CONCEPT MAPPING: EFFECTIVENESS OF A TEACHING TECHNIQUE AND
STUDENT SATISFACTION AS A LEARNING STRATEGY

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ABSTRACT

RESEARCH PAPER: Concept Mapping: Effectiveness as a Teaching Technique and Student Satisfaction as a Learning Strategy

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Student nurses are required to analyze patients’ problems and determine a diagnosis based on nursing concepts. Faculty are charged with finding teaching techniques that help nursing students learn and apply concepts. Concept mapping is one strategy to increase understanding of relationships among concepts by breaking knowledge into smaller parts (Hinck et al., 2006). The purpose of this study is to determine the effectiveness of concept mapping as a teaching technique, and describe student satisfaction with the technique. This is a replication of the Hinck et al.’s (2006) study. Novak and Gowin’s (1984) steps in designing concept maps is the organizing framework. A quasi-experimental one group pretest-posttest design will be used. The study will take place at a private liberal arts college in Indianapolis. A convenience sample of 30 second semester nursing students in an associate degree nursing program will be invited to participate. Concept maps will be examined using the Concept Map Grading Criteria (Hinck et al., 2006). Student satisfaction with concept mapping will be measured using the Student Assessment of Learning Gains Instrument (Seymour, 1997). Findings will provide information for nursing educators about the effectiveness of concept maps as a teaching strategy in nursing education.
Chapter I

Introduction

Today’s healthcare environment has become more and more complex. Patients in the hospital have a higher acuity level, and shorter length of stay (National Center for Health Statistics, 2012). In addition to the increasing acuity and decreasing length of stay, there is a constant change in technology that nurses must learn to use effectively. Documentation, learning new and revised procedures, and adapting to changes in management and administration, are all challenges for nurses. Nurses need to be prepared to function in the high tech, high acute, fast paced environment. Nurses must develop critical thinking skills in order to meet technology demands and function effectively (Chen, Liang, Lee, & Liao, 2011; Taylor & Littleton-Kearney, 2011).

Research on new nurse graduates suggests that critical thinking skills need to be developed as nurses enter practice (Toofany, 2008). Critical thinking skills for nursing practice begin during the nursing program (Chen et al., 2011; Taylor & Littleton-Kearney, 2011). Rote memorization has been an accepted learning method in the past, but is no longer recommended because deep meaning is not integrated into learning (Kumar, Dee, Kumar, & Velan, 2011). Student nurses must take an active role in the learning experience and become self-directed learners. Concept mapping assists learners to self-critique learning using the decision-making process. Self-awareness is critical to the learning process and transfer of knowledge into practice (Su & Osisek, 2011).
New teaching methods must be developed and implemented by nurse educators to assist students to think critically, understand complex relationships, integrate theoretical knowledge into nursing practice, and become lifelong learners (Hinck et al., 2006). One technique that has been suggested is concept mapping. This study examines the use of concept maps as a technique for learning.

**Background and Significance**

Concept maps have been described as a powerful teaching and learning technique for nursing education that facilitates meaningful learning (Pilcher, 2011). Concept mapping is an active learning strategy that can be used along with, or in place of, traditional lecture, reading, and class discussion to promote critical thinking (Noonan, 2011). Concept mapping was defined by Hinck et al. (2006) as: “…diagrams of key concepts and relationships between those concepts” (p. 23). Words or pictures are arranged in hierarchical structure. Secondary concepts branch out from the primary concept. Between concepts, lines are drawn with propositional statements to show relationships. A picture is created to provide an image of the concept.

Concept maps were initially developed as a method to organize data and represent changes in students’ thinking. It evolved into a technique to help students learn (Novak, 1990). Since that time concept mapping has been used in a variety of disciplines, with all age groups and learning levels. Concept mapping promotes meaningful learning and assists students to take an active part in learning (Novak, 1990). Using concept maps is currently listed among the top 10 active learning strategies for teaching science (Khourey-Bowers, 2011). Using concept maps assists in assimilating new knowledge and
identifying relationships among new knowledge and preexisting knowledge. Concept mapping can also help identify knowledge gaps (Schuster, 2008).

Concept mapping has been used as a technique in nursing education since the early 1990’s (St. Cyr & All, 2009). Therefore, the research on using concept maps in nursing education is somewhat limited. The majority of articles written about concept mapping in nursing education explain the process of creating concept maps, or the use of concept maps in educating nursing students (Conceição & Taylor, 2007). In nursing education concept mapping has been used in clinical practice, simulations, skills labs, classrooms, research, and curriculum development (Chen et al., 2011; Dearmon, Lawson, & Hall, 2011; Hinck et al., 2006; Noonan, 2011; Pilcher, 2011; Taylor & Littleton-Kearney, 2011).

Concept mapping can be used with students of all learning styles, and may assist students to develop new learning strategies (Kostovich, Poradzisz, Wood, & O’Brien, 2007). In Hinck et al.’s (2006) study, the researchers found that concept mapping is a learning strategy for nursing education, and students found concept mapping to enhance understanding of concepts. Pilcher (2009) found concept maps to be a more accurate method of assessing knowledge attained during an internship than the traditional multiple-choice test method (Pilcher, 2009). Concept mapping has also been used as a tool to evaluate critical thinking in both nursing students and graduate nurses (Hsu, 2004; Wilgis & McConnell, 2008).

Hinck et al. (2006) examined the usefulness of concept mapping as a learning technique for nursing students to prepare and assess nursing care in a community-based mental health course. Findings showed that concept map scores improved with a
significant increase in comprehensiveness. The authors concluded that concept mapping is an appropriate learning strategy for community-based nursing education.

Active learning methods that promote learning and critical thinking for nursing students are key to the future of nursing education and the nursing profession (Eason, 2010; Taylor & Littleton-Kearney, 2011). It is important that evidence-based methods be developed for increasing nursing students’ critical thinking and analytical skills. This study will validate Hinck et al.’s (2006) findings on concept mapping in nursing education. Findings will contribute to the evidence available on concept mapping.

**Problem Statement**

Student nurses are required to analyze patient problems and determine a diagnosis based on nursing concepts. Faculty are charged with finding teaching techniques that help nursing students understand and apply concepts. Concept mapping is one strategy to increase understanding of relationships among concepts by breaking knowledge into smaller parts (Hinck et al., 2006).

**Purpose of Study**

The purpose of this study is to determine the effectiveness of concept mapping as a teaching technique, and describe students’ self-evaluation of learning and satisfaction with the concept maps. This is a replication of the Hinck et al.’s (2006) study.

**Research Questions**

1. Is there a difference in scores of concept maps at the beginning and end of the course?
2. How do students self-evaluate and rate satisfaction with the learning experience using concept maps?
Conceptual Framework

The organizing framework for the study is Novak and Gown’s (1984) steps in designing concept maps. A concept map is a visual creation of “concepts” and “linking words.” The completed concept map represents relationships a person sees among concepts. This allows an educator, as well as the person creating the concept map, to visually see any misrepresentations or misconceptions that may be held. Concept maps can identify an area where more education is needed. The progression across time of the created concept maps demonstrates meaningful learning.

Concept mapping is a technique for promoting meaningful learning in nursing education. Constructing a concept map requires nursing students to examine relationships among concepts, and to link the concept to previous knowledge (Pilcher, 2011). When meaningful learning has taken place, and relationships among concepts are attached to prior understanding, the knowledge will last longer (Novak, 1991). This framework is appropriate for this study because nursing education needs to develop effective teaching techniques to enhance critical thinking among students. Concept mapping promotes meaningful learning which increases critical thinking and application of the learned concepts.

Definition of Terms: Conceptual and Operational

Conceptual: Concept Map. A concept map is a graphic representation created to organize and represent knowledge (Novak & Cañas, 2008). Included in a concept map are concepts in a box or circle linked with lines. On the lines are words or propositions that describe relationships among the concepts. Concept maps are arranged in a hierarchical structure with the more general concept at the top, and the more specific
concepts lower in the structure. The cross-links represent the relationships among concepts in different segments of the map (Novak & Cañas, 2008).

**Operational: Concept Map.** Students will complete concept maps to represent assessment, diagnoses, planning, and evaluation information about assigned patients. The central concept will be the patient. The student will arrange the primary health concern, the assessment data, and nursing diagnoses. Around each nursing diagnosis, the student will arrange information regarding risk factors, etiologies, diagnostic tests, treatments, and medications. A patient centered outcome with six nursing interventions will also be included. Relationships between concepts will be demonstrated with lines, cross-links, and propositional words. The tool to score the concept maps will be the Concept Map Grading Criteria. A maximum of 20 points will be possible for each concept map. The points will be from nine criteria, including nursing diagnoses, goals, interventions, evaluation, and teaching (Hinck et al., 2006).

**Conceptual: Self-Evaluation of Learning.** Learning is described as improved thinking ability that prepares the student to understand complex situations and plan care for a client (Seymour, 1997).

**Operational: Self-Evaluation of Learning.** Learning will be measured by the learning and satisfaction questionnaire based on the Student Assessment of Learning Gains Instrument (Seymour, 1997).

**Conceptual: Satisfaction with Concept Maps.** Satisfaction will be described as gratification with grading of concept maps and appreciation of feedback on concept maps (Seymour, 1997).
Operational: Satisfaction with Concept Maps. Satisfaction will be measured by student satisfaction questionnaire based on the Student Assessment of Learning Gains Instrument (Seymour, 1997).

Limitations

The generalizability of this research study will be limited due to the small number of participants and location.

Assumptions

1. Students want to learn how to organize information.
2. Nursing instructors can provide improved teaching by using concept maps.

Summary

Student nurses are required to analyze patient problems and determine a diagnosis based on nursing concepts. Faculty are charged with finding learning techniques that help nursing students understand and apply concepts. This research study will evaluate the effectiveness of concept mapping as a teaching technique and describe student self-evaluation of learning and satisfaction. The framework is Novak and Gowin’s (1984) steps in designing concept maps. Concept mapping is one strategy to increase understanding of relationships among concepts by breaking knowledge into smaller parts. This is a replication of the Hinck et al.’s (2006) study.
Chapter II
Review of Literature

Introduction

Concept mapping has been promoted as a teaching technique for almost 3 decades. Concept mapping is one strategy to increase understanding of relationships among concepts by analyzing smaller parts (Hinck et al., 2006). Concept maps were also used to measure the transformation of cognitive structure that occurred over several years.

The purpose of this study is to examine the effectiveness of concept mapping as a teaching technique, and describe students’ self-evaluation of learning, and satisfaction with the concept maps. In Hinck et al.’s (2006) study, students in a mental health course completed seven concept maps that were evaluated using the Concept Map Grading Criteria. This is a replication of Hinck et al.’s study.

Organization of Literature

The literature review consists of studies that address utilization of concept mapping as a teaching technique. The literature review is organized into four sections: (a) conceptual framework, (b) concept mapping: teaching method for critical thinking with nursing students, (c) concept mapping: learning tool for nursing students, and (d) concept mapping: evaluating professionals on critical thinking.
Conceptual Framework

Concept mapping was first developed and defined by Novak and Gowin (1984). A study at Cornell University followed students from the first and second grades, through the twelfth grade, examining changes in students’ concept meanings over time (Novak, 1990). The objective was to analyze how the concept meanings of individual students changed with time. Audio-tutorial science lessons were given to first and second graders to introduce basic science concepts.

The program was developed based on Ausubel’s (1968) Assimilation Theory of Cognitive Learning (as cited in Schuster, 2008). Ausubel was an educational psychologist who developed the Assimilation Theory (Schuster, 2008). According the Ausubel, for education to be meaningful, new knowledge must be built on preexisting knowledge. The fundamental assumption was: “If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly” (Ausubel, 1968, as cited in Novak, 1990, p. 937).

The large amount of information collected from the Cornell University study led to a search for ways to organize data (Novak, 1990). The understandings of each student were represented on a framework that incorporated the existing knowledge with the new knowledge. The framework was organized in a hierarchical manner. The concepts were linked via lines that were later labeled with propositions to describe relationships among concepts. This framework developed over 3 to 4 years and came to be called concept mapping (Novak, 1990).
A concept map is a visual creation of “concepts” and “linking words.” A concept is defined as “a regularity in events or objects designated by some label” (Novak & Gowin, 1984, p. 4). Lines designated by linking words connect concepts. Linking words describe relationships among the connected concepts. Any two connected concepts form a “propositional linkage,” or an expression of how a part of the world looks or works. Generally, concepts are arranged in a map hierarchically, with the most general concept at the top.

The first step in creating a concept map is to identify the context of the map with a focus question. The focus question clearly specifies, or defines the problem or issue, developed in the concept map. The second step is to identify the key concepts that apply to the problem or issue, and arrange the concepts in order from most general to most specific (Novak & Cañas, 2008).

Creating a preliminary concept map is the next step. Hierarchical ordering of the concepts, and grouping of different concepts takes place. After creating the preliminary concept map cross-links are inserted. Cross-links show relationships among concepts, and demonstrate the understanding the student has of the concepts. The final step is revision of the concept map with repositioning of the concepts for clarity. The concept map can be continually revised as new information is added, and new relationships understood (Novak & Cañas, 2008).

Concept maps can be created for any topic or concept. Having students create concept maps assists students to find new meanings in the concept, and relate the concept to knowledge already obtained (Novak, 1991). Novak and Gowin (1984) first developed the idea of concept mapping when conducting research on changes in understanding of
various abstract scientific ideas (Novak, 1990). During the studies that occurred over 2 years in the early 1980’s, the concept map developed as a method to define the specific concept and propositional meanings both before and after instruction.

Traditional learning involves rote memorization, and by grades four or five, students learn to prefer rote memorization to other learning techniques (Novak, 1991). The problem with rote memorization is that unless constantly reinforced, the information learned is usually forgotten within 2 to 3 weeks. Rote memorization does not produce meaningful learning. Moving students in the direction of meaningful self-directed learning is a goal of education (Heinze-Fry & Novak, 1990).

Meaningful learning assists students to retain knowledge over a much longer period of time, and necessitates connecting new concepts to prior-learned concepts. Meaningful learning facilitates the acquisition of critical thinking skills. Concept mapping encourages critical thinking as it assists students to form mental scaffolds of the relationships among concepts (Schuster, 2008). Concept maps can lead students to greater differentiation of concepts, and help to rectify misconceptions (Novak, 1993). Students need to be taught that meaningful learning and critical thinking are processes that are never complete.

Chabeli (2010) conducted a literature review of concept mapping as a method to promote critical thinking in nursing. The literature review consisted of an exploration of the theoretical foundation of concept mapping, the epistemological basis of concept mapping, and the theoretical framework of critical thinking. Implementation of concept mapping was discussed, including the steps of assessment, planning and implementation,
and evaluation and feedback. Concept maps facilitate creative and critical thinking. The process of creating a concept map encourages a deep approach to learning (Chabeli, 2010).

According to Senita (2008, p. 8), concept maps provide the following benefits to nursing students:

1. Provide a visual format to organize a client’s plan of care.
2. Show relationships between diagnoses, assessment data, medical and nursing treatment, and associated rationale.
3. Demonstrate understanding of theory and how it applies to practice.
4. Identify interrelationships.
5. Identify appropriate and unique plan of care for a particular client.
6. Identify collaborative problems.
7. Identify nursing priorities based on relationships.

The steps in concept mapping are described as follows: preparation, generation of ideas, organization, representation, interpretation, and utilization (Toofany, 2008). The steps make concept mapping a teaching technique useful for encouraging and evaluating critical thinking in nursing practice. Critical thinking will enhance clinical judgment skills that are essential for nursing practice (Toofany, 2008).

This framework is an appropriate fit for the study because it is essential that student nurses begin to develop critical thinking skills. Incorporating concept mapping as an instruction method may assist in helping students understand relationships among concepts, and provide the foundation for the deep learning needed to become successful graduate nurses.
Concept Mapping: Teaching Method for Critical Thinking with Nursing Students

Critical thinking is a core competency for nursing students. Active learning strategies promote development of critical thinking, whereas traditional nursing care plans promote linear thinking that may not foster critical thinking. The purpose of this study was to examine whether using concept maps, as opposed to traditional nursing care plans in preparation for clinical, would promote critical thinking in baccalaureate nursing students (Wheeler & Collins, 2003). Ausubel’s (1968) Assimilation Theory, and Novak’s (1972) Concept Maps were the frameworks (as cited in Wheeler & Collins, 2003).

There were 76 participants enrolled in the junior-level nursing courses of a baccalaureate nursing program. The participants were randomly assigned to an experimental group of 44 students taking either an Adult Health course, or one section of a Pediatric Nursing course. The control group had 32 students who were taking a Maternity course, a Psychiatric Nursing course, or two other sections of a Pediatric Nursing course. The mean age of the students was 23.46. There were no significant differences among the groups in age or gender (Wheeler & Collins, 2003). The experimental group was given an introduction to concept mapping during the orientation for the course. Each week, as part of clinical preparation, the students in the experimental group completed a concept map. The students in the control group prepared traditional nursing care plans in preparation for clinical.

Critical thinking was measured using the California Critical Thinking Skills Test (CCTST). There are two equivalent forms of the CCTST, and reliability and validity have been tested on both forms. Internal consistency has also been found to be
acceptable. Form A was used as the pretest, and Form B was completed at the end of the semester as the posttest (Wheeler & Collins, 2003).

The mean pretest scores on the CCTST were not significantly different among the experimental (16.93) and the control (17.34) groups. Overall the experimental group improved significantly on the posttest score (mean 18.02, p=.02), while the control group did not (mean 17.56, p=.52). When the CCTST results were broken down into five sections, analysis, evaluation, inference, deductive reasoning, and inductive reasoning, the scores among the two groups were not significantly different, except in the analysis subscale. On the analysis subscale the experimental group had a mean difference of 0.55 (p=.005), and the control group’s mean difference was 0.23 (p=.28). Both groups improved significantly in the evaluation subscale, with the experimental mean difference being 0.62 (p=.05), and control mean difference being 0.89 (p=.01) (Wheeler & Collins, 2003).

Both methods of clinical preparation effectively developed critical thinking skills among students. Wheeler and Collins (2003) identified several reasons for not finding a significant difference among the groups. The authors concluded that concept mapping does promote critical thinking, but critical thinking continues to be difficult to measure.

Nursing students must become active learners to grasp nursing concepts throughout the program. Concept mapping and problem-based learning are effective methods to assist nursing students to become active. The purpose of this study was to investigate the impact of using concept mapping in problem-based learning discussions on learning outcomes in nursing education (Hsu, 2004). The frameworks were Piaget’s (1972) and Vygotsky’s (1978) developmental theories (as cited in Hsu, 2004).
The sample was 92 students in a 2-year nursing program in Taiwan who had taken Nursing I. Simple random sampling identified two classes out of six first-year classes. Forty-nine students in class 1 made up the control group, and 43 students in class 2 were in the treatment group. The students were 19-20 years old, and were all females. The two groups had comparable educational backgrounds and entrance qualifications (Hsu, 2004). Two nursing faculty participated in this study.

The control group was given traditional teaching, while the experimental group was given six problem-based learning scenario discussions separately. Both groups completed a concept map after viewing a video. Four different categories were scored on the maps: propositions, hierarchies, cross-links, and examples. Each map received a total score, and four subscores using Novak and Gowin’s (1984) scoring system. The subscores measured: propositions, hierarchies, cross-links, and examples. The depth of thinking was indicated by the value of the score. It was found that the correlations between the two raters on all categories were significant, except for the category of ‘example,’ where there was no correlation (Hsu, 2004).

The experimental group scored significantly higher on propositions and hierarchies. The mean score on propositions was 5.5 in the experimental group, compared to 1.4 in the control group. The mean score on hierarchies was 2.2, compared to 0.4. The total score was also significantly higher with a mean of 9.1 in the experimental group compared to 3.2 in the control group. There were no statistical differences in cross-links and examples (Hsu, 2004).

Hsu (2004) believed findings supported the use of concept mapping as a problem-based learning strategy in nursing programs. Concept mapping and problem-based
learning encourage students to develop a higher level of thinking. Learning with concept maps facilitates students becoming active learners. Concept mapping assists the faculty evaluate a student’s thinking processes.

Concept mapping is an active learning activity that facilitates critical thinking. The purpose of this study was evaluation of students’ learning progress with the development of concept maps (Hsu & Hsieh, 2005). The framework was the constructivist’s view of learning (Hughes & Hay, 2001, as cited in Hsu & Hsieh, 2005).

The sample was 43 students enrolled in a 2-year nursing program in Taiwan. All the students had completed Nursing I (Hsu & Hsieh, 2005). The Framework for the course was Roy’s model, including the four concepts of physical function, self-concept, role functions, and interdependence. The students were divided into groups, and created six concept maps during the semester based on seven different scenarios.

Scoring was based on Novak and Gowin’s (1984) scoring system. Seven different scenarios were presented to the students. Each group of students completed a concept map after a lecture about the topic. A total of 30 points was possible measuring concept links (2 points each), crosslinks (10 points each), hierarchies (5 points each), and examples (1 point each) (Hsu & Hsieh, 2005). The researcher used a “proposition inventory” qualitative evaluation tool to evaluate each concept map.

The mean score for the first concept map was 8. By the sixth concept map the mean score had improved to 18.64. A qualitative evaluation of the concept maps was done. The authors found that the last concept maps were highly integrated, and demonstrated a holistic view of the patient (Hsu & Hsieh, 2005). Students learned
problem-solving and critical thinking skills by working in small groups to develop concept maps.

Hsu and Hsieh (2005) concluded that concept mapping is a useful tool for nurse educators to guide students in organizing knowledge and information in understanding patient care in a holistic manner. Concept mapping helps students develop critical thinking skills, and provides educators with a method of exploring and understanding students’ misconceptions.

Concept maps are defined as hierarchal map structures that place major concepts in a graphic arrangement. Students need to define concepts and relationships on the map to visualize thoughts. Critical thinking is a non-linear process, and is represented in a concept map. Concept mapping needs to be evaluated as a teaching activity. The purpose of this study was to describe the use of concept maps as an educational tool that promotes critical thinking, and to determine if concept maps can measure and evaluate critical thinking (Abel & Freeze, 2006). Also assessed were students’ appraisals of concept maps as a learning activity. The framework was based on the work of Daley (1996), (as cited in Abel & Freeze, 2006).

The sample was 28 nursing students in a graduating nursing class in an ADN program in North Carolina. The students had completed a concept map during the second semester of the nursing program. Of the 28 students, 24 were Caucasian, 25 were women, and the mean age was 28 years of age (Abel & Freeze, 2006).

A numerical score was calculated for each map over time using a scoring criteria used by Daley et al. (1999, as cited in Abel & Freeze, 2006). Students developed concept maps for one client. Scoring was based on inclusion of concepts, arrangement of
concepts, and links among concepts. This score was a reflection of the student’s critical thinking. Reliability of this scoring system was tested in a pilot study. Interrater reliability was found to have an 85% agreement among raters, and intrarater agreement was 97% and 94%. Validity of the scoring system was previously established, and was congruent with the definitions of critical thinking (Abel & Freeze, 2006).

ADN students demonstrated critical thinking by the use of the nursing process in the care of a hospitalized patient on a concept map. Total scores for concept maps ranged from a mean score of 173 in the second semester, to 249 in the fifth semester. This was a statistically significant difference in scores. Cross-link scores also improved from 140 in the second semester, to 260 in the fifth semester (Abel & Freeze, 2006).

Concepts maps did measure changes in critical thinking ability over time. The concept maps showed nonlinear thinking, and use of the nursing process. The increased cross-link scores demonstrated an increase in students’ critical thinking skills, and in comprehension of relationships among various components of client care (Abel & Freeze, 2006).

Faculty believed that concept mapping helped students learn to critically think and to develop nonlinear thinking. The concept maps reflected the students’ insight and understanding of the client as a whole. Concept maps helped faculty identify misunderstandings, and lack of knowledge in students. The majority of students thought that concept mapping increased knowledge, and should be used along with traditional nursing process. Concept maps assisted students to see the big picture of the client and the nursing care (Abel & Freeze, 2006). Abel and Freeze (2006) concluded that concept maps help to develop nonlinear thinking in students.
Nurse educators need tools to identify and measure critical thinking in nursing students. Concept maps are one strategy to promote critical thinking, but there are limited tools to evaluate the effectiveness of concept mapping in promoting critical thinking. The purpose of this study was to evaluate if concept maps enhance critical thinking, and to determine the level of critical thinking in second year baccalaureate nursing students (Hicks-Moore & Pastirik, 2006). The Holistic Critical Thinking Scoring Rubric (HCTSR) (Facione & Facione, 1994, as cited in Hicks-Moore & Pastirik, 2006) measured critical thinking in concept maps.

The sample included 18 of 42 second year nursing students in a baccalaureate program in Canada. The course was a 5-week concentrated hospital-based clinical practicum course. Eight of the 18 students were part of the focus group. Half of the seven clinical instructors were part of another focus group (Hicks-Moore & Pastirik, 2006).

Concept maps were scored using the HCTSR. The HCTSR scores identify critical thinking on responses using a 1-4 point scale. Clinical instructors attended an information session to review scoring, and inter-rater reliability was established. Intraclass correlation was 0.81. Two focus groups were conducted, one for students, and one for clinical instructors. Open-ended questioning was used in the focus groups that lasted about 1 hour (Hicks-Moore & Pastirik, 2006).

The majority of the students using the concept maps scored three or higher on the HCTSR, indicating critical thinking was demonstrated most of the time. Hicks-Moore and Pastirik (2006) believed findings supported the use of the HCTSR for evaluation of critical thinking in nursing students.
Two themes were identified in the focus groups: critical thinking, and clinical preparedness. The students stated concept mapping did promote a holistic view of the client and enhanced critical thinking. The concept maps also helped students be prepared for clinical practice with a more holistic picture of the patient. Faculty believed concept mapping was a helpful teaching strategy in developing critical thinking when used with clinical exposure. Concept mapping is a beneficial method to evaluate students’ overall knowledge and comprehension (Hicks-Moore & Pastirik, 2006). Faculty believed the HCTSR was challenging because it was a generic measure of critical thinking and not specific to nursing.

The authors concluded that using concept maps encourages critical thinking in nursing students. Concept mapping helps students to prepare for clinical practice and assists in developing a holistic view of the client. The HCTSR could be used with some modifications to measure critical thinking on concept maps (Hicks-Moore & Pastirik, 2006).

Traditionally, nursing care plans have been a method for teaching students the nursing process and critical thinking. Studies on critical thinking have shown that concept mapping is a method to use when teaching the nursing process. The purpose of this study was to determine whether concept mapping is a method for teaching critical thinking skills more effectively than traditional nursing care plans with nursing students (Maneval, Filburn, Deringer, & Lum, 2011).

The sample included 152 practical nursing students who graduated from two different campuses of a community college. The control group included 41 students who used traditional nursing care plans, and graduated in 2004. The experimental group
included 111 students who used concept maps, and graduated in 2005 or 2006. There were no statistically significant differences among the control group and the experimental group on demographic information. However, the experimental group using concept mapping had a significantly higher grade point average (3.28) on admission to the school than the control group (3.11, p=.037) (Maneval et al., 2011).

The instrument used was the National League for Nursing (NLN) Critical Thinking in Clinical Nursing Practice/PN Examination (NLNCT exam). This exam measures critical thinking in the areas of interpretation, analysis, evaluation, inference, and explanation. Scores are calculated for 17 topic areas along with the total test score (Maneval et al., 2011). Each group took the NLNCT exam after completing the 12 month practical nursing program. Faculty teaching the concept map groups used the same educational presentation and teaching methodology. Training was provided to faculty in evaluating and scoring student worksheets, and a standard rubric was utilized.

The mean score on the NLNCT exam for the control group was 95.93, while the mean score for the experimental group using concept maps was 92.12, (t=2.538, p=.012), with the control group scoring higher using traditional care plans. Each of the 17 subscores were also evaluated. The control care plan group achieved significantly better scores on seven areas: analysis (p=.008), evaluation (p=.033), explanation (p=.015), planning (p=.002), implementation (p=.003), legal/ethical (p=.047), and quality improvement/healthcare system (p=.047). The experimental group that used concept maps achieved significantly higher scores on three areas: health promotion (p=.000), client education (p=.000), and safety (p=.017) (Maneval et al., 2011).
There were five areas that correlated highly with success on the critical thinking exam: nursing grade point average (p=.000), age (p=.000), teaching method (p=.011), race (p=.026) and gender (p=.041). All students from both groups passed the NCLEX-PN licensure exam on the first attempt (Maneval et al., 2011).

Maneval et al. (2011) concluded that both groups of students achieved good scores on various parts of the NLNCT. Therefore the teaching method was not necessarily a factor on NCLEX-RN. Although traditional nursing care plans seemed to improve critical thinking skills in practical nursing students more than using concept maps, concept mapping continues to be a creative method to teach the nursing process. There are strengths and weaknesses with both methods.

**Concept Mapping: Learning Tool for Nursing Students**

Nursing students need to learn how to relate concepts of care in a variety of settings. Concept mapping has been used in nursing education as an effective tool to learn how to relate new knowledge to previous knowledge. The purpose of this study (Hinck et al., 2006) was to examine the usefulness of concept mapping as a learning technique for nursing students to prepare and assess nursing care given in a community-based mental health course. Students’ satisfaction with concept mapping and learning was also evaluated. The framework was concept mapping (Novak & Gowin 1984, as cited in Hinck et al., 2006).

The sample was 23 junior-level baccalaureate nursing students from a Midwest metropolitan university, enrolled in a community-based mental health clinical experience. The course occurred during a 16-week semester course. Eleven course and clinical faculty were involved in the study (Hinck et al., 2006).
Concept maps were evaluated with the Concept Map Grading Criteria. The clinical faculty of the university developed this scoring system. A maximum of 20 points was given after evaluation in nine different areas. Reliability was examined with two different investigators scoring six concept maps. The agreement on the six concept maps ranged from 0.44 to 0.70. Agreement on the remaining concept maps ranged from 0.41 to 1.0, with a mean of 0.84 (Hinck et al., 2006).

The researchers developed a 21-item questionnaire with 20 Likert type items, and 1 open-ended question, to measure student satisfaction. The questionnaire was based on the Student Assessment of Learning Gains Instrument (Seymour, 1997, as cited in Hinck et al., 2006). This tool was reviewed by three investigators not participating in data collection and analysis, for clarity, appropriateness of the content, format, and style.

Findings from the concept map grading criteria were that the concept map scores had improved from a mean of 15.35 on the first concept map, to a mean of 17.39 on the seventh concept map. The concept map scores improved with a significant increase in comprehensiveness (Hinck et al., 2006).

Findings from the student satisfaction questionnaire showed students favored in-class practice over reading assignments in learning how to create concept maps. Students said concept maps “improved thinking ability…preparation for the real world…and ability to understand complex situations” (Hinck et al., 2006, p. 27). The students recommended sufficient time be allowed for developing concept maps.

Hinck et al. (2006) concluded that concept mapping is a learning strategy for community-based nursing education. Students’ abilities to discern patterns and relationships are enhanced, and can increase critical thinking. Students found concept
mapping to be a satisfactory method to enhance understanding of factors influencing a client’s health.

Concept mapping is one of many methods used to develop critical thinking in nursing students. Students have different learning styles, and a teaching strategy that is effective for one learning style may not be as effective for another learning style. The purpose of this study was to describe the relationship between learning style and a student’s proficiency in concept mapping (Kostovich et al., 2007). Kolb’s (1976) learning theory was the framework (as cited in Kostovich et al., 2007).

The population was undergraduate nursing students at a private Catholic university in the Midwestern United States. The sample included 120 students enrolled in an adult medical-surgical class. Most of the students had not completed concept maps previously (Kostovich et al., 2007).

Two instruments were used. The first was the Learning Style Survey (LSS). This was an adaptation of Kolb’s (1976) Learning Style Inventory (LSI) (as cited in Kostovich et al., 2007). The survey consisted of nine sets of statements. The statements were scored on a 4 to 1 scale, corresponding to the degree the statement describes characteristics of the respondent in regards to learning style. The outcomes from the statements provide three different sets of scores. The first set of scores is descriptive of the respondent’s preference for concrete experience, active experimentation, abstract conceptualization, and reflective observation modes of learning. The first set of scores is used to compute the second set of scores: the grasping score and the transforming score. The two scores are then graphed on a grid to identify the respondent’s preferred learning style: concrete, active, abstract, or reflective. Internal reliability for this study was low.
Test-retest reliability was obtained using 13 subjects, and was moderately strong. Validity for the LSS was confirmed because negative correlations were found between the abstract conceptualization and concrete experience subscales.

The second instrument was created by the researchers with nine open-ended questions addressing the respondent’s preferences for concept mapping.

Students were provided written and verbal instructions on creating concept maps. Concept maps were graded using a rubric adapted from Novak and Gowin’s Model (1984). Two faculty graded the concept maps, but interrater reliability was moderately low. Because of this, only one faculty graded the concept maps for this study. Using the LSS, students were classified as concrete, reflective, abstract, or active learners. Mean concept map scores were calculated for each category of learning style. No significant influence of learning preference was found on concept map grades with ANOVA (Kostovich et al., 2007).

Preference for concept maps or case studies was evaluated. Results showed almost twice the number of students in the abstract learning style group preferred concept maps over case studies. The students in the other learning style groups showed no preference. From the responses to the open-ended questions two major categories emerged. The first was ‘impact on learning,’ and the second was ‘process of doing.’ No relationship was found between learning style and the comments (Kostovich et al., 2007).

Kostovich et al. (2007) concluded that a student’s learning style does affect the performance in creating concept maps. Concept mapping would be an appropriate teaching technique to use with students of all learning styles. Concept mapping may
assist some students to develop new learning strategies and expand the learning styles available.

**Concept Mapping: Evaluating Professionals on Critical Thinking**

Concept mapping has become accepted as a valuable teaching method to promote critical thinking in a holistic manner. Collaborative learning has been shown to assist students in examining various ideas and diverse hypotheses. The purpose of this study was to evaluate if differences in morphology of concept maps could be employed to purposefully form groups for maximized learning (Kinchin & Hay, 2005). The framework was based on collaborative learning. Concept maps were based on a model by Kinchin, Hay, and Adams (2000, as cited in Kinchin & Hay, 2005).

The sample was 12 postgraduate-students studying to be nurse educators. The participants were enrolled in a part-time program to obtain a postgraduate certificate in the education of adults. None of the students had been exposed to concept mapping prior to the study (Kinchin & Hay, 2005).

The students were initially given a 2 hour course in the use of concept maps. The study had two stages. In stage one, the participants were given 20 basic concepts, and were asked to form the concepts into a concept map individually. The resulting concept maps were sorted into three groups according to the characteristics of the concept map: spoke, chain, or net. Groups of students were formed using one of each type of map (heterogeneous groups): spoke, chain, and net. The groups created a new concept map as a group. Maps were then evaluated individually and as a group. A gain score was obtained for each student (Kinchin & Hay, 2005).
In stage two, the participants were divided into groups according to the kind of map the participant had created (homogeneous groups). Spoke map creators were together, chain map creators were together, and net map creators were together. A different group was given 20 concepts, and participants again created maps. Maps were evaluated individually and as a group, and gain scores were calculated for individuals (Kinchin & Hay, 2005).

The scores attained in the heterogeneous groups were more than the total of the scores attained by individuals. The average gain score for the heterogeneous group was +7, while the average gain score for the homogeneous groups was -0.825. The sharing of different perspectives in the collaborative groups assisted students to gain additional outlooks, and in increasing scores substantially. Creating collaborative groups to maximize variation among students promotes a valuable discussion and exchange of viewpoints (Kinchin & Hay, 2005).

Kinchin and Hay (2005) concluded that using concept maps assists the instructor to form collaborative groups of students to maximize the exchange of information among students. Each member of a group brings a distinct perspective that contributes to the other group members learning.

Newly registered nurses need to develop critical thinking skills. Nursing orientation programs should enable graduate nurses to perfect skills and enhance patient safety. A method to teach critical thinking skills is needed. The purpose of this study was to evaluate concept maps as a technique to develop critical thinking in graduate nurses before and after an orientation program (Wilgis & McConnell, 2008). Benner’s (1984) Theoretical Framework of Novice to Expert (as cited in Wilgis & McConnell,
2008) was used to support the study, and the concepts of critical thinking, concept maps, and stages of the novice nurse were applied.

The sample was 14 graduate nurses in an orientation program at a northeast Florida hospital. The age of participants ranged from 23 to 50, with a mean age of 33. One participant was male. One participant had completed a baccalaureate nursing program, and 21% had passed the National Council Licensure Examination (NCLEX). Each of the participants had completed a NCLEX review. Thirty-six percent of the participants had prior patient care experience before becoming a graduate nurse, and one had previously been exposed to concept mapping (Wilgis & McConnell, 2008).

The tool used was adapted from Schuster's Concept Map Care Plan Evaluation Tool (2002, as cited in Wilgis & McConnell, 2008) to score concept maps completed preorientation and postorientation. The tool had 11 questions, with a possible 25 points, and incorporated the six American Nurses Association standards (Wilgis & McConnell, 2008). Points were given for the content of the concept map, and for attainment of nursing care standards. Schuster’s Concept Map Care Plan Evaluation Tool was reliable. The faculty who taught the course graded the concept maps.

Findings indicated that concept mapping was an effective teaching tool to increase graduate nurses’ critical thinking skills. The post-concept map scores were significantly higher than the pre-concept map scores. Over 70% of the participants believed that concept mapping aided in prioritizing and organizing patient care, improved critical thinking, and assisted in linking knowledge together. Wilgis and McConnell (2008) concluded that concept mapping is a useful technique in evaluating critical
thinking in graduate nurses, and can facilitate the transition from novice nurse to competent nurse.

Creating a concept map provides learners with a visual representation of the holistic care of a patient. There have been few studies on using concept maps as part of a nursing orientation program. The purpose of this study was to evaluate concept maps as a method to measure knowledge before and after a nursing internship program (Pilcher, 2009). The framework was concept mapping.

The sample included seven nurses who were newly hired to work in NICU. All the nurses were inexperienced, and were starting a 6 week NICU internship program. Two of the nurses had previous experience with concept mapping in nursing school (Pilcher, 2009). The internship began with an overview of concept mapping, and the opportunity to participate in the group development of a generic concept map.

A pretest was given after participants were oriented to the idea of concept maps, and how to link interrelated factors. Each participant was asked to generate four different concept maps covering four neonatal issues (Pilcher, 2009). Each concept map was analyzed for appropriateness. The total number of items assessed, potential diagnoses, anticipated orders, task, potential complications, and social issues were divided by the number of appropriate responses. After the completion of the 6 week internship, including didactic and clinical training, the nurses were asked to complete four concept maps with the same issues again. The concept maps were scored in the same way.

In order to compare the pretest and posttest scores, the total number of appropriate responses was calculated. Findings indicated that individual improvement ranged from 59% to 181% on all concept maps completed. The average improvement was 97.1%
(Pilcher, 2009). The participants improved 29.8% on the traditional multiple-choice test given pre and post orientation.

Pilcher (2009) concluded that concept maps are a more accurate method than the traditional multiple-choice test method of assessing knowledge attained during a specialty internship. Concept maps assist the reviewer in assessing each nurse’s understanding, gaps in that understanding of the relationships, and holistic care of patients.

Health professionals, including dietitians, must think critically and problem solve. Concept maps may assist in the development of problem solving skills. The purpose of this study was to determine the benefit of using concept maps in promoting critical thinking with nutrition assessment in dietetic interns (Molaison, Taylor, Erickson, & Connell, 2009). The perceptions of the interns and the preceptors about concept mapping were also assessed. The framework was Novak’s (1984) Theory of Concept Mapping.

The sample was 19 dietetic interns, and 31 preceptors participating in a 9-month supervised internship. Almost all of the interns were female, except one male. Of the 19 interns, 13 had been taught traditional nutrition care plans during undergraduate training. Following a class about concept mapping, the interns completed a pre-assessment concept map based on a case study. After completing 15 additional concept maps over the next 9 months, the interns again completed a post-assessment concept map based on the same case study (Molaison et al., 2009).

Ninety percent of the preceptors who responded to the demographic survey worked in clinical dietetics, and 38% had a master’s degree (Molaison et al., 2009). The preceptors were given training on concept mapping and methods to evaluate the students’ maps. Three preceptors graded the pre- and post-assessment concept maps giving points
for crosslinks with and without directional arrows and linking terms. Inter-rater reliability was evaluated for the pre- and post-assessment concept map scores and found to be acceptable. The inter-rater reliability coefficient for the pre-concept maps was .850, and for the post-concept maps was .764 (Molaison et al., 2009).

A 20-item questionnaire was designed to assess perceptions of interns and preceptors about the concept mapping process. The questionnaire included 20 items, and covered 16 knowledge areas related to concept mapping. A 5-point Likert scale was used for each area, and scored from strongly disagree to strongly agree (Molaison et al., 2009).

There was a significant difference between the mean scores on the pre-assessment concept map, (28.35), and the mean scores on the post-assessment concept map, (117.96) (t=8.92, p=.001) (Molaison et al., 2009). The results from the 20-item questionnaire were that the interns’ perceptions of concept mapping as a learning technique were positive overall. The interns believed concept mapping assisted students to be independent self-directed learners, increased ability to link concepts, and required critical thinking. Results from the 20-item questionnaire given to the preceptors were that the preceptors believed concept mapping as a learning technique was time consuming, but did assist students to understand relationships.

Molaison et al. (2009) concluded concept mapping is an effective technique to promote critical thinking in dietetic interns. The use of concept maps can increase the student’s ability to be self-directed learners. The main barrier was that preceptors believed that concept mapping was time consuming.
Summary of Findings

Concept mapping: teaching method for critical thinking with nursing students. The purpose of the study by Wheeler and Collins (2003) was to examine whether using concept maps, as opposed to traditional nursing care plans in preparation for clinical, would promote critical thinking in baccalaureate nursing students. Findings were that there was no significant difference between the two methods. Both methods of clinical preparation effectively developed critical thinking skills among students. The authors concluded that concept mapping does promote critical thinking, but critical thinking continues to be difficult to measure.

Hsu (2004) conducted a study to investigate the impact of using concept mapping in problem-based learning discussions on learning outcomes in nursing education. The problem-based learning discussions increased scoring significantly in the concept maps. The author believed this study supported the use of concept mapping as a problem-based learning strategy in nursing programs.

The purpose of the study conducted by Hsu and Hsieh (2005) was to evaluate students’ learning progresses with the development of concept maps. The findings showed students learned problem-solving and critical thinking skills by working in small groups to develop concept maps. The authors concluded that concept mapping is a useful tool for nurse educators to guide students in organizing knowledge and information in understanding patient care in a holistic manner.

Describing the use of concept maps as an educational tool that promotes critical thinking, and determining if concept maps can measure and evaluate critical thinking, were the goals of the study by Abel and Freeze (2006). Findings showed that concept
maps did measure changes in critical thinking ability over time, and demonstrated an increase in students’ critical thinking skills, and in comprehension of relationships among various components of client care. Abel and Freeze concluded that concept maps assisted students to see the big picture of the client and nursing care, and helped to develop nonlinear thinking in students.

The goal of the study conducted by Hicks-Moore and Pastirik (2006) was to evaluate concept maps in enhancing critical thinking, and to determine the level of critical thinking in second year baccalaureate nursing students. The findings demonstrated the majority of the students used critical thinking most of the time. Concept mapping offered a beneficial method to evaluate the students’ overall knowledge and comprehension. The authors concluded that using concept mapping encourages critical thinking in nursing students.

The purpose of the study by Maneval et al. (2011) was to determine whether concept mapping is a method for teaching critical thinking skills more effectively than traditional nursing care plans with nursing students. Findings showed that the group using traditional nursing care plans scored significantly higher on seven areas: analysis, evaluation, explanation, planning, implementation, legal/ethical, and quality improvement/healthcare system. The group using concept maps scored significantly higher on three areas: health promotion, client education, and safety. The authors concluded that although traditional nursing care plans seemed to improve critical thinking skills in practical nursing students more than using concept maps, concept mapping continues to be a creative method to teach the nursing process.
Concept mapping: learning tool for nursing students. The purpose of the study by Hinck et al. (2006) was to examine the usefulness of concept mapping as a learning technique for nursing students to prepare and assess nursing care given in a community-based mental health course. Findings showed that concept map scores improved with a significant increase in comprehensiveness. The authors concluded that concept mapping is a learning strategy for community-based nursing education.

Description of the relationship between learning style and a student’s proficiency in concept mapping was the purpose of the study by Kostovich et al. (2007). Findings showed almost twice the number of students in the abstract learning style group preferred concept maps over case studies, while the students in the other learning style groups showed no preference. The authors concluded that a student’s learning style does affect the performance in creating concept maps, and that concept mapping would be an appropriate teaching technique to use with students of all learning styles. Concept mapping may actually assist some students to develop new learning strategies and expand the learning styles available.

Concept mapping: evaluating professionals on critical thinking. Kinchin and Hay (2005) conducted a study with the purpose of evaluating if differences in morphology of created concept maps could be employed for purposeful formation of groups for maximized learning. Findings showed that the sharing of different perspectives in the collaborative groups assisted the students to gain additional outlooks and assisted in increasing scores substantially. Creating collaborative groups to maximize variation among students promotes a valuable discussion and exchange of viewpoints. The authors concluded that using concept maps assists the instructor to use
collaborative groups of students to maximize the exchange of information among students.

The goal of the study by Wilgis and McConnell (2008) was to evaluate concept maps as a technique to develop critical thinking in graduate nurses before and after an orientation program. The findings indicated that concept mapping was an effective teaching tool to increase graduate nurses critical thinking skills. The authors concluded that concept mapping is a useful technique in evaluating critical thinking in graduate nurses.

The purpose of the study by Pilcher (2009) was to evaluate concept maps as a method to measure knowledge before and after a nursing internship program. Findings showed an individual improvement on all concept maps completed. The author concluded that concept maps are a more accurate method than the traditional multiple-choice test method of assessing knowledge attained during a specialty internship.

Determining the benefit of using concept maps in promoting critical thinking with nutrition assessment in dietetic interns was the goal of the study by Molaison et al. (2009). Findings showed that there was a significant increase between the mean score on the pre-assessment concept map and the post-assessment concept map. The interns believed concept mapping assisted students to be independent self-directed learners, increased ability to link concepts, and required critical thinking. The preceptors believed concept mapping was time consuming, but did assist students to understand relationships. The authors concluded concept mapping is an effective technique to promote critical thinking in dietetic interns.
Chapter III

Methodology

Introduction

Concept mapping has been promoted as a teaching technique for almost 3 decades. Concept mapping is one strategy to increase understanding of relationships among concepts by breaking knowledge into smaller parts (Hinck et al., 2006). Concept maps are also used to measure the transformation of cognitive structure that occur over several years.

The purpose of this study is to examine the effectiveness of concept mapping as a teaching technique, and describe students’ self-evaluation of learning satisfaction with the concept maps. This is a replication of Hinck et al.’s (2006) study.

Research questions

1. Is there a difference in scores of concept maps at the beginning and end of the course?

2. What are students’ self-evaluations of learning and satisfaction with use of concept maps?

Population and Sample

The population for this study will be all second semester nursing students in an associate degree nursing program. The sample will be selected from a private liberal arts
college in Indianapolis. A convenience sample of 30 second-semester nursing students will be invited to participate. All students in the Introduction to Medical/Surgical Nursing class will be included. The students will have already successfully completed the prerequisite classes, Fundamentals of Nursing and Health Assessment in Nursing. Introduction to Medical/Surgical Nursing is a 4 semester hour class and the associated clinical course is 5 semester hours covering a 16-week semester.

**Protection of Human Subjects**

The institutional review board at Ball State University and at the college will approve the study prior to data collection. All students in the Introduction to Medical/Surgical Nursing class will be sent a letter explaining the purpose of the study and an invitation to participate. The students will be informed that participation or nonparticipation will not affect the grade received in the class, and participation is voluntary.

All students in the class will be required to complete the concept maps. However only the students who agree to participate in the study will have concept maps and comments included in the data. The instructor will remove names from concept maps and assign codes prior to the researchers reviewing the assignments. Students will be asked not to include names on the self-assessment of learning and satisfaction questionnaires. Questionnaires will be coded for analysis. No risks have been identified.

There are several benefits of this research study. The first will be that by participating in the research the students will learn about and understand nursing research and the research process. Another benefit will be the contribution this research study will make to nursing education.
Procedures

Application for approval will be made to the Institutional Review Board of Ball State University and of the college. After approval the Dean of the Nursing Program will be contacted. Next the researcher will meet with all the medical/surgical faculty members. The study procedures and expectations will be explained. Four weeks prior to the beginning of the semester the students will be sent a letter explaining the study with a consent form agreeing to participate.

The nursing instructors for the class, including the clinical instructors, will attend a presentation by the researcher on concept mapping in order to gain a complete understanding of concept mapping and agreement on scoring procedures. In order to ensure uniform teaching and evaluation a strategy for student preparation, course expectations, and concept map evaluation will also be discussed with students.

At the beginning of the semester, during the clinical orientation, students will attend a presentation about concept mapping and the use of concept mapping in patient care. After the presentation, case studies will be given to the students to practice developing concept maps. Students will work in groups of three to develop a concept map, illustrating the relevant information from the case study. Instruction to the students include:

1. Use the patient as the main central concept.
2. Identify the patient’s primary health concern or chief complaint.
3. List assessment data, both subjective and objective, for the primary health concern.
4. Add two nursing diagnoses connected to the assessment data.

5. List current information, including medical diagnosis, risk factors and etiologies, diagnostic tests, treatments, and medications under each nursing diagnosis.

6. Identify an expected patient centered outcome for each diagnosis.

7. List at least six nursing interventions for each diagnosis.

8. Draw lines between concepts to demonstrate relationships. Use different types of lines (e.g., arrows, bolded lines, broken lines) to indicate the nature of the relationship. Use words on the lines to explain the relationships between the concepts. Include a map key to explain what colors, shapes, and lines represent.

Students will completed a concept map for 10 different patients cared for during the clinical experience. Clinical assignments will be made the day before patient care and students will begin the concept maps as information is gathered about the patient. Information gathering and assessments will continue during the clinical time and concept maps will continue to be developed. The completed concept maps will be due at the beginning of the next clinical 1 week later.

The researcher will work to grade each concept map, with the clinical instructors giving feedback and guidance. The first and tenth concept maps for each student will be scored by the researcher. The first concept map will be scored as the pretest, and the tenth concept map will be scored as the posttest.

During the final clinical session, the students will complete a questionnaire to evaluate satisfaction with the presentation of concept maps, and use of concept maps as a
learning tool. Students will not provide personal information on the questionnaire, and return the questionnaires to the researcher.

**Methods of Measurement**

Concept maps will be scored using the Concept Map Grading Criteria (Hinck et al., 2006). A maximum of 20 points will be possible for each concept map. The points will be from the following nine criteria (Hinck et al., p. 25):

1. The patient’s main health concern is present (1 point).
2. Two clearly stated nursing diagnoses (NANDA) are present (2 points).
3. Nursing diagnoses are prioritized for the patient (2 points).
4. Subjective and objective data support each nursing diagnosis (2 points).
5. Short- and long-term goals for each diagnosis are behaviorally stated with time frames that are measurable and realistic (4 points).
6. Nursing interventions relate to the nursing diagnosis and are individualized to the patient (2 points).
7. Evaluation addresses if the short- and long-term goals were met. Additionally, indicate if the goal should be continued, deleted, or replaced with another goal (2 points).
8. Teaching was relevant to the nursing diagnosis and realistic (2 points).
9. Cross-links are present (1 point).

The learning and student satisfaction questionnaire will be based on the Student Assessment of Learning Gains Instrument (Seymour, 1997). Based on the Student Assessment of Learning Gains Instrument (Seymour) a 21-item questionnaire was developed consisting of 20 5-point Likert scale items to evaluate amount of learning.
(5=great amount, 4=moderate amount, 3=fair amount, 2=minimal amount, 1=none), and one open-ended question. The questionnaire has been reviewed by three doctorate-prepared investigators for clarity, appropriateness of content, format, and style.

**Research Design**

This study will have a quasi-experimental one-group pretest-posttest design. A quasi-experimental study design can ideally be used in situations where complete control is not possible (Burns & Grove, 2009). This design uses only one treatment group with no comparison group. In this design the pretest scores serve as the control. Possible threats to validity with one-group pretest-posttest design are posttest scores being altered by maturation, administration of the pretest, and changes in instrumentation (Burns & Grove, 2009).

**Intended Method for Data Analysis**

Data analysis will be conducted using SPSS 12.0 (IBM, 2012). Concept map mean scores will be calculated at the beginning and end of the course. A paired samples t-test will be used to compare the mean scores. The mean is the measure of central tendency for a normally distributed population, and the t-test is used to screen two samples for significant differences (Burns & Grove, 2009). The questionnaire will be evaluated by calculating the means and standard deviations of each of the 20 items. The standard deviation is a measure of dispersion of the scores (Burns & Grove, 2009).

The final item on the questionnaire will be analyzed for common themes. This will be accomplished by examining for word repetitions. The repetitions will be reviewed for concepts, similarities, and differences (Ryan & Bernard, 2003).
Summary

This study will evaluate concept mapping as a method to assist nursing students to understand the relationships among the many concepts involved in patient care. Nurses must be able to think critically and quickly in order to provide safe and effective care to patients. Nursing students must learn these skills prior to taking on the nursing role. Concept mapping is an active learning technique that will reinforce life-long learning, a crucial skill for nursing students to develop for a successful career.
References


