this chapter provides a discussion of the implications of this study and recommendations for further research.

Summary of Study

Overview of Problem

The preparation-practice gap is a serious, growing problem for hospital administrators, health insurance companies, and the patients who receive care. Nurse educators do not accept that there is a significant preparation-practice gap in Nursing (Slaikeu, 2011). Novice nurses are not ready to meet the challenges of their first assignment as a practicing nurse. Hospital administrators and senior staff, who interact with novice nurses on a daily basis, see the preparation-practice gap so clearly (Slaikeu, 2011).

Novice nurses' most common critical thinking (CT) errors are: (a) giving medications incorrectly, (b) not following physician orders through misunderstanding or inattention, and (c) not being situationally aware of critical changes in patient health (Berkow et al., 2008). How to expedite their path to expertise to prevent these errors is the "million dollar" question. Answering the question will save lives.

Purpose Statement and Research Questions

The purpose of this study was to explore whether Adaptive Thinking Training Methodology (ATTM) interventions were an effective strategy to help close the preparation-practice gap. Three separate simulations occurred over the course of the

semester. Simulation one had no interventions, simulation two had one intervention, and simulation three had two interventions. The intended purpose of these interventions was to increase the CT disposition of advanced nursing students. The questions addressed in the study were:

- Do advanced nursing students' critical thinking disposition, as measured by the California Critical Thinking Dispositional Indicator overall score, differ based on the Critical Thinking Instructional Strategy implemented?
- Do advanced nursing students' critical thinking disposition, as measured by the California Critical Thinking Dispositional Indicator sub-scales, differ based on the Critical Thinking Instructional Strategy implemented?
- What are the observed critical thinking disposition changes in advanced student nurses' abilities when the Critical Thinking Instructional Strategy is implemented?
- Did students apply critical thinking disposition skill(s) discussed during the Critical Thinking Instructional Strategy in subsequent situations that required the use of that skill?

Review of Methodology

A mixed method quasi-experimental RM ANOVA design was used to determine the effectiveness of ATTM interventions. The Director of Simulation incorporated the ATTM interventions as part of her Critical Thinking Instructional Strategy (CTIS) for the course. Dependent variables used were (a) the California Critical Thinking Dispositional Indicator (CCTDI) and (b) the observations of CT disposition development during the

simulation exercises. The comments were recorded by two observers plus the researcher and triangulated with the self-reported scores of the CCTDI CT measure.

Major Findings

There were no statistically significant quantitative findings. The quantitative data found a glimmer of significance regarding the subscale Truth-Seeking, but the post ad hoc test showed the data to be a false positive. This was due to the Pairwise comparison testing being more sensitive than the RM ANOVA.

The observational data confirmed the quantitative findings that the advanced nursing students had not significantly increased their levels of CT as measured by the CCTDI. Students did not apply what they learned from either the post-simulation debrief or the adaptive thinking interventions from one simulation exercise to another.

Primary reasons for non-significance can be attributed to only three possibilities: (a) the HPS was not an effective instructional tool, (b) the instructor did not use an effective instructional strategy for HPS, or (c) the process for integrating the HPS into the curriculum was not effective. Faculty at NU cannot be sure an instructional strategy or HPS was helpful without having an intentional process of curriculum integration. First, this author will review the current method of curriculum creation at NU. Then a review of the ISD approach will occur.

Nurse University method for curriculum creation and integration. Nurse University's process of curriculum creation and integration is an eclectic approach (see Figure 3). The classroom instructor selects content after reviewing various textbooks, reflection about professional experiences, program goals, and course goals. Once the process of choosing material is complete, the instructor develops a semester plan. The

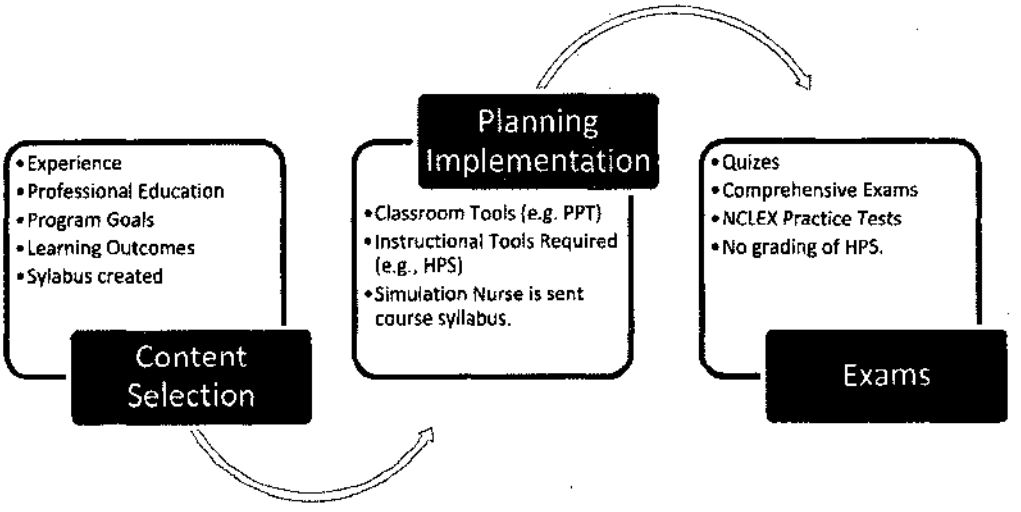
instructor selects the appropriate technology, reviews case studies, and other classroom activities to reinforce the course content. The Simulation Nurse also aligns HPS scenarios with classroom instruction at this time.

Methods of assessing knowledge are generic for all classes at NU. Formative evaluation occurs during the semester through quizzes, reflective questioning, and midterm exams. Summative assessment occurs through the standard method of final exams. Over the course of the semester, students are also provided National Council Licensure Examination (NCLEX) practice questions as Advanced Nursing students approach licensure. Advanced Nursing students are not given a grade for their simulation performance. While the current process of curriculum creation and integration at NU has worked, an Instructional System Design (ISD) process could provide more precise measures of merit for HPS learning outcomes.

From an Instructional Systems Design perspective, NU's current curriculum development process does not actively attempt to align the learning outcomes, instructional strategies, and assessments. NU's process of curriculum development also prevents an accurate measure of effectiveness for HPS and the accompanying scenarios. The ISD process also emphasizes the use of HPS to its fullest potential. The method to incorporate accurate measures of effectiveness and align all curriculum components is a key tenet of the Instructional Systems Design process.

Figure 3

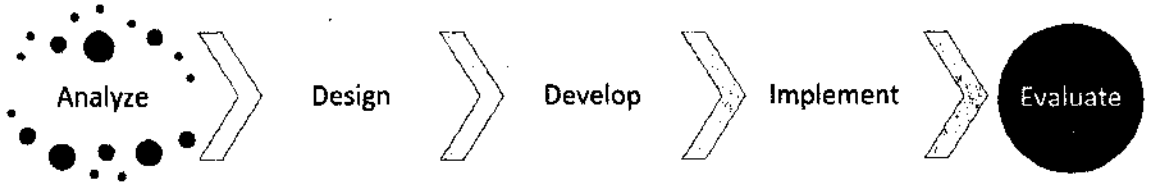
Nursing University Curriculum Creation Process.



Instructional system design for human patient simulator integration. Following the Instructional Systems Design (ISD) process should result in instructional experiences that make the acquisition of knowledge, skill and critical thinking more efficient, effective, and appealing. (Merrill, Drake, Lacy, & Pratt, 1996). A common ISD process is represented by the acronym ADDIE: (a) Analyze, (b) Design, (c) Develop, (d), Implement, and (e) Evaluate (see Figure 4).

Figure 4

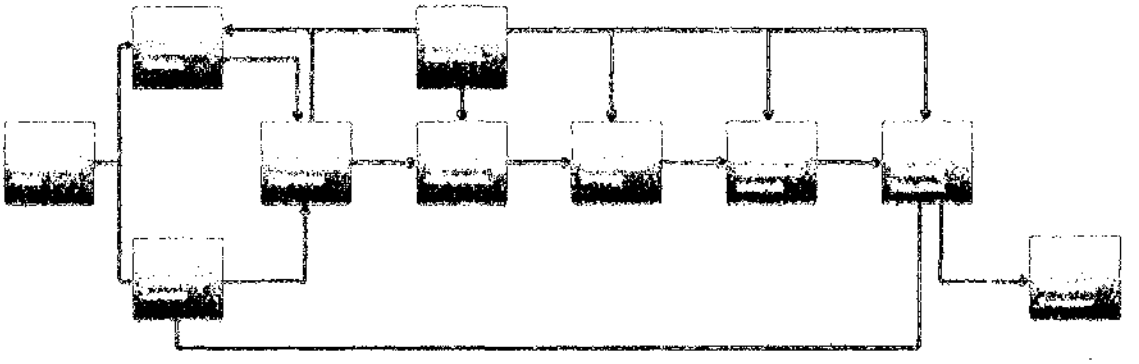
ADDIE Process.



The ADDIE process is a general model of curriculum creation (e.g. Nursing Education). Two ADDIE model adaptations are the PADDIE and the Dick and Carey models. The PADDIE process comes from the military. Its only change is explicitly stating the need for a plan of instruction that is implicit in ADDIE. As someone might guess, the military culture is always focused on a planning process that can be epitomized by the old service cliché, "You cannot deviate from a plan if you don't have one." The other ISD model is Dick and Carey Systems Approach Model (Dick, Carey, & Carey, 2005; see Figure 5).

Figure 5

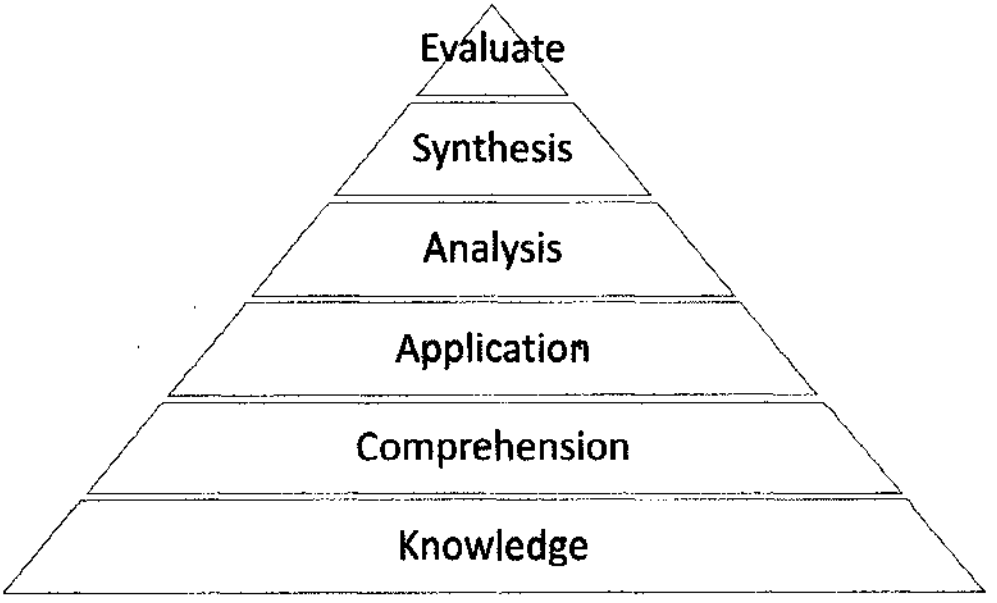
Dick and Carey's Process for Curriculum Creation (Dick, Carey, & Carey, 2005).



The ISD process also pinpoints specific measures of merit within a hierarchical framework known as *Bloom's Taxonomy*: (a) knowledge, (b) comprehension, (c) application, (d) analysis, (e) synthesis, and (f) evaluation (Bloom, 1956, see figure 6). This process assures that the curriculum aligns with prerequisite knowledge, learning objectives, and the best medium to use of technology. Bloom's levels of knowledge and the ISD process ensure all aspects of education connect for learning achievement.

Figure 6

Bloom's Taxonomy (Bloom, 1956).



Dick, Carey, and Carey systems model. Dick, Carey, and Carey (DCC) systems approach to instruction focuses on performance objectives, which fit well with nursing education's desire to prepare their students for the "real world". An Instructional Designer (ID) has knowledge of DCC, Bloom's hierarchy, learning theory, instructional strategies, and assessment methods would work closely with the Advanced Nursing classroom instructor. The DCC systematic steps are: (a) Identify goals of instruction, (b) Write performance objectives, (c) Develop criterion referenced tests, (d) Develop instructional strategies, (e) Develop and select instructional material, (f) Develop and conduct evaluation, (g) Identify foundational knowledge required for instruction.

The first step is to define the instructional goals which, at NU, would be accomplished through three types of analyses: instructional, learner, and contextual. Each

type of analysis subsequently results in the instructional plan including, performance objectives that specify what level of knowledge or performance (e.g. essay or HPS).

Learning objectives are then created as well as tests that measure the learning objectives. Then effective instructional strategies are chosen to reach the stated objectives. Considerations for choosing a strategy include the target audience, Bloom's hierarchy, and the context to measure the performance objectives. This is a prerequisite before choosing instructional materials for achieving learning goals.

Evaluation is the cornerstone of DCC, and it surrounds the systematic approach to curriculum development. The analysis starts the process of evaluation, but also evolves as new information, conditions, and requirements are unveiled during the curriculum and integration process. This step continually checks if the curriculum is still aligned, integrated, and flows together to achieve the primary instructional goals of the course of study.

The ISD process should result in a solid curriculum for NU or any other University through a systematic approach to instruction that could substantiate the investment in HPS. Classroom instructors, the simulation nurse, and an ID should collaborate from start to finish. Most important, course instructors would have the confidence that HPS is reaching its fullest potential.

Future Research

Results of this study found that current use of Human Patient Simulators (HPS) at Nurse University (NU) does not significantly contribute to the achievement of the classroom learning objectives, nor can it be said that NU uses HPS to its potential. The Researcher recommends that NU incorporates the ISD process to revise their curriculum;

this will align all the pieces already in place for a more coherent curriculum. This should also influence the Simulator Design and help lead to the Scenario Design for precise measures of critical thinking (CT). Then a synthesized curriculum can be built with performance measures that determine HPS effectiveness in achieving the classroom objectives with precise measures of merit.

There are also some training strategies utilized by the Marine Corps that could be used as a model by NU to help focus future curriculum design subsequent research in Nursing Education. Marines make decisions in complex, fluid and dynamic operating environments, which is true for nurses, too. The Marine Corps held a workshop on the subject Small Unit Decision Making (SUDM; United States Marine Corps [USMC], 2011). According to the Marine Corps, simulation should have very specific measurable outcomes that include: (a) Adaptability, (b), Sensemaking, (c) Problem Solving, (d) Metacognition, and (e) Attention Control. These outcomes are in sharp contrast to the general outcomes of Simulation in Nursing Education that include: (a) Learning, (b) Skill, (c) Satisfaction, (d) Critical Thinking, and (e) Self-Confidence (Jeffries, 2007). Perhaps future research efforts could focus on defining more specific outcomes of Human Patient Simulators (HPS) so scenarios can better target performance improvements.

The Small Unit Decision Making (SUDM) workshop has started to implement its recommendations this year. The Marine Corps integrates "deliberate practice" and "deliberate performance" for simulation exercises. The Office of Naval Research (ONR) has started mindfulness practices that help trainees attain an awareness of what is happening while it is happening and being aware enough to replicate the situation (i.e. ATTM). Marines are emphasizing instructional and assessment techniques that deepen

understanding and foster the habits of mind (critical thinking disposition) necessary for complex, adaptive decision-making. Nursing Education can follow suit by fully implementing ATTM that could prove to facilitate expert thinking for Advanced Nursing Students. This would require partnerships with other Schools of Nursing in a collaborative spirit in education.

Conclusions

The current implementation of Human Patient Simulators (HPS) at Nurse University does not use the simulators to their full potential let alone allowing the students to learn in stressful, authentic, Naturalistic Decision Making (NDM) simulated environments as they would during their first assignment. While the Marines are using the results of the Small Unit Decision Making (SDUM) Workshop to emphasize ATTM, combat-like conditions, Nursing Education has maintained its current methodology as defined by Jeffries (2007). Scenarios used at Nurse University are genuine but are non-stressful, sequential actions that may not be useful enough to bridge the preparation-practice gap. Nurses' first assignments will routinely place them in combat-like critical care situations (Levine et al., 2013). Finally, aligning curriculum with HPS use via the ISD process would be an important step in the right direction for NU and Nursing Education as a whole.

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APPENDIX A – ODU IRB APPROVAL LETTER

OLD DOMINION UNIVERSITY
DARDEN COLLEGE OF EDUCATION
Human Subject Committee
Norfolk, Virginia 23529-0156
Phone: (757) 683-6695
Fax: (757) 683-5756

August 17, 2014 Approved Application Number: 201403035

Dr. Richard Overbaugh
Department of Teaching and Learning

Dear Dr. Overbaugh:

Your Application for Exempt Research with Robert Fitkin entitled "Effect of an Adaptive Thinking Training Methodology on Critical Thinking Disposition Using Human Patient Simulators: A Catalyst for Preparing Advanced Nursing Students" has been found to be EXEMPT under Category 6.1 and 6.2 from IRB review by the Human Subjects Review Committee of the Darden College of Education.

The determination that this study is EXEMPT from IRB review is for an indefinite period of time provided no significant changes are made to your study. If any significant changes occur, notify me or the chair of this committee at that time and provide complete information regarding such changes. In the future, if this research project is funded externally, you must submit an application to the University IRB for approval to continue the study.

Best wishes in completing your study.

Sincerely,

Edwin Gómez, Ph.D., CPRP
Chair, Human Subjects Review, DCOE
Associate Professor and Coordinator of PRTS Program
Human Movement Sciences Department
Darden College of Education
Old Dominion University
egomez@odu.edu

APPENDIX B – LU IRB APPROVAL LETTER

LONGWOOD UNIVERSITY
Institutional Review Board
Committee Action Form

(To Be Completed By Researcher)

Proposal Title: Effect of an Adaptive Thinking Training Methodology on Critical Thinking Disposition using Human Patient Simulators: A Catalyst for Preparing Advanced Nursing Students.

Principal Investigator: Robert J. Fitkin

(For IRB Use Only)

[✓] Meets the criteria for making research exempt from obtaining written informed consent and Committee review.

[ ] Approved by the Longwood University Institutional Review Board.

[ ] Approved with revisions by the Longwood University Institutional Review Board.

[ ] Rejected by the Longwood University Institutional Review Board.

Date: 8/19/14

Signature of IRB (circle one) Member/Chair:

Comments:

APPENDIX C – CONSENT LETTER TO STUDENTS

08.27.14

Dear Student,

I am a doctoral student at Old Dominion University that is conducting research on critical thinking disposition and skill acquisition performance using scenario-driven human patient simulators (HPS).

I would sincerely appreciate your help with this study. The benefits for you are enormous because my goal is to help bridge the *preparation-practice gap* (for more information, see the Nursing Executive Center Report, 2008).

You will be asked to complete the California Critical Thinking Dispositional Indicator (CCTDI) assessment now and again after each of the three simulations that are currently scheduled over 16-weeks. I expect your time commitment for each assessment to be 30-45 minutes per assessment.

Risks are minimal. The researcher will maintain strict confidentiality. We will remove any information that might identify you. The results of this study may be used in reports, presentations, and publications, but *the researcher will not disclose your identity*.

Your participation is voluntary. You can decline taking CCTDI at any time. Your instructor has approved this project, but she will not know how you responded to items connected to this study. Your participation will *not* affect your grade in this class or your standing at the university.

You are encouraged to ask questions about anything you do not understand before completing the assessments. Should you have additional questions later or if you want to know more about this research, please contact Robert J. Fitkin at **804.814.7935** or rfitk001@odu.edu.

Thank you very much for your consideration.

Sincerely,

Robert J. Fitkin

I agree to participate in this study:

_____

APPENDIX D – LETTER OF APPROVAL

Fitkin, Bob

From: Fitkin, Bob
Sent: Friday, May 23, 2014 5:32 PM
To: Fitkin, Bob
Subject: Thank You

Letter of Approval

It was good to meet you, Bob and really nice that your son spent spring break visiting with you at Longwood!

I am glad we are able to help with your dissertation research. You will enjoy working with Cindy and we will enjoy having you with us.

Deb.

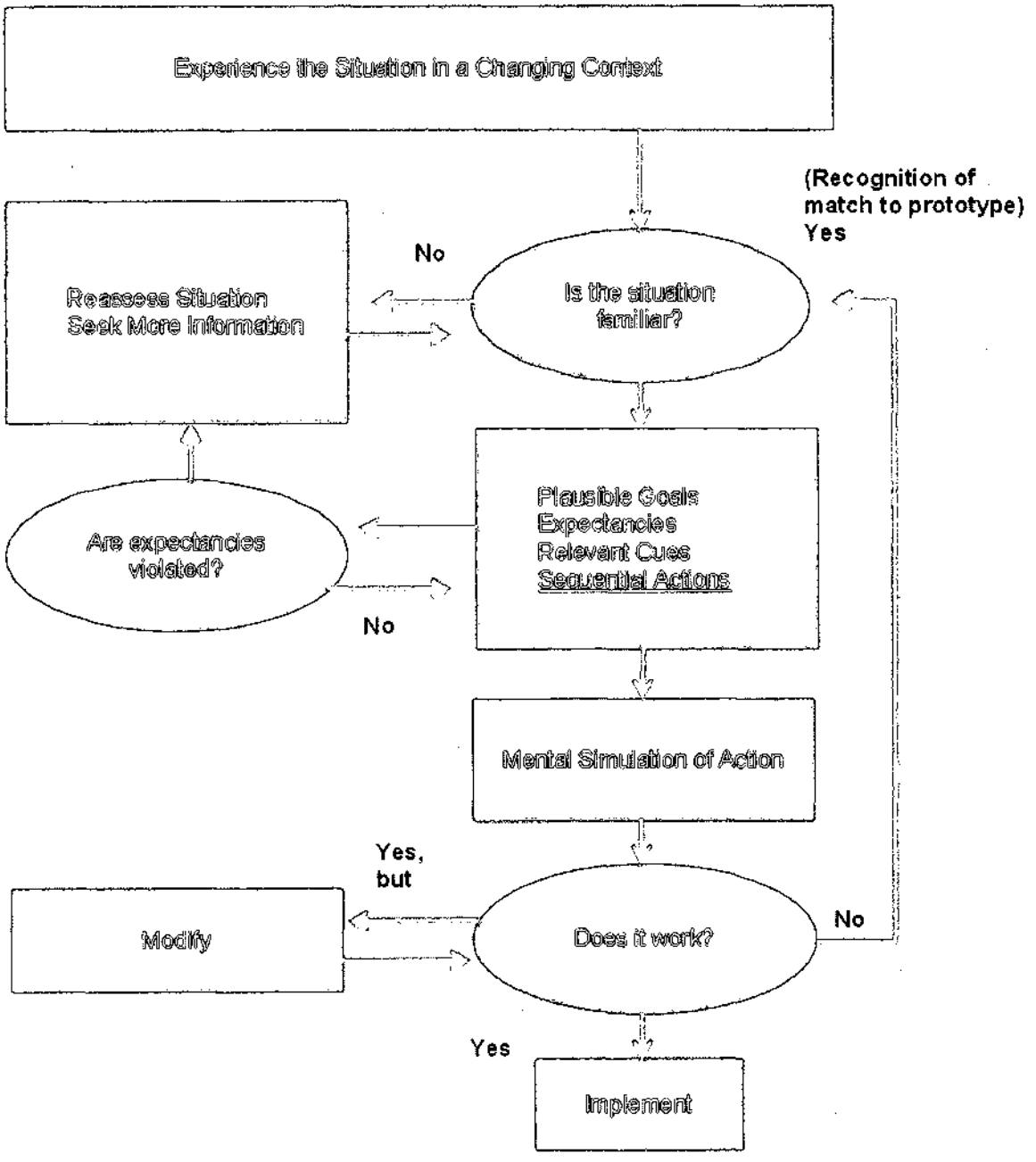
Deborah L. Ulmer, RN, PhD (Education), PhD (Nursing)
Department Chair and Director of Nursing Programs
Longwood University
Department of Nursing
Stevens 201A
Farmville, VA 23909

(434) 395-2667

APPENDIX E – COMPARISON OF APA & NURSING CRITICAL THINKING ATTRIBUTES

Comparison of Studies	Skills Attributes		Affective Attributes	
	1st Delphi study		2nd Delphi study	
	APA Skills (Facione, 1990)	Nursing Skills (Scheffer & Rubenfield, 2000)	APA Disposition (Facione, 1990)	Nursing HOM (Scheffer & Rubenfield, 2000)
	Analysis (p. 12 & 14)	Analyzing (p. 358)	Maturity (p. 9)	Contextual Perspective & Flexibility (p. 358)
	Evaluation (p. 15)	Applying Standards (p. 358)	No comparable disposition	Creativity (p. 358)
	Interpretation (p.13)	Discriminating (p. 358)	Inquisitiveness (p. 6)	Inquisitiveness (p. 358)
	Inference subskill (p.16)	Information Seeking (p. 358)	Truthseeking (p. 8)	Intellectual Integrity (p. 358)
	Explanation (p. 18)	Logical Reasoning (p. 358)	No comparable disposition	Intuition (p. 358)
	Inference subskill (p. 17)	Predicting (p. 358)	Open-mindedness (p. 6)	Open-mindedness (p. 358)
	No comparable skill	Transforming Knowledge (p. 358)	Systematicity (p. 7)	Perseverance (p. 358)
	Self-Regulation (p. 19)	No comparable skill	No comparable disposition but comparable to *APA skill – Self-Regulation (p. 19)*	Reflection (p. 358)
			Analyticity (p. 7)	No comparable Habit of the Mind

APPENDIX F – COMPLEX RPD STRATEGY (KLEIN, 1998)



APPENDIX G – BASIC PROBES FOR ACTA INTERVIEWS (MILITELLO & HUTTON, 1998)

- **Past & Future**. Experts can figure out how the situation developed, and they can think into the future to see where the situation is going. Among other things, this can allow experts to head off problems before they develop.

  Probing Question: Is there a time when you walked into the middle of a situation and knew exactly what to do while it was occurring that caused immediate decisions by you in order to be successful?

- **Big Picture**. Novices may only see bits and pieces. Experts quickly build an understanding of the whole situation or the Big Picture view. This allows the expert to think about how different elements fit together and affect each other.

  Probing Question: Can you give me an example of what is important about the Big Picture for this task? What are the major elements you have to know and keep track?

- **Noticing**. Experts can detect cues and see meaningful patterns that less-experienced personnel may miss altogether.

  Probing Question: Have you had experiences where part of the situation just "popped" out at you; where you noticed things going on that other didn't catch? What is an example?

- **Job Smarts**. Experts learn how to combine procedures and work a job in the most efficient way possible. They do not cut corners, but they do not waste time and resources either.

  Probing Question: When you do this task, are there ways of working smart or accomplishing more with less that you have found especially useful?

- **Opportunities/Improvising**. Experts are comfortable improvising (i.e., seeing what will work in this particular situation); they can shift directions to take advantage of opportunities.

  Probing Question: Can you think of an example when you have improvised in this task or noticed an opportunity to do something better?

- **Self-Monitoring**. Experts are aware of their performance; they check how they are doing and make adjustments. Experts notice when their performance is not what it should be (i.e., due to stress, fatigue, high workload) and can adjust so that the job gets done.

  Probing Question: Can you think of a time when you realized that you would need to change the way you were performing in order to get the job done?

- **Anomalies**. Novices do not know what is typical, so they have a hard time identifying what is atypical. Experts can quickly spot unusual events and detect deviations. They can notice when something that ought to happen doesn't.

  Probing Question: Can you describe an instance when you spotted a deviation from the norm, or knew something was amiss?

- **Equipment Difficulties**. Equipment can sometimes mislead. Novices, usually, believe whatever the mechanism tells them; they do not know when to be skeptical.

  Probing Question: Had there been times when the machine pointed in one direction, but your judgment told you to do something else? When have you had to rely on experience to avoid being led astray by the equipment?

APPENDIX H – COGNITIVE DEMANDS FOR POST-SURGICAL PATIENT – PAIN

Difficult Cognitive Element	Why Difficult	Common Errors	Cues and Strategies Used
Initial assessment of the Patient	Student nurse must ensure that all information comes from patient feedback, monitors attached to the patient, and patient's electronic record.	Students fail to work together to assess patients; want to jump to treat pain without having enough information. Fail to sooth the patient enough or ask non-abrasive questions to the patient	Communicate empathy to the patient; Ask pertinent questions for assessment; Amalgamate patient information together from appropriate sources; Continue to talk to the patient while actively assessing information to include physical and subjective information;
Assessment of Patient's complaint of Pain from surgery	Student nurse assess patient using standard practice using pain assessment scale; Determine correct pain medication; Check for bloating;	Fail to check for mechanical error with the Nasogastric Tube, Immediately want to use pharmaceutical methods of pain management versus non-pharmaceutical methods; Do not assess pain at all;	Communicate with others in the room for assessment of pain; Recognize the Nasogastric Tube could be non-functioning; Using assessment data of vital signs (blood pressure elevated, heart rate is high);
Treat the patient for Pain	Provide non-pharmaceutical methods for pain management, must provide pain medication using the 5-rights; Evaluation effectiveness of treatment;	Doesn't address pain at all; Fail to provide alternative methods of treatment; Fail to abide by the 5-rights of pain medication; Incorrect administration of pain medication; Fails to evaluation 15 minutes after administration;	Non-pharmaceutical methods (i.e., Pillow Splint; Guided Imagery) Collaborate as a team to verify the medication record; Correctly do all 5-rights; Reassess pain using pain assessment scale;

APPENDIX I – COGNITIVE DEMANDS FOR POST-SURGICAL PATIENT – NAUSEA

Difficult Cognitive Element	Why Difficult	Common Errors	Cues and Strategies Used
Initial assessment of the Patient	Student nurse must ensure that all information comes from patient feedback, monitors attached to the patient, and patient's electronic record.	Students fail to work together to assess patients; Fail to make the patient more comfortable; Fail to assess the Nasogastric Tube; Fail to sooth the patient enough or ask non-abrasive questions to the patient	Communicate empathy to the patient; Ask pertinent questions for assessment Amalgamate patient information together from appropriate sources; Continue to talk to the patient will assessing
Assessment of Patient's complaint of severe post-surgical Nausea and Urinary Retention	Student nurse assesses patient using standard practice, determine the source of nausea; Assess urinary retention;	Fail to check for mechanical error with the Nasogastric Tube; Immediately jump to nausea medication before checking Nasogastric Tube; Fails to elevate bed; Fail to recognize the patient's need to void	Communicate with others in the room to assessment of nausea; Recognize the Nasogastric Tube could be non-functioning; Offer alternative to medication (i.e. cool compress)
Treat the patient for Nausea and Urinary Retention	Provide non-pharmaceutical methods for nausea; management; provide nausea medication if nasogastric Tube is correct first; If using nausea medication, then the 5-rights;	Do not treat patient according to ABC method Fail to provide alternative methods of treatment Fail to abide by the 5-rights of pain medication	Elevate head of the bed; Assessed Nasogastric Tube; If not checked tube, to correctly provide nausea medication; Call Physician for the order to insert catheter; Insert catheter using proper sterile technique

APPENDIX J – COGNITIVE DEMANDS TABLE FOR STROKE PATIENT

Difficult Cognitive Element	Why Difficult	Common Errors	Cues and Strategies Used
Initial assessment of the Patient	Student nurse must ensure that all information comes from patient feedback, monitors attached to the patient, and patient's electronic record;	Fail to complete full patient assessment; Don't recognize elevated BP;	Communicate empathy to the patient; Ask pertinent questions for assessment; Amalgamate patient information; Recognize the urgent nature of the patient environment;
Assessment of Stroke	Student nurse assesses patient using standard practice of ABC. The Nurse has little knowledge of the patient. Emergency room stroke victim. Recognize Blood Pressure is extreme; Neurological Assessment occurs; Complex activities include correctly interpreting a CT scan results	Fail to understand the sense of urgency in the emergency room; Does not determine if it is a hemorrhagic or thrombotic stroke;	Communicate with others in the room to assessment stroke; Patient reactions to student nurses; Vital Signs of Patients;
Treat the patient for stroke	Recognize need to call MD; Provide information according to SBAR; Provide anti-hypertension drugs; Reevaluate effects of medication; Notify MD with CT results; Begin Heparin protocol;	Fail to call for orders/notify MD twice; Do not use the SBAR when communicating with doctor or pharmacist; Do not work prudently as a team; Does not reevaluate patient status; gives medication incorrectly; or does not setup Heparin protocol;	Call for and interpret CT scan; Need for medication on chart; SBAR communication; Patient reactions;

APPENDIX K – EXAMPLE CCTDI REPORT

Insight Assessment
Measuring Thinking Worldwide

Customer: [redacted]
Test/Survey: CCTDI - 92.1.92
Report Date: 8/8/2012 1:03:52 PM
Assignment: 1 [redacted]

The California Critical Thinking Disposition Inventory (CCTDI) measures seven habits of mind: Truth-seeking, Open-mindedness, Analyticity, Systematicity, Confidence in Reasoning, Inquisitiveness, and Maturity of Judgment.

Descriptive Information: [redacted]

Skill/Attribute Name	N	Mean	Median	Standard Deviation	SE Mean
Truth-seeking	66	35.2	35	5.1	0.6
Open-mindedness	66	45.4	46	5.9	0.7
Inquisitiveness	66	47.7	48	5.3	0.7
Analyticity	66	43.5	44	4.4	0.5
Systematicity	66	40.5	41	5.5	0.7
Confidence in Reasoning	66	45.3	46	5.3	0.7
Maturity of Judgment	66	42.4	43	5.2	0.6

Skill/Attribute Name	Minimum	Maximum	Quartile 1	Quartile 3
Truth-seeking	24	47	32	38
Open-mindedness	22	57	43	49
Inquisitiveness	33	60	45	52
Analyticity	34	55	41	46
Systematicity	27	52	38	45
Confidence in Reasoning	32	57	42	49
Maturity of Judgment	30	57	39	45

The descriptive information reported below indicates strengths and weaknesses in specific areas. These results are useful for understanding group characteristics, for comparing and contrasting similar groups on specific attributes or skills, and for guiding the development of more targeted educational or training programs.

APPENDIX L – CODED CRITICAL THINKING BEHAVIOR CHANGE INSTRUMENT

Critical Change Behavioral Change Instrument

Instructions:

- Read through the seven Critical Thinking Dispositions *three* (3) times before beginning your evaluation. This will help to focus your thoughts regarding what to record.
- Once familiar with the seven traits of critical thinking, begin listening to the Simulation 1 debrief or view the videotaped HPS sessions for the purpose of evaluation.
- Write down your *observations* of Critical Thinking Disposition. Simply let it be a free flow of thought on paper.

Truth-Seeking:	**What behavioral change(s) did you observe?** *Explain in detail:*
Truth-Seeking is the habit of always desiring the best possible understanding of any given situation; it is following reasons and evidence where ever they may lead, even if they lead one to question cherished beliefs. Truth-seekers ask hard, sometimes even frightening questions; they do not ignore relevant details; they strive not to let bias or preconception color their search for knowledge and truth. The opposite of truth-seeking is bias which ignores good reasons and relevant evidence in order not to have to face difficult ideas. Questioning Data Clarifying Information Recognizing Knowledge Acting on Thinking Significant Statements Collaborating Spirit	**Sim 1** 1. Asking patient if he is having trouble breathing because he is continuing to cough. 2. Asked Patient what he did for his last exacerbation. 3. Asked how often he's been in the hospital – has this been often happening. 4. Student stated they were looking for directions to figure out how to set up the handheld nebulizer. Also asked team members for help. 5. Clarified with instructor and peers to make sure how long HHN needs to run. 6. Wanted to be prepared for the sim and realizing that there is still so much more to learn. 7. Questioned how to determine priority nursing diagnosis given this situation. 8. Students recognized areas of weakness such as therapeutic communication and wanted to seek more feedback on how to communicate better with patients in difficult situations. 9. Observed patient had not accepted the fact he had COPD yet based on tissues on the floor, bandages, wanted to smoke. CO. 10. Felt perhaps that the death of his wife was something that delayed accepting COPD. 11. Asked about the patients daughters to understand his situation. 12. Observed that the oxygen was not for the COPD patient breath and asked "Why is that not on?" 13. When patient asked for a cigarette, which broke rules, students sought policy to say "no". 14. Students asked about CPAP, "Heard it was difficult to use." 15. Questioning what to do with a negative patient who wanted to die. 16. Desperately wanted to understand what to do for a patient with COPD other than "you can't smoke." 17. Sought to ID sounds of "crackles" when listening to breathing. 18. Asked what signs should trigger what treatment for the patient. 19. Asked about the effectiveness of caffeine for opening airways based on experience with her mother. **Sim 2**

Critical Change Behavioral Change Instrument

	1. Nurse asked patient where her pain was 2. Asked what kind of pressure do you feel? 3. 2:2 – Nurse asked if she felt like she needed to urinate and would she try. 4. Nurse called the physician about patient not voiding. 5. Student asked leader about breaking the sterile field for catheter insertion. 6. Student asked lots of questions about pain – where is it? What number? Does anything make it feel better? What's your tolerance level? 7. Student asked where pain was coming from and what type of pain it is 8. Student asked about where the pressure is. 9. Nurse asked patient if she was in pain and then what her pain was on a scale of 1-10. 10. Asked where she was feeling pressure. Then, at your incision site? Immediately asked for patient's temperature. 11. Nurse called doctor to ask about patient not voiding. 12. Nurse redirected with patient after all procedures: Pain, pressure, etc. 13. Asked about her pain and if she was nauseous. 14. Questioned about pedal pulses and asked if the difficulty assessing pulses was related to the compression stockings. Questioned during the pause, "What should be done if patient complains of pain site of IV?" 15. Recognizes mistakes in inserting foley and uses feedback from peers to make sure she is correctly setting up and completing task. 16. Questioned about how to maintain sterile field and how not to reach over the field. 17. Asked patient about pain in detail. Had understanding of what would potentially happen if fluids crystalized in line. 18. Asked appropriate questions to instructor. 19. Had other students verify assessment findings to confirm understanding. 20. Asked how patient was doing with surgery although they were not completely comfortable on how to address patient's psychosocial issues. 21. Reviews physician orders and MAR to verify what meds need to be given after pain medication. 22. Asks questions about sterile technique during instructional intervention. Communicates understanding of proper techniques 23. Asks if generic name was the same as the brand name and then used drug reference guide to verify. Further questioned patient about pain. 24. During intervention asked questions about labeling drugs and how to give flush after medication administration. **Sim 3** 1. Asking patient questions to figure out what he is trying to

Critical Change Behavioral Change Instrument

	communicate. 2. Called pharmacy for clarification on Heprin drip instruction 3. When patient wouldn't answer about pain on a scale of 1-10, the nurse asked him a different way. 4. Nurse asked him about alcohol and drug use several different ways until she could understand him. 5. When patient said he had a stroke, the student said we are waiting for the results of your scan to confirm that. 6. Student asked instructor for clarification on Heprin drip rates several times. 7. Students started doing neuro assessment right away by asking him questions. 8. One nurse asked the other what "occlusion" means. 9. Nurse asked him if he had just gotten back from a CT scan. 10. Asked patient how he was feeling – he said head pounding. 11. Asked patient if he had taken his meds at home that morning. 12. Although first student gave an appropriate SBAR group discussed other possible ways to improve and second student called MD after receiving feedback from instructor and other students. 13. Student seeks advice from other student to ensure proper administration of medication. 14. Work together and answer each other's questions when starting IV Help after instruction. 15. Verifies with one another findings and that blood pressure is high, they question one another as to what they need to do next. 16. Verify new orders and appropriate dose with second student. 17. Talking about how to give heparin drip after initial order among group members and referred to drug book to figure out how to start drip. 18. Although they should have known the KVO rate they called the MD to verify what the correct rate should be. 19. Group discusses next actions before calling MD with results of CT scan. All members collaborated to figure out how to administer the Heparin drip protocol. 20. Verifying med dose with other student prior to giving IVP labetalol. Student refers to drug book for Heparin administration recommendations. 21. Discussing with one another the next steps to take after administering IVP labetalol and receiving additional information. 22. Discussing how to administer IV Heparin once they received the protocol. 23. Student reading blood pressure, discussed with one another next steps based on information. 24. Worked together to verify medications were correct dose and used all rights of med administration. 25. Confirm blood pressure reading. 26. Asks patient appropriate questions about medications from home. 27. Discusses with one another what to do next after they completed

Critical Change Behavioral Change Instrument

	initial assessment. 28. Calls physician to verify orders and clarify what is needed Review heparin protocol carefully as a group. *Total Observations* = **71**
Inquisitiveness: Inquisitiveness is intellectual curiosity. It is the tendency to want to know things, even if they are not immediately or obviously useful at the moment. It is being curious and eager to acquire new knowledge and to learn the explanations for things even when the applications of that new learning are not immediately apparent. The opposite of inquisitiveness is indifference. Questioning Data Clarifying Information Recognizing Knowledge Acting on Thinking Significant Statements Collaborating Spirit	**What behavioral change(s) did you observe?** *Explain in detail:* **Sim 1** 1. Student was asking about the gag reflex. 2. One group asked about the mannequin's bandaged finger. 3. Students wondered "What do I now?" observed the blood oxygen was low. 4. Asked specifics about the medication being provided to the COPD patient. 5. Asked Simulation Nurse when/if reuse of a needle is appropriate. 6. Students asked simulation nurse if they provided caffeine to the patient what effective it might have on his health. 7. Student asked if they should verify the patient's response to their questions. 8. Asked a procedural question about when to start the oxygen on the patient. 9. Asked about oxygen protocol for COPD patient for deeper knowledge. 10. Students wanted to know if reassessment of patient would be in order again and again to ensure proper care. 11. Asked questions about breathing treatment regarding how to measure flow rate. 12. Questioned why the patient's oxygen saturation was not improving despite having nasal cannula in place. 13. Requested lab information that was not readily available to determine if antibiotics were useful. 14. Questioned the use of CPAP for further understanding and clarification of the use and indications. 15. Questioning what the role of the nurse is in response to increasing oxygen and how to know when to or not increase oxygen. 16. Student asked if she needed to re-evaluate respiratory rate after interventions. 17. Asked for clarification of lung sounds (crackles) although not relevant for this simulation. 18. Asked if they could refer back to textbook and notes to verify the proper nursing diagnosis for the client. 19. Questioned about sputum culture and knowing which antibiotic is appropriate and when to give even though we don't have the culture and sensitivity report back. 20. Asked what additional information they should have gathered from patient so they would know what to do in the future when they get a new admit.

Critical Change Behavioral Change Instrument

	Sim 2 1. Student asked patient how she was feeling about her stoma. 2. Nurse asked patient if she was going to have any visitors – her children, her parents. 3. Student asked her about what happened to the patient. 4. Asked if patient had been to the bathroom today. 5. Students asked leader what to say to patients about the colostomy bag. Talked about how to reduce smell. 6. Had second nurse check behind lung sounds to verify assessment findings. Questions about compatibility of med in IV line vs in blood stream. 7. Students collaborating on steps for care and asking questions of one another. 8. Double checking assessment findings such as bowel sounds. 9. Asked appropriate questions about proper procedure to give IVP meds that are not compatible. 10. Asked about other meds that may cause pain at site and how to intervene. 11. Questions about sterility ensuring they understood correct procedure which was different than what they had previously completed. 12. Asks about assessing abdomen after surgery . 13. Questions one another about what actions are needed next. 14. Verifies with one another to make sure med and doses are correct prior to administration. 15. Asks about patient's complaint of pain and pressure. Looks to one another to determine what needs to be done. 16. Asked questions throughout the teaching intervention to gain better understanding of proper procedure and sterile technique. 17. Asked appropriate questions during intervention to ensure. 18. Understanding of how to properly administer incompatible medications (i.e. specifically about protocols for Dilantin). 19. Discuss that patient may be feeling pressure related to lack of voiding and then offered patient the bed-pan. **Sim 3** 1. Asked patient if he had taken any meds this morning. 2. Asked patient if his eye was hurting. 3. At instructor intervention, one of the students asked about how she would communicate with someone in real life – i.e. wait to get his medical history from his wife, etc. 4. Nurses did a lot of double checking/verifying of orders to ensure accuracy of care. 5. Asked patient about when he took his meds – this morning and last night. 6. Asked about patient's family history of stroke – first group to do so 7. Assessed pain and pain quality. 8. Asked the leader about who is responsible for meds being correct – physician or nurse. (I think that was the question).

Critical Change Behavioral Change Instrument

	9. Asked patient if he'd ever had problems with strokes before. 10. Asked patient what he meant by "you feel funny," when patient wasn't answering, she kept asking him. 11. Student asked leader if multiple lines is synonymous with multiple IVs. 12. Asks about whether or not giving pain medication is appropriate for CVA patient as it may alter patient's level of consciousness. 13. Seeking to better understand hot to address patient's complaints of throbbing head. 14. Asks about whether they can call the pharmacy to verify how to administer Heparin drip correctly using the protocol (which is a correct action if it is something they are unfamiliar with doing). They then pulled out the drug book to verify how to administer. 15. During intervention asked appropriate questions about heparin drip. 16. Asked questions of instructor of how to properly assess patient with difficulty communicating secondary to CVA. 17. Asked questions about how they would know how to hang heparin drip to instructor and asked more specific questions about the policies and procedures. 18. Wanting to understand the purpose of the NS used with the heparin drip. 19. During instruction of Heparin Drip various members of group asked appropriate questions to ensure proper understanding of use of Heparin and protocol. 20. Asks question during instruction to understand the use of a primary NS line with Heparin drip rather than using a secondary line. 21. Student voices need to ask TPA questions in anticipation of possible fibrinolysis therapy. 22. Group discusses need to call MD and rationale for call. 23. Asks how to collect additional PTT/PT labs since blood has already been drawn. 24. During intervention asked for clarification of how to know location of stroke based on client's signs and symptoms and how to document using the HER. 25. During second intervention very inquisitive about how to properly hang Heparin drip and how to follow protocols. 26. Asks about INR as reported on screen to confirm lab report. Verifies with other students if they have assessed heart and lung sounds. 27. Asks why patient is not a candidate for TPA. *Total Observations* = **66**
Systematicity: Systematicity is the	**What behavioral change(s) did you observe?** *Explain in detail:* **Sim 1**

Critical Change Behavioral Change Instrument

tendency or habit of striving to approach problems in a disciplined, orderly, and systematic way. The habit of being disorganized is the opposite tendency. The person who is strong in systematicity may not know of a given approach, or may not be skilled at using a given strategy of problem solving, but that person has the desire and tendency to try to approach questions and issues in an organized and orderly way. Questioning Data Clarifying Information Recognizing Knowledge Acting on Thinking Significant Statements Collaborating Spirit	1. Students verified that they met the 5 rights during sim 2. Students identified that they needed to be more methodical in their sim than they were 3. Students set airway as a priority before going into the Sim 4. Students had a game plan going into the room 5. Students focused on patient's distress first and then circled back to do complete assessment once he was stable. 6. Explained what the medicine was, verified patient ID, used the 5-rights of medicine administration, documented the medicine provided. 7. Students knew that before they cleaned the room that his airway breathing had to be controlled. 8. Conceptually knew they need to help systemically go through the ABCs of nursing. 9. Students notice the environment of the room and client presentation on entering simulation. 10. Student realized need to elevate head of bed to increase chest expansion and ease breathing 11. Verifying patient identifiers out loud and in conjunction with team members 12. Immediately elevated head of bed and applied oxygen when recognizing low oxygen saturations. 13. Looked for order medications and recognized need to notify pharmacy if med is not available, however had not questioned patient about whether they had taken med previously at home 14. Elevate HOB to open airway 15. Systematically gave meds following rights 16. Completed simulation in a systematic manner with initial assessment, treatment, and then re-evaluation of effectiveness of interventions 17. Displayed organized method of preparing medications and followed rights of med administration 18. Notice the environment and patients coughing as an abnormal finding and need to apply oxygen and elevate head of bed immediately prior to placing pulse ox on patient. 19. Administration of nebulizer once realized that other treatments were not being effective. 20. Asks patient for patient identifiers at the beginning of the Sim 21. Student stated that as they entered the room they remembered what they needed to do based on knowledge of care routines and going to skills lab to refresh 22. Stated that after setting HHN personally she will always know how to do this. It was one thing to observe the instructor but now that she did it herself she will be able to do it in the future. 23. Came to Sim with a plan but recognized that the patient's condition that the plan had to be quickly modified to ensure positive Patient outcome 24. Discussed use of nursing process in meeting patient's needs

Critical Change Behavioral Change Instrument

	Sim 2
	1. Checking meds: nurse filled syringes and set each syringe next to its vial. Once all syringes were ready, nurse double-checked each vial and syringe to the orders chart. 2. Students appeared to be following a checklist. 3. Nurse double-checked med vials and syringes against chart again before administering in IV 4. Students were reading aloud from a checklist 5. *Student told patient they were going to do a head to toe* assessment and go from there 6. Nurses discussed what each was going to do. 7. Elevates head of bed and offers a splint for abd for pain. Discuss taking vital signs as first assessment action. Assess pain and indicates that the will be getting patient something for pain. 8. Followed rights of med administration by verbalizing checks and rechecks. 9. Organizes medications on cart systematically prior to going to the bedside to administer medications. Uses patient identifiers prior to administering meds. Each student repeated actions of giving *incompatible medication following proper procedure.* Re-evaluates pain 15mins after pain med given 10. Identified problem and need to notify md to receive order for foley catheter. 11. Entered room and began assessing patient in an organized manner including subjective pain assessment, vs, and head to toe assessment. 12. Uses 2 patient identifiers prior to medication administration, immediately stopped infusion once patient complained of pain at IV site. Verbalized incompatibility of IVF and Dilantin. 13. Entered room and immediately elevated Head of Bed when patient complained of nausea. Recognized that she broke sterile field when putting in the foley cath and voiced the need to get a new kit. On second attempt very astute to not breaking sterile technique and followed instructions with guidance from peers. 14. Group entered and began assessing pain, VS,, and focused physical assessment to identify patients' needs and baseline data 15. Immediately elevates head of bed due to NGT and offers splinting exercises for comfort. 16. Begin head to toe assessment and discusses finding with one another 17. Entered room asked patient about pain level and elevated head of bed, offered pain medication before doing anything else. Used patient identifiers prior to medication administration. 18. After intervention worked collaboratively to administer medication appropriately following correct techniques 19. Reassessed pain and vital signs at close of simulation very appropriate 20. Entered room asked how patient was doing and in response to c/o

Critical Change Behavioral Change Instrument

	nausea elevated head of bed. 21. Verifies patient identifiers and uses rights of medication administration. When pump alarmed ensured clamp was open and followed prompts on pump. 22. Group worked collaboratively to assess patient and discuss best plan of care. **Sim 3** 1. Nurses are testing different reactions of patient – seem to be doing so in a specific order. 2. Nurses appear to be following a checklist 3. Called pharmacy for clarification on Heparin drip instruction 4. Re checked patient's neuro after a certain amount of time 5. Read meds back to dr on the phone 6. Students rechecked neuro after a certain amount of time 7. Students seemed to be following a checklist 8. Nurse re evaluated neuro after a certain amount of time 9. Read meds back to dr over the phone 10. Student did a follow up neuro check 11. Started with taking vitals immediately 12. Reassessed neuro after a certain amount of time 13. Recognizes s/s of CVA and begins to perform neuro assessment and working together to complete full head to toe assessment 14. Entered room, elevated head of bed, began asking questions about stoke and conducting neuro assessment with gag reflex 15. Calls MD using SBAR providing relevant information, receives orders, and repeats back orders 16. Completes neuro assessments and VS every 15 minutes referring back to MD orders as a necessary. 17. Verbalizes medication checks (rights of medication) when preparing to administer Labetalol. 18. Notifies MD once CT scan report is received although they did not have exact time when symptoms started they asked patient for information. 19. Enter simulation and immediately began vital sign and neuro assessment. 20. Recognized that on first attempt calling MD that they did not have all data or used SBAR. 21. Used rights of medication administration and verbalizes three checks. 22. Re evaluates neuro and VS assessment at regular intervals. 23. Entered room and systematically began assessment including vs, neuro checks, and pain assessment. 24. Entered room introduced selves and began collecting subjective/objective data to include: VS, neuro checks, and asking patient questions about symptoms and past medical history. 25. Organized in method of data collection. 26. Enters room introduces selves and asks patient about complaints

Critical Change Behavioral Change Instrument

	of pain and signs/symptoms. 27. Begins collecting assessment data and neuro checks in a head to toe approach. 28. Re-evaluates neuros and VS per protocol. 29. Read backs orders to MD. 30. Entered room, introduced self and began assessing vital signs, pain using pain scale, and subjective/objective data. 31. After intervention student's SBAR was much improved. 32. Entered room and immediately elevated HOB. 33. Began setting up IV pump and assessing vital signs quickly and systematically. 34. Recognizes that elevated blood pressure requires immediate attention. 35. Completes neuro assessment and reviews available lab results. 36. Uses patient identifiers with each medication administration. 37. Entered room and introduced selves as they began a systematic assessment of VS and neuro checks. 38. Communicates with one another throughout simulation discussing possible options. 39. Completes periodic neuro assessments to determine if there are changes in findings. *Total Observations* = **85**
Confidence in Reasoning: Confidence in reasoning is the habitual tendency to trust reflective thinking to solve problems and to make decisions. As with the other attributes measured here, confidence in reasoning applies to individuals and to groups. A family, team, office, community, or society can be trustful of reasoned judgment as the means of solving problems and reaching goals. The opposite habit is mistrust of reasoning, often manifested as aversion to the use of	***What behavioral change(s) did you observe?*** *Explain in detail:* **Sim 1** 1. Explained why the raised the head of the patient's bed 2. Ordered oxygen right away because it was ordered. 3. Justified using neb right away by referring to ABCs 4. Asked patient about dizziness and headache because albuterol can cause those 5. Student explained why he gave the piggy back med before he did IV push meds – meds are compatible and he had it ready first. 6. Got nebulizer to open airways faster. 7. Saw the Nebulizer was dismantled and sought to put together the Nebulizer. Students had confidence that they could figure it out. 8. Recognized that more oxygen would not help, so decided to use hand held nebulizer to break up some of the mucus. 9. Recognized the side-effects of the steroid and acted on it on behalf of the patient. 10. Students explained to the patient what would happen procedurally and educated according to their thought process. 11. Recognized effects of treatment calming the patient's cough. 12. Confident in explaining to patient that he could not have alcohol and dairy products are not recommended as it increases mucous production.

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	possible need for patient to void 18. Properly educates patient on significance of incentive spirometer 19. Recognizes the need to have patient void would decrease pressure and discuss that they need to get a 20. Worked together to recognize next steps based on previous situations. 21. Explained getting VS and assessments. **Sim 3** 1. Asked patient to squeeze her hands – checking other reactions (gag, etc.) with confidence 2. Said they needed to lower it right away – he is presenting with ischemic stroke 3. One of the students said they should wait before calling the dr. for pain meds to see if the blood pressure meds help the headache – she wanted to give them time to work. 4. Called dr. right away regarding patient's high blood pressure. 5. One nurse said I think we need to call the dr to see if we can get something to lower his blood pressure. Later she said, I feel like if we lower his blood pressure, his headache will improve. 6. One nurse told the other two nurses not to check the two vitals at the same time – one nurse was doing blood pressure – not sure. what the other one was going to do that elicited this response. 7. One nurse said that with his heart pounding we should probably get him his beta blocker, another nurse said they should call the Dr. 8. Confident in knowledge about how quickly to administer IVP labetalol and that it is always safe to give IV push saline behind any med. 9. Recognizes the need to call MD when BP is found to be elevated. 10. Verbalizes that medication is compatible therefore no need to flush line prior to administering the dose. 11. Discusses that the reason the patient has a HA is r/t elevated BP and that once BP is down HA should improve. 12. Recognizes elevation of blood pressure and garbled speech are signs of stroke worsening. 13. Called MD initially reporting elevated BP and giving relevant patient information and requesting something to give patient for blood pressure. 14. Aware that once they administered BP med that patient's headache would improve. 15. Recognizes that giving Labetalol for BP will help decrease patient's complaint of headache 16. Connected the patient's complaint of a throbbing HA to patient's elevated BP and the use of IVP med to help with both. 17. Read back orders to physician, connects closed eye with right sided facial drooping. 18. Recognizes that ordered antihypertensive med will help with decreasing blood pressure as well as decrease headache.

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	19. Confident in how to adjust heparin drip after intervention and demonstrates understanding. *Total Observations* = **58**
Maturity in Judgment: Maturity of judgment is the habit of seeing the complexity of issues and yet striving to make timely decisions. A person with maturity of judgment understands that multiple solutions may be acceptable while yet appreciating the need to reach closure at times even in the absence of complete knowledge. The opposite, cognitive immaturity, is imprudent, black-and-white thinking, failing to make timely decisions, stubbornly refusing to change when reasons and evidence would indicate one is mistaken, or revising opinions will-nilly without good reason for doing so. Questioning Data Clarifying Information Recognizing Knowledge Acting on Thinking Significant Statements Collaborating Spirit	**What behavioral change(s) did you observe?** *Explain in detail:* **Sim 1** 1. Wanted to do a nebulizer treatment instead of giving more oxygen 2. Chose to use hand-held nebulizer to help break up mucus and to get a fast response 3. Offered coffee without cream or milk, so mucus production won't increase 4. Student chose to push the steroid first because she wanted to take advantage of his airways being clearer and she wanted to keep them open 5. Observed patient on the back and needed setup the patient, and then check to see vital signs. Trusted their knowledge of patient needs. 6. Recognizes the need to involve family with care and develop support group for client. 7. Group entered simulation recognizing the signs and symptoms of respiratory distress and need to intervene quickly. 8. Recognized immediate repertory distress and voiced need for HHN, without having all vital signs or data 9. Wanting to focus on ABCs began HHN in 5 minutes of Sim and recognized that the HHN would take 10-15 minutes to give before improvement of patient condition 10. One student recognized that she liked more complex environments and felt that working in a group would be more helpful if the situation was more complex so she wouldn't get bored. 11. Recognized patients increased work of breathing and did not ask questions of patient as speech would be difficult until treatments and interventions given. 12. Discussed rationale of medication administration, thought through decisions of which med should be administered first based on med purposes and administration routes 13. Applied oxygen despite not having all initial vital signs or oxygen saturation. 14. Recognized s/s of distress and demonstrated to patient and coached patient with breathing techniques based on early s/s of patient's condition. 15. Recognized client's condition and need to intervene quickly, elevating head of bed, assessment, oxygen, sputum collection then nebulizer. **Sim 2** 1. Giving Pepcid via IV since patient can't eat or drink right now. 2. Offered patient the pillow splint for deep breathing when she was

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	complaining of pain 3. Nurse introduced the pillow splint to the patient and asked her to do some deep breathing 4. Student gave patient the pillow splint when she complained of pain as they raised the head of the bed 5. Student asked patient if she had urinated yet since her tube came out – asked right away when patient complained of pressure 6. Nurse was talking to patient about getting her out of bed and into a chair 7. 2.8 – Nurse raised head of bed immediately when entering room 8. Told patient they were going to move her forward and when she complained, nurse said it would be good to have movement. 9. Recognizes elevations of vital signs may be contributed to multiple factors but plan to treat pain as first solution to the problem. Discussed with team members possible rationale for assessment findings of patient while determining appropriate plan of care. 10. Asking about multiple possible problems with patient at the beginning of the scenario recognizing that there could be more than one reason for the patient's uncomfortableness. 11. Discuss with one another next steps they needed to do in providing care. Also discussed possible findings and need to intervene. 12. Group recognizes potential complications of surgery and asks appropriate questions to gain better understanding of patient chief complaint and presentation to plan next steps of care. 13. Recognizes oxygen is off and checks pulse ox and determines that patient does not need oxygen any longer. 14. Student does an excellent job asking relevant questions to patient about care. 15. Questions one another about whether or not to apply oxygen as they did not see the pulse ox but knew that there may be a potential need to apply oxygen although they did not have the o2 sat to verify. **Sim 3** 1. Decided to call the doctor based on pain and blood pressure. 2. Called pharmacy for clarification on Heprin drip instruction. 3. Called the dr immediately about high blood pressure. Said they needed to lower it right away – he is presenting with ischemic stroke. 4. Students called dr back for clarification on the rate of the IV psuh 5. Called dr about patient's blood pressure and that he hadn't been feeling well for a few days. 6. One of the students said – before we call the Dr. we need to determine his level of consciousness – someone needs to talk to him (the patient). 7. One nurse said I think we need to call the Dr to see if we can get something to lower his blood pressure. Later she said, I feel like if we lower his blood pressure, his headache will improve.

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	8. Called dr. again to tell him that the patient is feeling "foggy". 9. One student communicates to group possible rationale for headache and need to notify MD to begin treatment. 10. Recognizes s/s of stroke and gathers assessment information quickly to develop a plan of care including need to call MD. 11. Communicates orders with group and they begin to assign responsibilities to quickly intervene. 12. Recognizes that possible treatments that will need to be given based on patients presentation and results of CT scan. 13. After first intervention gathered additional information to provide better SBAR to MD. 14. Informs patient to notify the nurses if his HA returns or gets worse, recognizing that BP med was helping and if HA returns BP may be elevated 15. Recognizes patient condition is s/s of stroke and elevation of BP requires immediate call to MD. 16. Called MD with results of CT scan and aware of possible treatment plans. 17. Recognizes deterioration of client and need to quickly call MD 18. In under 15 minutes recognizes need to call physician with current assessment findings. 19. Connects headache with blood pressure elevation. 20. Continues to check for results of CT scan and calls physician immediately after receiving results to obtain orders. *Total Observations* = **50**
Analyticity: Analyticity is the tendency to be alert to what happens next. This is the habit of striving to anticipate both the good and the bad potential consequences or outcomes of the situations, choices, proposals, and plans. The opposite of analyticity is being heedless of consequences, not attending to what happens next when one makes choices or accepts ideas uncritically.	**What behavioral change(s) did you observe?** *Explain in detail:* **Sim 1** 1. Students set airway as a priority before going into the room. 2. Chose to start neb right away because they knew it would take 15 minutes. 3. Student thought that the meds were not right, so she called the pharmacy, avoiding a medication error. 4. Saw patient discomfort and thought a two or three ways that would make breathing easier. 5. Provided oxygen based on not being able to get rid of COPD patient. 6. Sought to calm patient down with knowledge future impact to him. 7. Prioritized the need of the patient regarding smoking. 8. Recognized that the cough would slow down once the treatment occurred. 9. Alert to clients deteriorating respiratory status and recognized need for hand held nebulizer to open client's airway. 10. Alert to potential side effects of HHN and discusses whether or not to give caffeine which will elevate heart rate. 11. Discussed being alert to potential consequences of not having

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CODE Key:	
Questioning Data Clarifying Interpretation Recognizing Knowledge Acting on Thinking Significant Statements Collaborating Spirit	oxygen on. 12. Anticipated that patient's condition was about to change and evaluated clients condition after intervention. 13. Discussed that they knew if oxygen was not applied pat oxygen saturation would continue to drop. 14. Aware that if they did not start HHN patient would not breathe better. **Sim 2** 1. Nurse wanted to do the correct procedure herself once so that they all were able to practice in case they didn't have a buddy in the future. 2. Offered the patient a pillow to press to her stomach as they raised the bed to alleviate some of the pain. 3. Told the patient not to do any heavy lifting when she gets home because of her incisions. 4. Student wanted to make sure she didn't break the sterile field for the catheter. 5. Student moved patient to her side to give her body some movement and to move her off of her stoma site. 6. Nurse was talking patient into ambulating today to help speed up her recovery and avoid complications. 7. Student put up the head of the bed immediately because she has an ng tube. 8. Student explained she should try to at least sit up because it would help get her bowels moving. 9. Nurse talked to patient about avoiding getting pneumonia and using the spirometer. 10. When patient acted like she was in major pain when using the spirometer, she offered her a splint. 11. Talked to patient about how getting up and moving will help with healing and help with her stomach by getting everything moving in there. 12. Discusses with patient the rationale for each medication and need to prevent complications from missed doses. 13. Explains to patient after review of skill each step of the process. providing patient with knowledge of what is going to happen next. 14. Identified need for pain medication as priority and began IVP. 15. Recognized nausea may be related to misplacement of NGT and verified placement with air bolus. 16. Aware of need to void in regards to time between last void and time for catheter placement to relieve pressure felt by patient. 17. Aware and discusses possible causes for patient post-operative complications and plans care appropriately. 18. Discusses with patient the need to perform exercises to prevent post-op complications from bed rest. **Sim 3** 1. Each test result seems to be causing nurse's next actions 2. Compared bracelet to med bottle when she couldn't understand

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	his verbal confirmation of his identity 3. Said they needed to lower it right away – he is presenting with ischemic stroke. 4. Discusses the importance of getting necessary information in a timely manner in order to consider use of TPA. 5. Understands that IVP Labetalol is to be used to lower BP and communicates this with the patient and explains need to re-evaluate BP. 6. Recognizes that side effect of labetalol is orthostatic hypotension therefore lowers the head of the bed prior to administering IV Labetalol. 7. Re-evaluated patient's headache, BP, and neuros after administering IVP medication. 8. When IV pump was alarming flushed IV line with flush to rule out possible occlusion at IV site. During intervention were able to discuss the need to decrease IVF rate to KVO to prevent overload. 9. Recognizes need to call MD quickly when blood pressure was assessed to be elevated. 10. Recognized that heartrate decreased significantly with second dose of labetalol and notified MD immediately. 11. Connects that HA should improve with administration of antihypertensive medications. *Total Observations* = **42**
Open-mindedness: Open-mindedness is the tendency to allow others to voice views with which one may not agree. Open-minded people act with tolerance toward the opinions of others, knowing that often we all hold beliefs which make sense only from our own perspectives. Open-mindedness, as used here, is important for harmony in a pluralistic and complex society where people approach issues from different religious, political, social, family, cultural, and personal backgrounds.	**What behavioral change(s) did you observe?** *Explain in detail:* **Sim 1** 1. Students did not respond negatively to patient when he asked about his cigarettes 2. Student spoke to patient with respect when he talked about smoking in the bathroom last time in the hospital 3. Student started to do IV push, but stopped to do nebulizer instead because he couldn't breath 4. Students are open to letting one another inform the other regarding medication and patient care. 5. Allowed one another to accept the role most comfortable during the scenario. 6. Discussion about differences in patient behaviors between facilities and needing to be aware of the policies of the facility 7. Met prior to simulation to share opinions and thoughts about how and what they anticipated would occur during the simulation 8. Discussion on homeopathic remedies for individuals with respiratory infections although the use of alcohol is not encouraged. 9. Open minded about smoking cessation and takes the frame of reference that it is ultimately up to the patient to make the decision to quit smoking and the patient should not be judged or

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The opposite of open-mindedness is intolerance. Questioning Data Clarifying Information Recognizing Knowledge Acting on Thinking Significant Statements Collaborating Spirit	criticized. **Sim 2** 1. One nurse asked the meds nurse if she needed help, and she said the second nurse could do the IV piggyback b/c she hadn't done it yet. 2. Students were eager to learn how to insert the catheter from the leader during the intervention 3. Patient said she was in too much pain to use spirometer – nurse said they could wait until after she has her morphine 4. Told patient she wouldn't give her the nausea shot unless she wanted it. 5. Willing to better understand errors and ways to improve patient care. 6. Stated they were not aware that foley could be set up at bedside and requested that way be demonstrated. 7. Asked peer about proper administration of IV medication that was incompatible. **Sim 3** 1. Called pharmacy for clarification on Heprin drip instruction 2. When patient wouldn't answer about pain on a scale of 1-10, the nurse asked him a different way 3. Students asked leader question comparing what she has read about which side the stroke is on vs. which side shows weakness – checking her understanding with another authority. 4. One student asked another student to check behind her on patient's blood pressure. 5. Recognizes error in giving second dose is related to miss-writing of telephone orders and open to discussion on best practices. *Total Observations* = **21**

APPENDIX M – NURSE UNIVERSITY SCENARIO TICKET 1

Student Learning Objectives:

1. Recalls indications, contraindications, and potential adverse effects of prescribed medication
2. Implements the "6 rights" of medication administration
3. Implements a focused respiratory assessment
4. Recognizes signs and symptoms of respiratory distress and implements correct treatment in a timely manner.
5. Recalls indications and contraindications for oxygen therapy.

Demographics:

Client Name: Vincent Brody **Gender:** Male **Race:** Caucasian

Age: 67 **Weight:** 70kg **Height:** 68" **Location:** Med-Surg 318
Allergies: NKDA **Immunizations:** UTD
Physician: Dr. Williams

Client Information: Vincent Brody is a 67 year old male admitted directly from a Physician Office several hours ago for exacerbation of COPD. He is maintaining O2 saturations at 94% on 2L/min of oxygen per nasal cannula. IV of D5 ½ NS w/ 20 meq KCL infusing at 100 ml/hr in right hand. Patient has complained of increasing fatigue with activity and inability to sleep well at night. He has also had increased sputum production and cough. He has responded well to medications and treatments and appears to be resting.

Past Medical History: COPD & HTN Patient has a 50 year history of smoking 2 packs a day. He has continued to smoke despite health care provider's recommendations to quit. During the last year he has had two exacerbations.

Social History: Mr. Brody is a retired Post-Master that lives alone. His wife died two years ago from pneumonia. He has two adult children Veronica and Vincent Jr that live in Richmond.
Religion: Baptist. **Socioeconomic status:** Retired Middle Class

Questions to complete prior to simulation experience.

1. Under Sim Chart-My Clinicals there is a Simulation 1– COPD. Please complete the Pre-Clinical Manager components which include diagnosis, medications, and lab and diagnostic rationales.
2. Define the pathophysiology, clinical manifestations, and collaborative care of the patient with chronic obstructive pulmonary disease (COPD).
3. Complete the medication profile for each of Mr. Brody's medications. (in Sim Chart)
4. Review provided lab values and give rationale for normal and abnormal findings. (in Sim Chart)
5. Identify the most common etiologic factors in the development of COPD and the effects of cigarette smoking directly associated with COPD.
6. Identify the indications for O_2 therapy, methods of delivery, and complications of O_2 administration.
7. Explain the nursing management of the patient with COPD
8. What additional patient health history and information would be necessary to know as you provide care to your client?
9. Based on the information provided about your patient, identify 3 possible nursing diagnosis with 3-5 planned interventions to care for your client. How do you plan to evaluate the outcomes of your interventions?

APPENDIX N – NURSE UNIVERSITY SCENARIO TICKET 2

Student Learning Objectives:

1. Provides care to a post-operative patient to include health history, physical exam, and recognizing potential complications.
2. Implements the "6 rights" of medication administration
3. Recalls indications, contraindications, and potential adverse effects of prescribed medications
4. Recognize and manage routine post-operative care of NGT, colostomy, IVF, medication administration, urinary retention, etc.
5. Prioritizes and implements care.

Demographics:
Client Name: Sue Watkins **Gender:** Female **Race:** Caucasian
Age: 55 **Weight:** 70.5kg **Height:** 67" **Location:** Med-Surg 318
Allergies: NKDA **Immunizations:** UTD
Physician: Dr. G. Astro

Client Information: Ms. Watkins is post op day 1; s/p Sigmoid Bowel Resection w/ ostomy for Stage II T3 colorectal CA. She arrived to the surgical unit yesterday at 1:30 pm. The morning nurse discontinued the patient's foley catheter as ordered at 6:00 am and reported that she has not voided. She has a colostomy, midline abdominal dressing, nasogastric tube to low continuous suction, telemetry. O2 2L NC, ICS, SCDSs, and peripheral IV in R arm with D5 ½ NS+20KCL @125 mL/hr. Pain and nausea are being managed by PRN medications.
Past Medical History: Seizure disorder managed with oral Dilantin for 15 years. G4T3L3; On 3/15 she had a routine colonoscopy in which suspicious polyps on the sigmoid colon were biopsied resulting in a diagnoses of colorectal cancer. Denies other significant past medical history.
Social History: Ms. Watkins is a second grade school teacher. She is divorced with three children. She has a 24 y.o. son who lives in Richmond, 21 year old daughter who is in college; and 17 year old daughter is in high school.
Religion: Christian **Socioeconomic status:** Middle Class

Potential Skills for Scenario:
It is strongly recommended that you read your textbook Chapter 43 pgs 1034 - 1046

Answer these questions to help prepare for your clinical simulation. We will discuss prior to entering the Simulation lab.

1. Under Sim Chart-My Clinicals there is a patient Sue Watkins. Please complete the Pre-Clinical Manager components which include diagnosis, medications, and lab and diagnostic rationales.
2. Discuss the pathophysiology of this client. (in Sim Chart)
3. Provide rationale for normal and abnormal lab values. (in Sim Chart)
4. How would you as the nurse caring for Ms. Watkins post-operatively focus your assessment? Why does the patient have a nasogastric tube to low continuous suction?
5. Give rationale for administration of prescribed medications and Intravenous Fluids.
6. Discuss the physical and psychological needs of a client with a new colostomy.
7. Identify three possible nursing diagnosis that you would assign to Ms Watkins .
8. What interventions do you anticipate you will need to provide in caring for Ms. Watkins during this post-op period? How will you evaluate these interventions given that a patient's postoperative?

APPENDIX O – NURSE UNIVERSITY SCENARIO TICKET 3

Student Learning Objectives

1. Provides care to a patient wit
2. Implements the "6 rights" of
3. Recalls indications, contraindications, and potential adverse effects of prescribed medications.
4. Implements correct stroke protocol.
5. Implements safety measures and demonstrates effective teamwork and collaboration.
6. Demonstrate therapeutic communications in care of the patient and family.

Demographics:

Client Name: William Edwards **Gender:** Male **Race:** Caucasian
Age: 65 **Weight:** 93kg **Height:** 73" **Location:** ED
Allergies: Codeine **Immunizations:** UTD
Physician: Dr. JG Wilson

Client Information:

Past Medical Hx: Mr. Edwards has been diagnosed and treated by his primary care physician over the past years for HTN, CHD, and non-compliant NIDDM. He smokes cigarettes 1 ppd despite medical advice. He is left-handed.

History of Present Illness: Over the last couple of das Mr. Edwards has felt more uncomfortable than usual. His wife has been very concerned but he refuses to see a doctor. Mr. Edward has arrived to ED at 10:00 am after waking up this morning (7am) with right-sided weakness of upper extremity, right-sided facial drooping, and garbled speech.

Social History: Mr. Edwards is a newly retired police officer and he enjoys boating. He is married to Mary his wife for 47 years who brings Mr. Edwards to the hospital this morning and is ver concerned that her husband is having a stroke.

Religion: Christian **Socioeconomic status:** Retired Middle Class

Potential Skills for Scenario:

It is strongly recommended that you read your textbook Nursing Management Stroke Chapter 58

Answer these questions to help prepare for your clinical simulation. We will discuss prior to entering the Simulation lab.

1. Under Sim Chart-My Clinicals there is a patient William Edwards- CVA Simulation. Please complete the Pre-Clinical Manager components which include diagnosis, medications, and lab and diagnostic rationales.
2. Discuss the pathophysiology of this client. (in Sim Chart)
3. Provide rationale for normal and abnormal lab values. (in Sim Chart)
4. Complete Medication profile(in Sim Chart)
5. Mr. Edwards has been diagnosed with Ischemic Stroke. Provide pathophysiology description, clinical manifestations, and anticipated treatment for a client experiencing an ischemic stroke.
6. In addition to information provided what additional assessment data should you obtain?
7. Identify Mr. Edwards modifiable and non-modifiable risk factors for CVA
8. Identify 3 possible nursing diagnosis for Mr. W. Edwards and what nursing interventions are necessary to manage Mr. Edwards care?

APPENDIX P – CHARACTERISTICS OF ADAPTIVE THINKING TRAINING METHODOLOGY

1. *Repetition* – Task Performance occurs repetitively rather than at a naturally occurring frequency. A goal of deliberate practice is to develop habits that operate expertly and automatically. If appropriate situations occur relatively infrequently or widely spaced apart while performing within an authentic setting, they will not become habitual as readily.
2. *Focused feedback* – Task performance is evaluated by the coach or leader during performance. There is a focus on elements of the form, critical parts of how one does the task. During an "as you fight" performance these elements appear in a more holistic fashion.
3. *Immediacy of performance* – After corrective feedback on job performance there is an immediate repetition so that the work can be performed more in accordance with expert norms. Performance feedback occurs during an after-action review (AAR), and there is usually not an opportunity to perform in accordance with the feedback for some time.
4. *Stop and start* – Because of the repetition and feedback, deliberate practice becomes a series of short performances rather than a continuous flow.
5. *Emphasis on challenging aspect* – Deliberate practice will focus on more difficult aspects. For example, when flying an airplane normally takeoffs and landings consume only a small percentage of one's flight time. In deliberate practice simulators, however, a significant portion of the time will be involved in landings and takeoffs and relatively little in steady level flight. Similarly, rarely occurring emergencies can be exercised very frequently in deliberate practice.
6. *Focus on areas of weakness* – Deliberate practice can be tailored to students' needs and focused on areas of weakness. During "train as you fight" performances the individual will avoid situations in which he knows he is weak, and rightly so as there is a desire to do one's best.
7. *Conscious focus* – Expert behavior occurs when many aspects are performed with little conscious effort. Such automatic decisions come from past performances and constituted skilled behavior. In fact, typically, when the expert consciously attends to the elements, performance is degraded. In deliberate practice, the learner may consciously attend to the complicated part because improving performance at the task is more important in this situation than performing one's best. After a member of repetitions attending to correct performance, the learner resumes executing without consciously attending to the detail.
8. *Work vs. play* – Characteristically, deliberate practice feels more like work and is more effortful than casual performance. The motivation to engage in deliberate practice comes from a sense that one is improving in skill.
9. *Active coaching* – Typically a coach must be very active during deliberate practice, monitoring performance, assessing adequacy and controlling the structure of training. Typically in "train as you fight" performances there are no coaches. Instead, there are observers/controllers who attempt to interfere as little as possible in the performance.

APPENDIX Q – EXAMPLE ADAPTIVE THINKING CUE POINTS FOR MILITARY TRAINING

Keep a Focus on the Mission and Higher's Intent.

- Commanders must never lose sight of the purpose and results they are directed to achieve—even when unusual and critical events may draw them in a different direction.

Model a Thinking Enemy

- Commanders must not forget that the adversary is a reasoning human being, intent on defeating them—its tempting to simplify the battlefield by treating the enemy as static or simply reactive.

Consider Effects of Terrain

- Commanders must not lose sight of the operational effects of the terrain on which they must fight—every combination of terrain and weather has a significant effect on what can and should be done to accomplish the mission.

Use All Assets Available

- Commanders must not lose sight of the synergistic effects of fighting their command as a combined arms team—this includes not only all assets under their command, but also those which higher headquarters might bring to bear to assist them.

Consider Timing

- Commanders must not lose sight of the time they have available to them to get things done—a good sense of how much time it takes to accomplish various battlefield tasks and the proper use of that sense is a vital combat multiplier.

See the Big Picture

- Commanders must remain aware of what is happening around them and how it might effect their operations and how what they do can effect others' operations—a narrow focus on your own fight can get you blind-sided.

Visualize the Battlefield

- Commanders must be able to visualize a fluid and dynamic battlefield with some accuracy and use this visualization to their advantage—a commander who develops this difficult skill can reason proactively like no other.

Consider Contingencies and Remain Flexible

- Commanders must never lose sight of the old maxim that "no plan survives the first shot"—flexible plans and well thought out contingencies result in rapid, effective responses under fire.

APPENDIX R – EXAMPLE MILITARY ADAPTIVE THINKING INTERVIEW QUESTIONS

Keep Focus on Mission/Higher Intent

- What was the back-up plan?
- How will the host nation respond to my actions?
- How do the ROE apply in this situation?

Model a Thinking Enemy

- What do the civilians want? Food? Transportation?
- Is there a hostile intent here?
- How can we best influence these people? Crowd leader(s)? Local official?
- How will the media be used by the enemy?

Consider Effects of Terrain

- What other routes are available?

Use all Available Assets

- Can I get civil affairs support?
- How can I best use the media?
- What can the Centralian military and local agencies do to support us?
- Are there alternative ways to get fuel to ROSE?

Consider Timing

- How much time do I have to make a decision?

See the Bigger Picture

- Can the get by without refueling in ROSE?

Visualize the Battlefield

- What could have been done to avoid this?

Consider Contingencies and Remain Flexible

- How can this situation get worse? How can it be solved?

VITA

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EDUCATION / CERTIFICATIONS

Lee University, B.S., 1992
Pentecostal Theological Seminary, M.Div., 1995
Old Dominion University, M.S.Ed., 2004
Gordon-Conwell Theological Seminary, D.Min., 2005
Old Dominion University, Ph.D., 2015

CERTIFICATIONS

Visual Display of Information, Yale University, New Haven, CT
Instructor Training School, US Navy
Chaplain Basic Course and Candidate Program, US Navy
Aviation Electronics Technician School, US Marine Corps
Flash ActionScript 3.0, Motion Over Time, New York, NY
Oracle Database Design
FIRO Element B Inventory
Myers-Briggs Type Indicator
Taylor-Johnsons Temperamental Analysis
Project Management Professional (PMP) Certification

PROFESSIONAL EXPERIENCE

GP Strategies Corporation – Glen Allen, VA Learning Solutions Manager/Program Manager	2013 – 2015
Independent Consultant – Virginia Beach, VA Training Analyst/Instructional Designer/Program Manager	2012 – 2013
Virtual Learning Systems – Richmond, VA Chief Learning Officer	2010 – 2012
Novonics Corporation Training Technology Lab – Orlando, FL Instructional System Architect	2009 – 2010
L-3 Communications – Virginia Beach, VA Director of Future Training/Principle ISD	2007 – 2009
Regent University – Virginia Beach, VA Senior Instructional Systems Designer	2006 – 2007
United States Navy – Various Locations Program Manager/Chaplain	1993 – 2006
United States Marine Corps – Various Locations Aviation Electronic Technician (6432/6433)	1983 – 1993

AWARDS

Navy and Marine Corps Commendation Medal (3)
Navy and Marine Corps Achievement Medal (2)
Meritorious Unit Commendation (2)
Iraqi Campaign Medal
Presidential Unit Citation
Meritorious Mast

SKILLS

HTML 5; JavaScript; ActionScript; CSS3; Various LMS; Flash CS6; Photoshop CS6; Audition CS6; Articulate Storyline; Captivate 7; Camtasia 8; Lectora Inspire; SPSS; R Programming; 3D Max 2014; Maya 2014; SharePoint; Microsoft Suite; RoboHelp;