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# Meaningful learning development in student nurses: the traditional nursing care plan versus the concept map care plan approach

Deborah Sue Karns

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UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

MEANINGFUL LEARNING DEVELOPMENT IN STUDENT NURSES:  
THE TRADITIONAL NURSING CARE PLAN VERSUS  
THE CONCEPT MAP CARE PLAN APPROACH

A Dissertation Submitted in Partial Fulfillment  
of the Requirements for the Degree of  
Doctor of Philosophy

Deborah Sue Karns

College of Natural and Health Sciences  
School of Nursing  
Nursing Education

May, 2010

This Dissertation by: Deborah Sue Karns

Entitled: *Meaningful Learning Development in Student Nurses: The Traditional Nursing Care Plan Versus the Concept Map Care Plan Approach*

has been approved as meeting the requirements for the Degree of Doctor of Philosophy in College of Natural and Health Sciences in School of Nursing, Program of Nursing Education

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## ABSTRACT

Karns, Deborah Sue. *Meaningful Learning Development in Student Nurses: The Traditional Nursing Care Plan Versus the Concept Map Care Plan Approach*. Published Doctor of Philosophy dissertation, University of Northern Colorado, 2010.

Nurse educators have an important responsibility to prepare students for safe nursing practice. The National League for Nursing advocates the use of innovative, active learning strategies in the educational environment that offer meaningful learning opportunities for students. However, controversy exists related to the effectiveness of the traditional nursing care plan in promoting the development of meaningful learning, and clinical judgment in students. The purpose of this quasi-experimental study was to determine if there was a significant difference in meaningful learning development between baccalaureate nursing students who plan nursing care using a traditional nursing care plan compared to those who plan care using a concept map care plan.

The revised two-factor Study Process Questionnaire that measures the deep approach or meaningful learning, and the surface approach or rote learning was administered in a pre-test/post-test design. The control group participants used a traditional nursing care plan, and the treatment group participants used a concept map care plan in the clinical setting with both groups completing four of the assigned care plans during the quarter. Findings revealed that both care plan groups primarily used the deep approach to learning that demonstrated an intention to understand and achieve

competency of the information. The concept map care plan group scores for meaningful learning increased, and the traditional nursing care plan group scores for meaningful learning decreased. Secondly, both groups used a surface approach to learning that demonstrated the intention of memorizing essential, targeted information for the purpose of reproducing the information, for instance, on an examination. Both groups' surface approach scores increased, demonstrating more of an intention to do only what was minimally required by the end of the quarter.

There was a statistically significant difference between groups related to the effectiveness of the care plan preparation, level of satisfaction with the care plan process, and recommendation for use in the future. The data support the importance of ensuring effective preparation for the care plan method being used.

Data in this study provided insufficient evidence regarding whether the traditional nursing care plan or concept map care plan contributed more to the development of meaningful learning.

## DEDICATION

This manuscript is dedicated to my family who has provided support and encouragement throughout my numerous years of education, culminating in the completion of this doctoral research study, and education. Your love, laughter, and understanding have been an incredible source of strength for me to accomplish my goals. I would like to acknowledge my closest family members:

Erick J. Karns

Albert and Sydney Gubala

Mark, Nancy, Hannah, and Rachel Gubala, and Pauline Thiel

Mady Karns

Mark, Janet, Graeme, and Hannah Beeley

Mark Karns, Johanna Kool, and Mark Karns

To my family, friends, colleagues, and students:

My hope is that my success will motivate, and inspire you to achieve your dreams.

Learn, laugh, and live life to the fullest!

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## CHAPTER I

### INTRODUCTION

The goal of nursing education is to prepare students for safe clinical nursing practice. In order to be safe practitioners and care for individuals with complex health care needs, students must have a well-developed knowledge base, the ability to think critically, be able to use sound clinical reasoning and judgment, and have efficient and accurate problem solving and decision-making skills in the care they provide. Nurse educators can facilitate the development and application of these skills through the use of active learning strategies in the classroom and clinical setting that support this professional growth and offer opportunities for meaningful learning (Bradshaw, 2004).

Nurses provide care for diverse individuals and groups with unique healthcare needs and therefore need to plan nursing care that addresses those needs in a holistic, individualized manner. Nurses use the nursing process to systematically collect and scientifically analyze the client's unique data to identify nursing problems or diagnoses, plan and implement nursing interventions, and evaluate the client's responses to those nursing interventions (Koehler, 2004). The nursing plan of care can be revised based on the client's responses and as new data is assessed and analyzed. Nurses draw from their theoretical and scientific body of knowledge to set priorities, make decisions, and implement care that is based on scientific evidence. Nurse educators are responsible for

teaching student nurses how to develop and apply the nursing process in a variety of healthcare or community settings with the goal of optimizing client outcomes.

Nurse educators have traditionally taught students the nursing process through the use of a nursing care plan that uses a linear columnar format. Ignatavicius (2004) has posited that this style of care planning “may not foster critical thinking.... [and] may not be individualized to the assigned client” (p. 207) as many students draw information directly from a care plan book without relating it to the client’s specific needs. Also, these care plans are often completed retrospectively. Some argue that care plans are obsolete in nursing practice and that thorough, accurate documentation reflects the nursing process better than a document that requires continuous manual updating that lends little to effective nursing practice (LaDuke, 2008). Yet there is still an important role in nursing education for nursing care plans, as these are the basis for students learning how to think like a nurse. More exploration of this issue is needed to determine if there are more innovative ways to learn the nursing process, build on nursing knowledge in a meaningful manner, and apply important theoretical principles in the clinical setting (Koehler, 2004).

Traditionally, nursing education has been based on a behaviorism model that has not been conducive to advancing education practices (Bevis & Watson, 1989). It has been teacher-and teaching-centered, using primarily lecture, rote memorization, and multiple-choice questions as teaching strategies. This type of model is not exclusive to nursing education curriculums, but has dominated the American higher education system for decades. The end result has been students memorizing information short-term and not

actively integrating new information into their knowledge base (Bevis & Watson, 1989; Richardson, 2005).

The National League for Nursing instituted accreditation criteria in 1990 requiring nursing programs to demonstrate the development of student critical thinking skills consisting of “analysis, reasoning, decision making, and independent judgment” (Richardson, 2005, p. 32). Nurse educators need to implement teaching and learning practices that are supported by research evidence if students are to achieve a high level of critical thinking and be prepared to provide nursing care in the 21<sup>st</sup> century. Active learning strategies have been identified as facilitating the development of critical thinking, clinical reasoning, problem solving, and decision making in nursing students who, in turn, can more readily apply that knowledge in the clinical setting (Alfaro-LeFevre, 2009). An active learning strategy is one in which the student learns by actively participating in the learning process and thinking about what he/she is doing.

An innovative tool that can provide a meaningful learning experience for students by acknowledging and building on prior knowledge, and making connections of important client care concerns is a concept map (Irvine, 1995). A concept map is an active, “visual learning tool which requires the student to organize information in a way distinctive to the learner and representing the learner’s unique understanding of the content” (Caputi & Blach, 2008, p. 6). The concept mapping process used in planning care for a client requires students to use critical thinking skills, assess, organize, and analyze relevant client data, identify interrelationships between data elements, and build upon their previous knowledge to develop a plan of nursing care uniquely addressing the client’s needs (Caputi & Blach).



Early educational psychologists and researchers began to study the process of learning and the use of concept mapping in various educational settings. Ausubel, Novak, and Hanesian (1978) studied meaningful receptive learning in the early 1960's that emphasized the importance of relating potentially meaningful information to what the learner already knows in a nonarbitrary and substantive way. In fact, Ausubel et al. believed this could be "the most important thing influencing learning" (p. 352).

Novak and Gowin (1984) originally conceived and studied concept mapping from which they developed a theory of meaningful learning in which the visual depiction was found to be effective in showing complex ideas and making important connections between the elements. Hay and Kinchin (2008), over the last decade, have used Novak and Gowin's conceptual mapping method to study more than 1000 individuals and have assessed more than 3000 concept maps of university students from various programs of study including nursing as well as individuals working in the business world. They concluded that concept maps provide a way of observing and measuring direct changes in learning quality.

Novak (1998) claimed, "that *the central purpose of education is to empower learners to take charge of their own meaning making*" (p. 9, italics in original). The most successful education needs to focus on all aspects of learning, "acquisition of knowledge (cognitive learning), change in emotions or feelings (affective learning), and gain in physical or motor actions or performance (psychomotor learning) that enhance a person's capacity to make sense out of their experiences" (p. 9). The elements of learner, teacher, knowledge, evaluation, and context interact to bring about a meaningful learning experience. These ideals have lead Novak to develop his theory of education:

“Meaningful learning underlies the constructive integration of thinking, feeling, and acting leading to empowerment for commitment and responsibility” (p. 15).

Bevis and Watson’s (1989) *Human Caring Theory: Educative Caring Curriculum* that moves nursing education toward advances in new pedagogies, informs this study. Watson (1989) has advocated for innovative “curriculum development that is philosophically and morally consistent with phenomena and practices of human caring in nursing’s clinical world” (p. 53). In the educational setting, teaching and learning are viewed as reciprocal human processes between educator and student resulting in a partnership toward learning together. The educator and student both bring their unique perspectives, knowledge, and experiences to the interaction that further enriches and supports the learning environment. “Teachers must make deliberate attempts, through learning activities and teacher-student interactions, to move the students into ways of knowing that are most useful to students and helpful in furthering their ability to respond caringly and effectively to client needs” (Bevis, 1989b, p. 185).

This research study was built upon the work of these key theorists/researchers. This study differed from previous studies in that the focus was investigating if there was a difference in meaningful learning development between nursing students who use a concept map care plan versus those who use a traditional nursing care plan. This provided a different context of application in a setting that mandates relevant, holistic care. The educator facilitates and optimizes the learning experience for the student to further integrate new nursing knowledge into prior learning. Providing opportunities for meaningful learning to occur is essential in the education of nursing students, who need a strong basis of knowledge as they prepare for their licensure examination and move into

nursing practice (NLN Board of Governors, 2003). The visual diagram of the concept mapping process allows the learner to build on previous learning, extend his/her learning, and link important concepts in developing holistic, individualized plans of care.

### Statement of the Problem

Nurse educators have an important responsibility to prepare students for safe nursing practice. They must use effective teaching and learning strategies that will strengthen the student's theoretical knowledge base of nursing care and link those principles to clinical practice. Controversy exists with the effectiveness of the traditional nursing care plan in promoting the development of critical thinking and clinical judgment needed to care for clients complex health needs (Ignatavicius, 2004). The National League for Nursing and experienced nurse educators have identified a need to incorporate innovative, active teaching and learning strategies into nursing education that facilitate meaningful learning opportunities for students. The purpose of this quasi-experimental study was to determine if there is a significant difference in meaningful learning development between students who plan nursing care using a traditional nursing care plan and students who plan nursing care using a concept map care plan.

### Research Question

Is there a significant difference in meaningful learning development between baccalaureate nursing students who plan nursing care using a traditional nursing care plan compared to baccalaureate nursing students who plan nursing care using a concept map care plan?

### Conceptual Definitions

Nursing Process: The cognitive process used by nurses to address the client's needs in order to provide preventive, supportive, restorative, or rehabilitative care that

addresses the client's needs. It entails assessing subjective and objective client data on an ongoing basis, analyzing and identifying nursing diagnoses, identifying outcome criteria, planning and implementing nursing interventions, and evaluating the client's response to the interventions (American Nurses Association, 2003).

Traditional Nursing Care Plan: The traditional nursing care plan is a linear columnar document of the nursing process. It is used by many nursing education programs and often formatted to fit the nursing theorist(s) on which the program bases their curriculum. The students complete a history and physical assessment, identify the most important nursing diagnosis, and develop a plan of nursing care for the client (Schuster, 2000).

Concept Map Nursing Care Plan: A visual diagram of the nursing process that depicts the student's current understanding of the major concepts relevant to providing nursing care to the individual and how those elements relate or are connected. A concept map consists of major concepts linked with propositions that show the nature of the connection or relationship between concepts, and cross links that connect concepts across hierarchical branches, that directly reflect the student's knowledge and understanding of information relevant to providing safe care for the client (Baugh & Mellott, 1998).

Pre-Clinical Concept Map: The concept map developed by the student in preparation for the clinical experience that visually displays and integrates prior nursing knowledge, elements of data they collected from the client, the client's medical record, and the textbook references they used to be able to safely plan care for the client. The student reports to the clinical setting with the pre-clinical concept map care plan before any influences of the structured clinical experience begins (Baugh & Mellott, 1998).

Post-Clinical Concept Map: The concept map revised, and updated by the student after clinical discussions with faculty and other registered nurses, the clinical experience itself that entails interacting with the client and providing nursing care, pre/post-conference discussions with peers and faculty, and reflection on the learning experience (Baugh & Mellott, 1998).

Meaningful Learning: A student's cognitive structure is "changed through purposeful and deliberate integration of new knowledge among the prior-knowledge structure" (Hay & Kinchin, 2008, p. 174). The educational literature has used the term meaningful learning for over thirty years to depict the goal of the learning process. Novak (1998) has defined meaningful learning as containing the following traits:

1. Relevant prior knowledge: The learner must know some information that relates to the new information to be learned in some nontrivial way.
2. Meaningful material: The knowledge to be learned must be relevant to other knowledge and must contain significant concepts and propositions.
3. The learner must choose to learn meaningfully: The learner must consciously and deliberately choose to relate new knowledge to knowledge the learner already knows in some nontrivial way. (p. 19)

Deep Approach: Essentially, deep approach is the same as meaningful learning. "Meaningful (or deep) learning occurred where new and old material were combined to make new meanings" (Hay, Kinchin, & Lygo-Baker, 2008, p. 300). The student seeks to understand the underlying meaning linked to prior learning and relates it to make a complete whole (Marton & Saljo, 1976).

Surface Approach: Essentially, surface approach is the same as rote learning.

“Rote (or surface) learning was observed where the new material was added superficially without integration” (Hay, et al., 2008, p. 300). The student seeks to memorize what he/she thinks to be essential information necessary to succeed on an exam and fails to link it to prior learning (Marton & Saljo, 1976).

Deep Motive: Students are intrinsically motivated and approach learning with the intention of achieving a level of competency of the information (Kember, Jamieson, Pomfret, & Wong, 1995).

Deep Strategy: Students relate new knowledge with previously learned, relevant knowledge. Approach to learning is meaningful with the intent to understand and read widely to achieve this level (Kember et al., 1995).

Surface Motive: Students intend to meet the minimal requirements for their classes. It is instrumental in maintaining “a balance between working too hard and failing” (Kember et al., 1995, p. 333).

Surface Strategy: Students approach learning through memorization with the intention of reproducing limited target information (Kember et al., 1995).

Assimilation: Taking a new idea and linking it with prior knowledge in a way that both the new and anchoring ideas are modified to form an interactional product of meaningful learning. It facilitates acquisition, retention, and organization of knowledge in a cognitive structure (Ausubel et al., 1978).

Subsumptive Learning: The “process of linking new information to preexisting segments of cognitive structure” (Ausubel et al., 1978, p. 58).

Superordinate Learning: “Takes place in the course of inductive reasoning or when presented material is organized inductively or involves the synthesis of component ideas” (Ausubel et al., 1978, p. 59).

Combinatorial Learning: The learning that falls outside the subsumptive and superordinate areas of learning because it is “not relatable to *particular* relevant ideas within cognitive structure” (p. 59) making it more difficult to learn and retain (Ausubel et al., 1978).

Progressive Differentiation: “The process of sequential assimilation of new meanings...of concepts or propositions with the consequent refinement of meanings and an enhanced potential for providing anchorage for further meaningful learning” (Ausubel et al., 1978, p. 127).

Integrative Reconciliation: “New information is acquired *and* existing elements of cognitive structure may take on new organization and hence new meaning” (Ausubel et al., 1978, p. 124). This is facilitated when new ideas or concepts are clearly presented, and conflicts and inconsistencies between information are resolved.

### Proposed Model

The proposed model appears in Figure 1. The relevant theories, concepts, and outcomes related to how concept map care plans facilitate the development of meaningful learning are represented in the model.

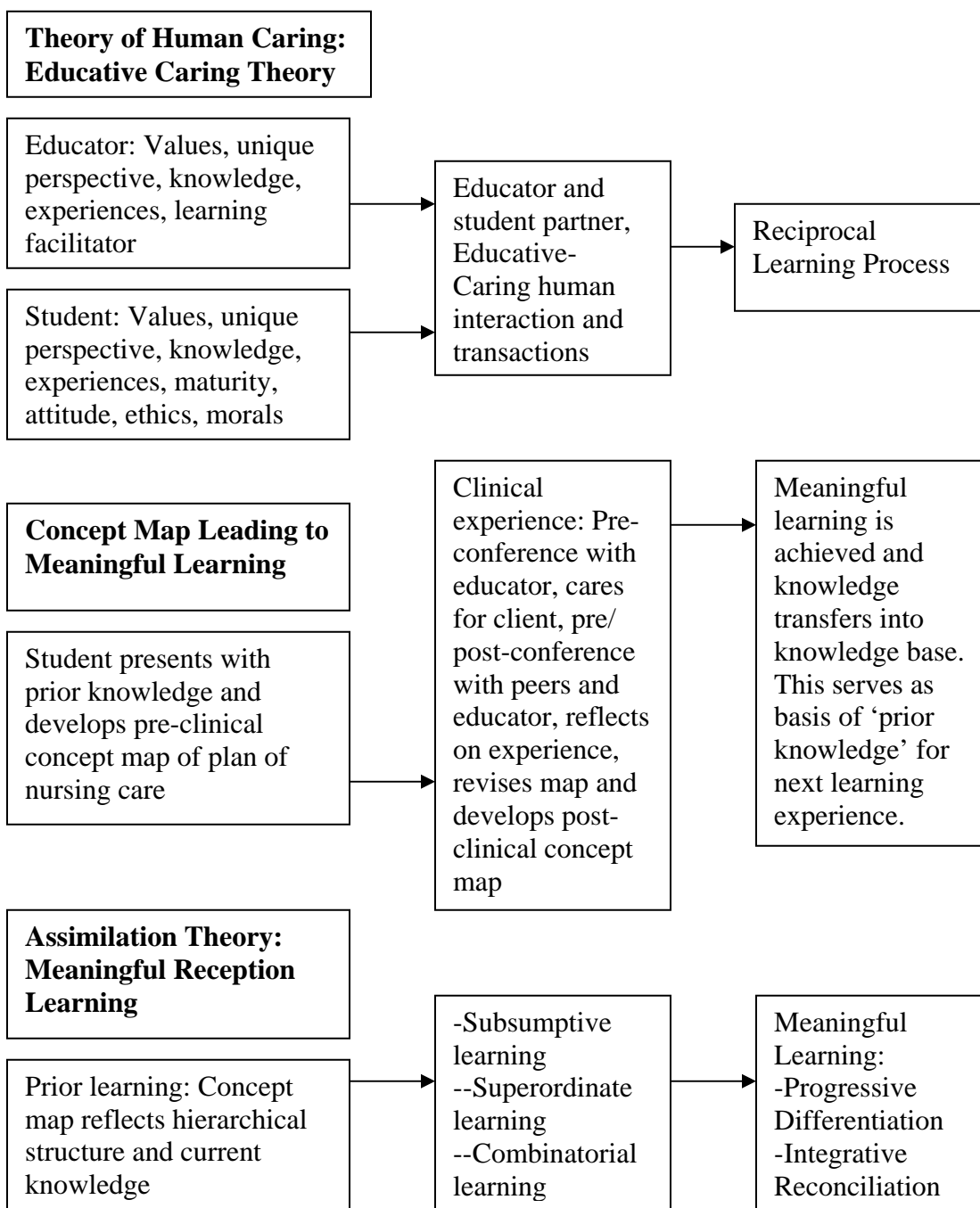


Figure 1. Proposed Model



## Research Hypothesis

The null hypothesis is:

There is no difference in meaningful learning development between baccalaureate nursing students who plan nursing care using a traditional nursing care plan compared to baccalaureate nursing students who plan nursing care using a concept map care plan.

## Significance of the Study

Determining if meaningful learning takes place by using either a traditional nursing care plan or a concept map to plan nursing care would be important in clarifying the effectiveness of learning strategies used in nursing education. This information will help educators determine which strategies facilitate more meaningful learning for nursing students in the clinical setting. This could lead students to attain an improved knowledge base and level of understanding of the principles of nursing care and may effectively improve client outcomes. Nurse educators want to make the most of clinical learning experiences. An effective written assignment that promotes meaningful learning, organizes data, and enhances the student's understanding complements the experience (Stokes & Kost, 2005).

The National League for Nursing Board of Governors (2003) has called for curriculum reform and mandated that nurse educators use innovative, research-based teaching and learning activities that prepare students for safe clinical practice. They also recommend that more pedagogical research be conducted related to these innovations. Studying the development of meaningful learning by planning nursing care using a concept map versus traditional care plan supports these recommendations and will add to the pedagogy of nursing education. Nurse educators may be more willing to implement innovative learning strategies that they know support meaningful student learning.

Nursing education consists of theoretical knowledge and nursing science principles that are applied in a nursing context to address a client's unique health care needs in a variety of settings. The education needs to be relevant, current, and based on effective teaching and learning practices.

As graduates enter nursing practice they need to be prepared to care for individuals with complex health care needs. This requires a solid knowledge base of nursing science and the ability to plan, coordinate, and provide nursing care. The healthcare setting requires nurses who can think through complex health care situations, problem solve, and make decisions that facilitate optimal client outcomes. The student who has experience assessing data and linking all the relevant pieces to better understand the client's clinical situation will be better able to meet that professional practice requirement. The concept map used to plan nursing care may offer that possibility and help connect theory to practice (Daley, 1996).

There have been several research studies (August-Brady, 2005; Daley, Shaw, Balistreri, Glasenapp, & Piacentine, 1999; Hay & Kinchin, 2008; Novak & Gowin, 1984; Wheeler & Collins, 2003) in the nursing and educational literature describing the effects of concept mapping in the learning process. There have been many scholarly articles and books written that provide positive anecdotal accounts of the contributions concept maps make toward learning. Some have had inconsistent findings, particularly in the area of developing critical thinking. Conducting a study related to determining if there is a difference in developing meaningful learning by planning nursing care using a concept map compared to planning nursing care using a traditional care plan will build on learning theory in a nursing context. Also, it will help to inform nursing theory,

specifically the Theory of Human Caring: Educative-Caring Curriculum developed by Bevis and Watson (1989), which supports the principle of student-centered learning by encouraging students to construct and create knowledge and actively participate in the learning process.

### Summary

Nurse educators need to use learning activities that are supported by empirical evidence to create meaningful learning experiences for students. Students need to be engaged in the learning process to develop their thinking and knowledge base related to safe nursing care practices. Using concept maps to plan nursing care may be useful in developing meaningful learning in students. Clinical nursing practice provides opportunities for students to apply the theoretical and scientific nursing principles learned in the classroom setting. Clinical experiences offer unique, real-life situations for students to apply critical thinking, clinical-reasoning, problem-solving and decision-making skills in the care of individuals. This chapter has presented an introductory discussion of using concept maps to plan nursing care and the theoretical principles that support the use of concept maps. The following chapter will provide a thorough discussion of the literature related to this proposed research study.

## CHAPTER II

### REVIEW OF THE LITERATURE

Student nurses need a solid knowledge base to be able to accurately assess their client's needs, analyze the data, identify nursing problems, plan and implement appropriate nursing care, and evaluate the effectiveness of that care. Throughout their program of study, students are exposed to large quantities of information. As each course builds on the previous courses, students need effective methods of learning information in a meaningful manner so it will be available to them for future thinking, reasoning, and clinical decision-making. Using concept mapping to plan nursing care may be an effective strategy to allow for the development of meaningful learning. A review of the literature will begin with a discussion of the theoretical frameworks that have guided the development of this study which are Ausubel's (Ausubel et al., 1978) Assimilation Theory: Meaningful Reception Learning and Bevis and Watson's (1989) Theory of Human Caring: Educative Caring Curriculum. The next section is a critique and synthesis of the educational and nursing literature related to the topics of traditional nursing care planning, concept mapping to plan nursing care, and meaningful learning.

The literature search included the key words: meaningful learning, learning, active learning, learning in nursing, critical thinking, clinical judgment, concept mapping, nursing, concept map care plans, mind map care plans, traditional nursing care plans, nursing care plans, and nursing process. The primary electronic databases used in the

search were: Cumulative Index to Nursing and Applied Health Literature (CINAHL), EBSCOhost, Academic Research Premier, PsychINFO, Mental Measurements Yearbook, ProQuest Dissertations, and Educational Resources Information Center (ERIC).

References frequently cited in relevant articles were collected and reviewed, as well as, works by the key expert authors who developed the founding theoretical framework of meaningful learning and concept mapping.

### Theoretical Frameworks

#### *Learning Theory*

The educational psychology learning theory used as a supporting theory for this study was Ausubel's Assimilation Theory conceived in 1963, expanded in 1968, and now modified by Ausubel, Novak, and Hanesian in 1978. The theory emphasizes the concepts of subsumption that leads to progressive differentiation, and superordinate and combinatorial learning that leads to integrative reconciliation. Every student presents with prior knowledge related to their values/perceptions, education, and life experiences. The term subsumption is used to describe the "process of linking new information to preexisting segments of cognitive structure" (Ausubel et al., 1978, p. 58). Progressive differentiation is taking those concepts and propositions of the new meanings and progressing from the most general to a level of desired detail creating an organizational framework that will facilitate learning of future information. Superordinate learning occurs through a synthesis of established ideas. For example, if the learner has an established cognitive structure already present the new information is learned and previous information takes a subsumed position. Combinatorial learning occurs when the new idea is not relatable in a specific sense to an existing anchor, but to more generally

relevant content. This makes the information more difficult to learn and retain, however, once learned it can become a stable part of the cognitive structure. As new information is acquired through superordinate or combinatorial learning processes and is reorganized and assigned new meaning in an existing cognitive structure, it is called integrative reconciliation (Ausubel et al.).

“Meaningful learning in humans occurs through an *interaction* of new information with relevant existing ideas in cognitive structure” (Ausubel et al., 1978, p. 67, italics in original). This interaction “is an assimilation of old and new meanings to form a more highly differentiated cognitive structure” (Ausubel et al., pp. 67-68). This structure is a concept or proposition that helps anchor the concept, allowing for better retention and recall for learning and problem solving in the future.

Ausubel et al. (1978) promoted *educational* programs as opposed to *training* programs that acknowledge the importance of the student’s previous learning in making connections to new learning opportunities. To support this learning principle, Novak and Gowin (1984) devised the concept map in which individuals develop their own visual diagram of their current level of understanding with concepts linked in propositions that state the relationship between the concepts. As learning occurs, new concepts and proposition links can be added to represent the expanded level of understanding the individual has gained. The process of reflective thinking that goes into the development and revision of the concept map is a powerful tool that allows the student to practice and strengthen their thinking about the topic of interest. Also, the concept map brings awareness to misconceptions that may be present so meanings can be discussed,

negotiated, and clarified with the educator. Concept maps can be used to evaluate higher order thinking that is visually presented in a concept map format.

### *Nursing Theory*

In Watson's Theory of Human Caring (Bevis & Watson, 1989), the key feature of the Educative-Caring Curriculum "is that *curriculum is the interactions and transactions that occur between and among students and teachers with the intent that learning occur*" (p. 5). It is important to make interactions meaningful and intellectually stimulating to foster the development of creative and critical thinking. The educative-caring curriculum is designed to use active learning strategies that require the student to become engaged in the learning process. The learning environment supports the partnering of the teacher and student, although it encourages the student to be responsible for his or her own learning as the teacher is there for active facilitation. Teachers need to be aware that this change in dynamic and responsibility may cause a grief reaction in the student over the loss of passive learning opportunities. The more quickly the teacher acknowledges and is accepting of this grief response by the student, the quicker it can be resolved allowing the student to move into a more mature learning level. The teacher and student can work together to develop meaningful ways of knowing as they reflect on their individual and shared learning experiences. "Liberating teacher-student interactions are necessary to support educative learning" (Bevis, 1989a, p. 80).

Following the Theory of Human Caring: Educative Caring Curriculum allows for a liberating curriculum that supports caring, and engages students in holistic, educative-caring development. This theoretical framework acknowledges that nursing education and the teaching-learning process is based on the same human caring principles used in

clinical practice. These caring elements are integrated into the cognitive learning processes between the teacher and student. This liberating environment and transactions between teacher and student help move the student along the continuum of maturity toward the reciprocating level. Within this level there is an active exchange of ideas and dialogue between the teacher and student related to the insights, challenges, and issues related to the client. There is open communication and mutual respect as the pair challenges each other, learns together, and expands the thinking required to resolve issues or advance the thinking processes (Bevis, 1989a).

Within the Educative Caring Curriculum the concept map is supported based on several important features. When students plan nursing care for the client using a concept map it allows for them to visually depict their current understanding of the situation. Using the concept map the student can explain her/his thinking, and share and gain insights during the interaction with the teacher. The concept map facilitates a deeper, more meaningful transaction between the teacher and student. As the student identifies and understands the connections made and sees the whole picture, she/he can begin to plan and provide nursing care according to the client's unique needs (Bevis, 1989a).

There are various learning typologies that fall along a continuum of having either training (item, directive, and rationale) or education (contextual, syntactical, and inquiry) qualities. The rationale (training) learning typology is commonly used in the traditional care planning process and is useful in understanding the theories and rationale behind nursing interventions and how they are applied to practice. Using a concept map to plan nursing care expands upon this process and focuses on meaningful wholes, insights and interpretations to individualize the plan of care to support the syntactical (education)



learning typology. This advancement in thinking begins to bring in elements of the contextual (education) learning typology that is a cultural framework and the essence of nursing. “It is the aspects of learning nursing that help one become a person who thinks and feels like a nurse” (Bevis, 1989a, p. 93). This process helps the student to develop his/her attitudes, values, ethics, and morals about nursing, and “to perceive of nursing as a human science in ways that influence nurses’ transactions with clients and with colleagues so that these transactions are caring, compassionate, and positive” (Bevis, p. 93). These learning typologies are useful in examining various learning activities and identifying whether they support a training or educative learning process. Rationale learning falls in the training category, and contextual and syntactical learning fall in the educative category that tends to offer a more professional level of cognitive development (Bevis).

The process that directs the learning activity helps the student to take responsibility for her/his own learning and initiate ways of seeking new solutions, engage in critical thinking, and determine when ongoing inquiry and discovery of information is necessary. “Thinking becomes the road to learning” (Bevis, 1989b, p. 172) and sets the stage for life-long learning and inquisitiveness. The confidence that is developed through this process facilitates student’s motivation, reflection and critical thinking in the learning process. Concept mapping the plan of nursing care builds on the premise of previous learning and promotes independent thinking processes with the intention of creating a meaningful learning experience. This intention and meaningful learning is achieved when the learning activities are deliberately designed and the teacher-student interactions are implemented to promote an educative learning environment.

For learning to be successful, Bevis (1989c) believed that three aspects must be present: information, operation, and validation. Information refers to the data related to the learning experience or activity, operation refers to the active involvement of the students in the learning episode, and validation refers to the students testing or realizing what they can do. The concept mapping process supports all three of these learning aspects. The students must be actively engaged in the mapping by assessing pertinent data, organizing it, and making valid connections that represent their level of knowledge. Students can create a visual diagram of their understanding, and confirm, clarify, and extend their thinking when they interact with their teacher as they explain their thinking as depicted on the concept map. This is an experience directly dealing with a real situation in which the safe care of the client is at stake and takes on a genuine importance and responsibility for the student. When the student is able to provide logical thinking about her/his client and prioritize the client's needs her/his understanding is validated and provides the basis from which future understanding can be built. Not all learning episodes offer a complete learning experience. The use of concept maps used to plan nursing care during a clinical experience would qualify as using all three learning components (Bevis).

The Theory of Human Caring: Educative-Caring Curriculum and the Assimilation Theory of Meaningful Reception Learning both support the use of concept mapping as a learning activity to plan nursing care that may promote the development of meaningful learning in nursing students. The concept map allows for active engagement of the learner in the collection of relevant data, the analysis, and the creation of a map that displays understanding about the client's information as well as the important connections among the concepts. This mapping can provide the basis of interaction and

transaction between the teacher and student and allow for the pair to enrich their understanding and learn together in a caring educative environment.

### Nursing Literature on Traditional Nursing Care Plans

The American Nurses Association (2003) defines nursing as “the protection, promotion, and optimization of health and abilities, prevention of illness and injury, alleviation of suffering through the diagnosis and treatment of human response, and advocacy in the care of individuals, families, communities, and populations” (p. 6). This definition has guided the basis of nursing care and introduced the nursing process, within the nursing care plan, as the vehicle to systematically assess, analyze, plan, implement, and evaluate the individual’s responses to the care provided.

In nursing education, the traditional nursing care plan has been a tool for providing written documentation of the nursing process initially introduced to improve the quality of nursing care (Anonymous, 2007). The nursing process has consisted of students conducting an assessment, analyzing subjective and objective data, developing a priority nursing diagnosis, identifying measurable outcomes for the client, planning nursing interventions to be implemented based on scientific rationale, and evaluating the client’s responses in a columnar format (Schuster, 2000). It is time consuming, and often completed after the clinical day, rather than ideally developed and used throughout the clinical day. Standardized care plans are now used on many nursing units and are available in textbooks. Emphasis needs to be focused on making the plan of care individual to the client’s needs (Schuster).

Nursing care plans were initially believed to facilitate the development of analytical thinking, and assist with “individualizing patient care, promoting the art of

nursing, and developing problem solving skills” (Anonymous, 2007, p. 6). A group of anonymous researchers surveyed 100 students in India from a general and baccalaureate-nursing program about their attitudes of the nursing process and its influence on providing quality care. The findings revealed 52% had a highly positive attitude and 4% had a negative attitude toward nursing process in providing quality nursing care, with more general nursing students, more 19-year-old nursing students, and more female nursing students having a positive attitude. Eighty percent of the “students agree[d] that nursing process uniquely defines the practice of nursing” (p. 7).

Tanner (2006) had identified that the term clinical judgment has been used more recently to describe the nursing process model of practice. She identified the nursing process as just one way students could be taught to problem-solve systematically, however, the nursing process may not take into consideration the complexities of clinical judgment necessary for nursing. Tanner had reviewed nearly 200 studies in the literature and developed a model of clinical judgment. The model is based on four components, the first being ‘Noticing’ in which the nurses’ expectations, knowledge, experience, and values are brought to the situation. The next steps are ‘Interpreting’ and ‘Responding’ where the nurse uses the reasoning patterns of analytic processes, intuition, and narrative thinking to interpret the data, decide on a course of action, and evaluate the client’s response to the intervention. The final step is ‘Reflection’ where the nurse uses reflection-in-action to determine how well he/she is able to evaluate the client’s response in relation to the expected outcomes and uses reflection-on-action to subsequently catalog what was learned and how it may be applied to clinical judgments in the future (Tanner).

Twycross and Powls (2006) conducted a research study in London to evaluate how nurses make clinical decisions in the care of children using the think aloud technique. Twelve registered nurses were given three scenarios and asked to verbalize their thinking process throughout each clinical situation. The findings revealed that all nurses in the study used the analytical thinking pattern despite their level of experience, which was identified as a 'backward reasoning strategy' thought to be used typically in novice nurses rather than 'forward thinking' which is used in expert decision-making processes. The conclusion that nurses used analytical thinking and backward reasoning processes came from the fact that nurses collected data by observing the patient, communicated with the patient or other team members, and reviewed data from the medical and medication records before planning and implementing care. This description is similar to the nursing process, suggesting that nurse educators are using an approach that teaches students to learn through a backward reasoning process rather than "using forward reasoning [where] an individual decides on a course of action and then collects information to prove or disprove this action" (p. 1327).

Orlando's (1961) Theory of the Deliberative Nursing Process supports the process of nurses exploring patient data in all forms to more accurately determine how the patient is being affected by the issue of concern before making a decision, setting a plan, and taking action to intervene on the patient's behalf. Orlando posited that a deliberative process was necessary to conduct effective nursing practice, whereas, an automatic process was determined to be an ineffective nursing practice. Lunney (2006) also identified the importance of accurately interpreting data following a thorough assessment in order to take appropriate actions.

Michalopoulos and Michalopoulos (2006) evaluated teamwork and nursing process in relation to motivation and job satisfaction. They evaluated whether the factors in Herzberg's Motivation Theory were present in Orlando's Theory of the Deliberative Nursing Process. The seven factors present in the motivation theory that contribute to job satisfaction are "removing control, increasing accountability, creating teams, providing feedback, introducing new tasks, giving out special assignments, and assigning additional authority" (p. 54). The researchers concluded that within each step of the nursing process, assessment, diagnosis, planning, implementation, and evaluation lay the factors that motivate nurses toward a higher level of job satisfaction in the context of team nursing.

Kern, Bush, and McCleish (2006) implemented mind-mapped care plans after realizing that over the years the complexity of nurses thinking and reasoning had increased within the profession. They identified that "the linear thinking encouraged by the nursing care plan no longer accurately depicted the thinking required for the complex needs of nursing and patient care" (p. 112). They were also confronted with students copying directly from care plan books rather than individualizing plans to meet the patient's needs, and they wanted a more holistic view of the patient's care needs.

Lunney (2006) brought in another important aspect of nursing and nursing care plans as we move toward advances in technology and the electronic health record. This new technology will require a standardized nursing language that students will need to understand as they document electronically. The American Nurses Association has approved the North American Nursing Diagnosis Association (NANDA), Nursing Outcomes Classification (NOC), and Nursing Interventions Classification (NIC) terminology as the standardized language for the electronic health record. This language

differs from traditional nursing process, and will require additional education for improved intellectual, interpersonal, and technical competency. It demands accurate nursing diagnosis so appropriate patient outcomes and nursing interventions can be determined. Lunney suggested this standardization would facilitate interpretation of large amounts of patient data leading to accurate diagnosis, make nursing care visible, and enable tracking of quality care indicators. This may support the initiation of nursing care being paid for rather than included in the 'bed and board.'

There is evidence that the nursing process used in the development of the traditional care plan is still widely used in the nursing profession to reason through acute care situations as well as to solve community problems. Funkesson, Anbacken, and Ek (2007) documented clinical reasoning used in planning care for patients that focused on pressure ulcer prevention. Through the 'think aloud' process they determined that nurses applied the nursing process in a fluid manner and did not necessarily progress in a linear fashion from one step to another. This may have led to a less efficient manner of thinking, difficulty in documentation, and may contribute to the problem of accepting evidence-based information into their thinking and reasoning processes. Although, Funkesson et al. found that the reasoning processes of nurses were influenced by the nurses' knowledge and experiences, and were more efficient when they were directly involved with patient care, and knew the patient for a longer length of time.

Hoyt (2007) documented the Problem Solving for Better Health Nursing model used throughout the world to "define the problem...prioritize the problem...define a solution...create an action plan...[and] take action to implement the project" (p. 101). This process has improved the confidence of participants and strengthened the leadership

for the programs, which in turn has improved the quality of the services offered, and improved the quality of life for those individuals involved. This model has been effective in focusing the efforts towards those projects that are most needed and has contributed to the sustainability of the programs implemented.

#### Nursing and Educational Literature on Concept Maps

Concept maps have a long history of use in the educational and psychological literature, but more recently have been introduced into nursing education. Concept maps are a learning tool that can be implemented in the classroom as well as the clinical area and can be used with different levels of students and different courses of study. The following describes the studies conducted in the nursing and educational literature.

Daley (1996) conducted a qualitative, interpretivist study with six first year associate degree students to determine how they applied theoretical information to clinical nursing practice. Daley based her study on meaningful learning by Novak (1998), and the assimilation theory of Ausubel et al. (1978) that described how new learning is related to concepts of previous learning. Daley conducted structured interviews with six randomly selected students from a clinical group of ten students. The students were asked the same questions and each interview lasted 20-35 minutes. The instructor was also interviewed and asked the same questions as the students. The researcher developed a concept map of the course concepts identified during the interview with the instructor and another map from the course syllabus, plus a concept map of each of the six student interviews. She confirmed the accuracy of the maps by conferring with the instructor and students and did change one item on a student's map.



Instructors' and students' concept maps indicated differences in the areas of assessment parameters, nursing process, clinical preparation, and basic sciences. Students did not adequately differentiate first and second level client assessment data and did not conduct a systematic meaningful assessment. Most data were identified as separate elements and not linked together. Assessment components were not linked to the nursing process and connections between the elements of the nursing process were not made. Students demonstrated poor development of their thinking related to planning and evaluation. The data indicated that the students had not associated their course content with clinical preparation and saw the two entities of course work studies and clinical practice as separate. Also, there was little connection of basic science information to their clinical experience, although this group was just beginning their anatomy and physiology course (Daley, 1996).

The researcher noted that concept mapping had great potential for facilitating the bridge between theory and practice. Through concept mapping, the instructor could identify gaps in the student's understanding and clarify or correct any misconceptions. Concept mapping could be used to assess the student's knowledge and assimilation of new knowledge into practice in a meaningful way rather than through rote memorization as one student stated she attempted to use. Also, there are research recommendations to determine the optimal number of times mapping could be used during the semester to promote the most learning and if concept maps could be used to promote the development of thought processes associated with the nursing process. The study supported how students construct knowledge, where they are in the learning process, and

pointed to the importance of nurse educators using methods to help students develop their thinking and build the links in the nursing process (Daley, 1996).

Wheeler and Collins (2003) conducted a quasi-experimental study with a pre-test, post-test design to determine if there was an improvement in junior level BSN students' critical thinking ability if they prepared for clinical using a concept map rather than a traditional care plan for the first four weeks of the semester. A convenience sample of 76 students was randomly assigned to four clinical courses with 44 students assigned to the experimental group and 32 assigned to the control group. The researchers used the California Critical Thinking Skills Test (CCTST) to measure critical thinking and administered one version for the pre-test and the other version for the post-test that provided an overall score and five subscale scores in the areas of analysis, evaluation, inference, deductive reasoning, and inductive reasoning.

The findings revealed there was no significant difference between pretest scores in the two groups. An analysis of covariance was found to be significant between the pre- and post-test mean differences of the overall scores and subscale scores however, there was no significant difference between the two groups. The faculty perceived that students who had used concept maps to prepare for clinical "approached problems and managed complex care issues" (Wheeler & Collins, 2003, p. 343) differently than the students in the control group. The researchers identified that the effect of the concept map could have been blunted from doing traditional care plans the second half of the semester and recommended a longitudinal study on the long-term effect of using concept maps to prepare for clinical. They also posited that the CCTST might not have been sensitive enough to detect a change in those students who used concept mapping. The researchers

expressed confidence that concept mapping is effective and felt there was a challenge in capturing this effect objectively.

Daley et al. (1999) conducted a study in which they “implemented concept maps as a methodology to teach and evaluate critical thinking” (p. 42). They noted an important feature of concept maps was that they engaged students in an “active process of thinking, learning, and drawing relationships” (p. 42) that allowed students to learn in a meaningful way and to assimilate information into their learning. Daley et al. taught six clinical groups of students (n=54) to use concept maps and had them create three concept maps throughout the course of the semester along with post conference discussions. They randomly selected three students from each of six clinical groups of students in their final semester of a baccalaureate-nursing program to analyze and score their maps. The first concept map mean score was 40.38 and the third concept map mean score was 135.55. The researchers interpreted this as a statistically significant difference between the first and third maps that “is indicative of the students’ increase in conceptual and critical thinking” (p. 45). The scoring was based on Novak & Gowin’s (1984) criteria that counts propositions, hierarchy, and cross-links in a concept map to measure the depth of the thinking evident on the mapping.

Daley et al. (1999) collected feedback from the students who reported feeling lost during the creation of the concept maps as they attempted to show the relationships between the concepts. Also, they reported the concept maps took a lot of time to prepare, although they felt they learned a lot and it helped them understand how all the client factors related to each other. They felt it would have been helpful to be taught how to do

concept maps earlier in the program, as it was difficult to use a new learning strategy toward the end of the program.

Faculty provided feedback as well, and identified that the concept maps were beneficial in showing how student's knowledge increased throughout the semester. The faculty reported they were better able to determine which students were clinically safe by examining the student's concept maps. It was especially helpful in evaluating the thinking of those students who were quieter than others in confirming they understood the connections between the client's needs and the care that was planned. It helped with the evaluation of the more verbal students as well who may give the outward impression they have a good understanding of their client's care needs but their misperceptions become evident on the concept map that can then be corrected (Daley et al., 1999).

The researchers concluded that concept maps provide a method of learning critical thinking and evaluating thinking abilities within the context of nursing. They recommend a larger sample size and multi-institutional sites to test concept mapping with other critical thinking development strategies as well as against other critical thinking measures. Finally, construct validity needed to be established for "concept mapping as a measurement of critical thinking" (Daley et al., 1999, p. 47).

Hicks-Moore and Pastirik (2006) conducted a descriptive, exploratory, pilot study to determine the level of critical thinking present in clinical concept maps measured by the Holistic Critical Thinking Scoring Rubric (HCTSR) developed by Facione and Facione in 1994. The participants were second year students in a condensed 5-week course in which 18 of the 42 students voluntarily participated and submitted their concept map for scoring, and 8 of the 18 participated in a focus group session. Interrater

reliability of the two researchers scoring the concept maps using the HCTSR tool demonstrated a strong correlation coefficient of .81. The clinical instructors, who also used the HCTSR to score the students maps, found it challenging to adequately score the student's map without having the student available to share their reasoning behind the data and interventions they chose to include or exclude, and the interrelationships between elements they depicted on their maps. The instructor's evaluation of the student's level of critical thinking demonstrated on the concept map was changed after having a discussion with the student. The students reported the concept maps helped them to be prepared and organized for their clinical experience and gave them a better understanding of the whole picture. The findings revealed that concept maps could lead to enhanced clinical preparedness and critical thinking as well as a more holistic view of the client's needs.

Hinck, Webb, Sims-Giddens, Helton, Hope, Utley et al. (2006) studied concept mapping and its effectiveness in the care planning and evaluation of 23 junior level baccalaureate students in a community-based mental health course using a quasi-experimental design. Students also provided a self-evaluation about their level of learning and satisfaction. Before starting the study, a comprehensive training program for students and faculty was provided by experts in concept mapping.

Hinck et al. (2006), throughout the semester, had the students develop eight concept maps of the nursing care they planned for their clients. For the course, students chose two maps for grading purposes based on a grading tool developed by the faculty that contained the care plan components they felt were important. For the study, the identifying information was removed from the concept maps and then the first and

seventh concept maps were graded by the investigators using the tool developed by the faculty. Reliability was established by having two different investigators grade the maps and compare the number of items scored similarly divided by the number of items. Discussions were held among the investigators to determine how items that were not labeled would be scored and what depth of information would be required to receive credit for an item. A low reliability agreement ranged from .44 to .70 with a mean of .84 for all items. The initial mapping of the group was scored at a mean of 15.35,  $SD=2.95$ , and the seventh mapping of the group was scored at a mean of 17.39,  $SD=1.12$  indicating “a significant increase in comprehensiveness of CMs over the course ( $t=-3.01$ ,  $df=22$ ,  $p=.006$ )” (p. 27). The student’s responses varied from liking concept maps to not liking them. Some students felt it was difficult to get their thinking out on paper, and felt the concept mapping process took too much time; about an average of three hours to complete.

Hinck et al. (2006) identified that concept maps were able to demonstrate student learning and an improved student ability to make connections and see relationships. The faculty working with the students felt it gave students a holistic view of the client and revealed to them how complex the client’s problems were and why managing the problems can be so challenging. The investigators felt the students had a good understanding of the nursing process before using concept mapping to plan care that may have helped with the implementation of the new learning strategy. It is recommended to provide students with complete instructions of what is expected and give them examples to help them view the client holistically and understand how to develop their concept maps. Sometimes this has been felt to hinder students’ creativity as the student tries to

develop his/her map in relation to how it will be graded rather than extend their thinking about the client's needs.

Hinck et al. (2006) identified difficulties with reliably grading the concept maps because it was very subjective and achieving appropriate interrater reliability was challenging as evidenced by the low ratings in this study. Having discussions prior to and during the process can help to gain some consistency between instructors related to student's requirements and development of certain areas of the map. In this study they based the grading scale on a fixed number of points (20). In other studies, the grading system has been more open to allow for higher scoring based on the depth of the student's detail in the concept map.

August-Brady (2005) conducted a quasi-experimental study on a convenience sample of 80 students in a baccalaureate program "to examine the effect of concept mapping on approach to learning and the self-regulation of learning" (p. 299). There were 45 students in the control group and 35 students in the treatment group. The researcher provided a one-hour educational session where students were taught about the process of concept mapping and were asked to complete an example based on a case study and additional readings. The participants completed 6 concept maps on their clients assigned in the clinical area over the next 15 weeks. The researcher used the revised Study Process Questionnaire-2 Factor to measure approach to learning and The Strategic Flexibility Questionnaire to measure self-regulation of learning. Paired t-test of pre- and post-test differences showed no significant difference in treatment group for deep ( $t=-1.01$ ,  $df=34$ ,  $p=0.316$ ) or surface ( $t=-0.45$ ,  $df=34$ ,  $p=0.66$ ) learning approach mean scores; however, there was a statistically significant difference in the control group with a decrease in deep

learning approach mean score ( $t=2.13$ ,  $df=42$ ,  $p=0.04$ ) and an increase in surface learning approach mean score ( $t=-3.26$ ,  $df=42$ ,  $p=0.002$ ). An ANCOVA revealed a statistically significant difference in pre-test, post-test mean scores of the treatment group in deep learning ( $F(1)=5.62$ ,  $p=0.021$ ) with a power of .65 and no significant difference in surface learning approach ( $F(1)=1.09$ ,  $p=0.301$ ).

August-Brady (2005) used the Strategic Flexibility Questionnaire to evaluate adaptive, inflexible, and irresolute control beliefs in the self-regulation of learning. There were no statistically significant differences in either the treatment or the control group with regards to inflexible or irresolute control beliefs. However, there was a statistically significant difference in the treatment group between the pretest and posttest adaptive control belief “( $t=-2.79$ ,  $df=34$ ,  $p=0.009$ ) with an increase in posttest adaptive control beliefs” (p. 300). The researcher found that concept mapping had a significant positive effect on the participants in the treatment group for increasing their deep approach to learning and increasing their adaptive control belief scores.

Hay and Kinchin (2008) demonstrated how concept mapping can be used to measure prior knowledge and how the quality of learning can be determined by evaluating the degree of change in the student’s mappings. They used the terms non-learning, rote, or meaningful learning. Hay and Kinchin over the last decade have used Novak and Gowin’s (1984) conceptual mapping method to study more than 1000 individuals and have assessed more than 3000 concept maps of university students from various programs of study. Hay and Kinchin concluded that concept maps provide a way of observing and measuring direct changes in learning quality. In an effort to further refine the scoring of concept maps to be certain the propositions and links make sense,



“scoring methods that are based on subjective measures of concept richness, linkage quality, structure and complexity of propositions” (p. 171) have been developed by Hay and his colleagues.

Hay and Kinchin (2008) have used the following terms in their framework for determining changes in learning through the use of pre- and post-learning concept maps. Non-learning is measured by the lack of additional new concepts and links in the second map. Rote learning is measured by the addition of new concepts that are not linked to prior learning or newly learned concepts. Meaningful learning is measured by the addition of new knowledge structures that are linked to prior knowledge or to the new concepts in a non-trivial manner. Hay and Kinchin have identified the terms non-learning, rote learning, and meaningful learning to be “broadly similar (in epistemology) with the distinction between deep and surface learning” (p. 173) used by Marton and Saljo (1976) in their research on approaches to learning. Deep learning, as meaningful learning, is focused on understanding the meaning underlying the subject of interest, where surface learning, as rote-learning, focuses on memorizing the written facts.

Rooda (1994) used mind mapping, another term used for concept mapping, to teach a course on research to sophomore level, baccalaureate in science of nursing (BSN) students. A convenience sample (group 1 n=36, group 2 n=24) was used and one group received the course using lecture, notes, and overhead projector, and the other group used these same techniques but added the mind-mapping process in the course. The two groups were tested and considered equivalent from age, gender, and grade point average perspectives and were given the same three multiple-choice exams throughout the semester. A t-test indicated a statistically significant difference between the means of the

exam scores between the two groups (group 1 mean = 76.78%; group 2 mean = 83.40%)  $t=4.65$ ,  $df=176.6$ ,  $p=0.001$ . The students in group 2 provided positive comments in the course evaluations related to the use of mind-mapping; they felt it was fun and helpful in learning a large amount of information, and recommended that the instructor continue to use it in the course.

Gaines (1996) used a quasi-experimental, one group ( $n=54$ ), post-test only design to evaluate the effectiveness of concept maps and synthesizers to promote encoding and recall of information presented in a pharmacology course taught to junior level BSN students. For activities, the students were placed in groups and were given incomplete concept maps and synthesizers developed by the instructor to be filled in during class before the lecture was presented. The instructor developed four exams and a final based on the course objectives to measure the student's comprehension and application of information that revealed reliability coefficients of .46, .60, .60, .54, and .74 respectively. The findings revealed weak correlations between the activities and the exam scores on 3 of the 8 activities used in the course and very weak or no correlation on the remaining activities used. The student comments related to the concept maps and synthesizers reflected a positive influence on their learning and motivated them to study and prepare for class. However, there was a mixed response when asked if they created maps outside of class to study pharmacology concepts. The researcher recognized the limitations of the study, but concluded that the data analysis and the literature review supported the use of concept maps and synthesizers in helping students encode and recall large amounts of information and was important in nursing education.

Wilkes, Cooper, Lewin, and Batts (1999) used concept maps to teach nurses science in a baccalaureate program. They developed work packages for independent learning that required concept maps to be developed based on the various topics presented in the modules. They designed and implemented the program and sought feedback from the nurses to make further modifications to the program. A pre-survey and post-survey was completed and revealed an improved understanding of scientific principles related to nursing care. The instructors felt this process allowed them to spend more time working with those students who were having difficulty with the material. The students felt they were more in control of their own learning and had more confidence in their knowledge. They came away from the process with a deeper understanding of the information and a useful technique that they found applicable in their own nursing practice when developing plans of care with their clients or teaching them about clinical pathways. The students felt that it was unnecessary to include a peer-reviewed presentation and an additional essay further explaining one concept in-depth along with the concept maps, so those activities were eliminated in future semesters.

Abel and Freeze (2006) used concept mapping as a method of promoting critical thinking in an associate degree program in nursing. They had 28 participants in one graduating class complete a concept map in their second semester, fourth semester, and two in their fifth semester of a program, over a one-year period of time. They used Novak's scoring method of propositions (1 pt.), hierarchy (5 pts.), cross-links (10 pts.), and examples (1 pt.), as well as, established interrater reliability (.85) for the scoring between two instructors in a pilot study. They partially modeled their study after a study conducted by Daley et al. (1999) where a strong premise was established linking concept

maps to the critical thinking definition based on the consensus statement of the Delphi research project. “Critical thinking is the process of purposeful, self-regulatory judgment. This process gives reasoned consideration to evidence, contexts, conceptualizations, methods, and criteria” (American Philosophical Association, 1990, p. 2). Daley et al. (1999) further established that “concept maps are metacognitive tools that assist learners to develop a self-appraisal of their own individual thinking processes” (p. 42).

Abel and Freeze (2006) analyzed the group mean score of the first map to be 173 and the average of the mean scores of the last two maps to be 249. A paired t-test was performed on the mean score of the first concept maps and the average mean score of the last two maps and it was determined there was a statistically significant difference between the scores for the first and last maps ( $t=-4.75$ ,  $df=27$ ,  $p=0.05$ ). The researcher looked at the cross links for evidence of “the students’ ability to synthesize current and past knowledge and to identify relationships” (p. 362). The group mean score for cross-links in the first map was 89 and the average mean score for the last two maps were 143. A paired t-test revealed a statistically significant difference between the scores of the first and last maps ( $t=-3.76$ ,  $df=27$ ,  $p=0.05$ ). The researchers concluded that the details in the concept maps increased over time representing an increase in the students’ knowledge and critical thinking ability to identify the relationships between the client’s needs and nursing care required.

Baugh and Mellott (1998) implemented Clinical Concept Maps (CCM) in an advanced medical-surgical clinical rotation. The students collected data related to the client they would be caring for and developed a CCM from that data in preparation for their clinical experience. The students updated the concept map throughout the clinical

day as their knowledge was increased and refined. Clinical post-conference discussions were enriched and questions raised about the relationship between data elements. The instructors evaluated the CCM to determine the students' level of understanding and correct any misconceptions identified. Students have remarked that CCM “really made me think,’ ‘helped me pull things together,’ ‘took a while to get used to, but I really learned from it,’ and ‘helped me to prepare for clinical experiences’” (p. 256).

Kostovich, Poradzisz, Wood, and O'Brien (2007) conducted a correlational, descriptive study to determine if a relationship exists between learning style preference and aptitude for concept mapping. The researchers measured learning style using a modified Kolb's Learning Style Survey (LSS), developed nine open-ended questions related to preference for creating concept maps, and scored the maps using the grading rubric developed by Novak and Gowin (1984). The findings of the study revealed the mean score for the learning subscale of Active Experimentation was significantly higher than the other three subscales (mean=17.33, SD=3.09,  $p < 0.001$ ). The concept maps were scored and correlations made between the learning style preference and the scores. “Although the students in the active group had higher mean concept map grades than did students with other learning preferences, the difference was not significantly higher [ $F(3, 75) = 0.921, p = 0.435$ ].” (Kostovich et al., 2007, p. 229). On the author-developed survey, the abstract learner preferred concept maps to case studies 2:1. The researchers noted there were no reliability and validity studies available for the LSS, and that some degree of subjectivity was present when grading the maps although they attempted to minimize this effect.

Hsu (2004) conducted an experimental study in Taiwan, in which students were randomly assigned to two groups, the experimental group (n=43) used concept maps to analyze six problem-based scenarios during the 16-week course and the control group (n=49) attended a traditional course. At the end of the semester each participant during their final exam was asked to develop a concept map related to a video they had watched during the semester. There were significantly higher scores on the proposition and hierarchy elements for the experimental group however; there was not a significant difference in the cross-link, or example scores when compared to the control group. The majority of the participants in both groups 22 (51.2%) in the experimental group and 28 (57.1%) in the control group scored low ( $\leq 10$ ) on the overall scores for their maps with 4 (9.3%) of the experimental group and 18 (36.7%) of the control group receiving a score of 0. It must be noted that the control group did not receive any education or have any practice developing concept maps prior to the final exam, unlike the experimental group that developed six different maps and had the opportunity to revise them after the instructor lectured on the topic, and as necessary within a two week period before submitting them for a score. The researcher concluded that concept mapping and problem-based learning can be successfully integrated into a traditionally passive learning environment and that students can learn to apply theoretical nursing concepts to client problems. This was true for 39.5% of the experimental group and 6.2% of the control group and they had no experience with concept mapping. So, taking this into consideration, this could possibly be true for 33.3% of the students offered this strategy.

Hsu and Hsieh (2005) further examined the data from the experimental group described above to determine the efficacy of using concept mapping as a teaching

strategy. The participants were divided into seven groups and each group developed six concept maps throughout a 16-week course. The authors reported the first concept maps all received low scores (mean 8, SD  $\pm 5.16$ ) but by the third map all groups showed improvement in scores (mean 19.93, SD  $\pm 4.57$ ) based on the scoring system (concept links 2 points each, cross links 10 points each, hierarchies 5 points each, and examples 1 point each), and showed “a highly integrated and hierarchical linkage demonstrating a deep understanding of the topic” (p. 146). The researchers noticed a consistent “improvement in higher order thinking only...after drawing two maps” (p. 147). The researchers did not discuss interrater reliability of the process they used to score the concept maps nor did they indicate that the changes in mean scores between the first and subsequent maps were statistically significant.

There have been some disadvantages identified by educators and researchers. Concept maps are somewhat time-consuming for students to complete especially at first when students are beginning to learn the technique (Beitz, 1998). Novak (1998) has identified that there needs to be a training period to allow students to learn the process of concept mapping, and there may be a learning curve great enough where student’s cognitive performance declines for a 2-4 week period of time, upon which “there is a marked improvement upwards toward achievement” (Irvine, 1995, p. 1179). The usefulness of computer technology can be an advantage to some but a disadvantage to others less adept at using technology (Beitz). Faculty attitudes can greatly affect the successfulness of this learning strategy and faculty who are better supported in their efforts to learn this new technique will be more successful. Some subject matter will be easier to use concept mapping on than others so some experimenting may be necessary

for the most successful implementation. Concept mapping is not as effective when the instructor creates a concept map for the students, as the key component of using concept mapping as a learning tool is to allow the students to work through the process of creating a visual display of their own thinking on paper (Beitz).

#### Literature on Meaningful Learning

The educational literature has used the terms non-learning, rote and meaningful learning for over thirty years to describe the parts of the continuum of the learning process. Novak (1998) has defined meaningful learning as learning that connects prior learning to the new learning in a nontrivial way, where new information is relevant to prior knowledge, and where the learner chooses to intentionally relate new knowledge to prior knowledge in a significant manner.

Hay (2007) used Novak's definition of meaningful learning in his study to develop criteria for measuring deep, surface, and non-learning outcomes using concept maps. The researcher taught the students how to create a concept map using Novak's criteria of hierarchal concepts arranged graphically with links identified and labeled with statements to demonstrate the student's understanding of the meaning. He had 12 postgraduate students create a concept map before and after a learning intervention and reading assignment. He evaluated the concept maps using the established criteria and concluded that the outcomes of deep, surface, and non-learning could be directly observed and the quality of learning measured by using concept maps.

Hay, Kinchin, and Lygo-Baker (2008) have used Novak's definition of meaningful learning in their studies of the role concept mapping has in higher education to make learning visible. The researchers further distinguish that rote or surface learning



can be separated from meaningful or deep learning by the degree of integration of the new learning with the prior learning to make new meanings. With rote learning the learner may add new concepts superficially to the map but they are not linked with prior knowledge. “That learning is change and that change is measurable... necessitates that prior knowledge *must* be measured as the first step in documenting learning” (p. 300, italics in original). Those students who start with more knowledge will be in a more advantageous position to make more sense of the new information and have a better quality of learning. Concept mapping allows the student to see their knowledge and understanding change throughout their course of learning.

Jarvis (1993) has created a model of learning that focuses on the individual in which “learning is the process of transforming experience into knowledge, skills, attitudes, values, senses, and emotions” (p. 180). He has posited that it is necessary to distinguish between learning and non-learning outcomes, as every potential learning situation does not always result in a learning experience. There are a few thought processes that can lead to non-learning; they are presumption where the individual believes he already knows the information, non-consideration where he believes he doesn’t need to know the information, or rejection where he evaluates the facts and decides he doesn’t need to know the information. When learning does occur it can be a result of reflective thinking, “using contemplation, reflective skills learning, or experimental learning... or it can be non-reflective relying on preconscious learning, skills learning, or memorization” (p. 182).

Novak (1998) and Dunn conducted an experiment with students using concept maps and a series of questions that directed the students to perform various activities

related to the concept maps. An electroencephalographic (EEG) measurement was taken of the student's brain-wave activity while they were performing simple and complex tasks. "The results showed very high statistically significant differences in EEG patterns for these two kinds of tasks, suggesting, in part, the validity of concept maps as knowledge representation tools and the greater cognitive activity needed for more complex tasks" (p. 218). The researchers predicted revolutionary changes in education and learning based on the value concept maps were demonstrating as a learning tool. The Navy and the National Aeronautics and Space Administration are already using concept mapping to capture and store the knowledge of experts before they retire from service so their knowledge can be accessed and used by others in the field.

Another prominent feature of concept maps is their usefulness in evaluation. Concept maps allow educators to test the complexity and depth of the learner's understanding to a greater extent than if multiple choice-questions were being used. Novak (1998) has used concept maps in place of an exam in which he has provided the student with 20-30 concepts and required the student to add 10-20 more concepts, and develop the concept map at home. Novak identified that if a grading rubric is used, it doesn't take long to grade the mapping. But it becomes an intense learning experience for the student and "a unique evaluation experience" (p. 192) that is best done after the student has had time to practice the technique.

Kathol, Geiger, and Hartig (1998) provided a clinical example in which students constructed a clinical correlation map and found that it helped to assess the student's level of knowledge and preparation for the clinical day. The students' preparation was more comprehensive and it allowed students to see major nursing problems and identify

priorities of nursing care. Also, they have used this technique as an evaluation tool having the student create a concept map based on a case study for the final examination. They report a positive response from the students as well related to the use of the clinical correlation map.

Irvine (1995) has identified that nurse educators have expressed a desire to “consider teaching strategies that help students ‘learn how to learn’ than those that encourage rote learning” (p. 1175). Why then has concept mapping, a metacognitive strategy, not been included as a teaching strategy in the nursing curriculum? Irvine speculates that nurses who were taught using lecture as a primary teaching strategy continue to use that strategy in their own courses. Many nurse educators have the perception, supported by much of our educational system, assessment strategies, and textbooks, that they must ‘cover the content’ which leaves little time for application, discussion and reflection for gaining a deeper meaning of the concepts being learned (Irvine, 1995; Novak, 1990; Diekelmann, 2002). Novak’s (1998) research related to students using and gaining improved skill in constructing concept maps led students to “report that they were learning how to learn” (p. 27). Irvine recommends conducting a study to evaluate educator’s attitudes toward concept maps to provide a better understanding of why there is resistance to using this teaching strategy.

Kember, Charlesworth, Davies, McKay, and Stott (1997) have studied how to evaluate the effectiveness of innovative educational strategies. Measuring when meaningful learning takes place is an important feature in determining if an innovative strategy is effective. They have tested The Study Process Questionnaire and have determined that “changes in the learning approaches of the students....are taken as an

indicator as to whether or not meaningful learning has occurred” (p. 3). Students who use a surface approach to learning when reading focus on key phrases, rote memorization, and cannot provide a detailed description of the content of the article. Those students who adopt a deep approach to learning focus on understanding the underlying meaning of the article, and are motivated by interest or the topic holds some importance to their personal or professional development. Students may have a predisposition or preference for a certain learning approach but this “can be modified by the teaching context or learning environment for individual course or particular learning tasks” (p. 4). Within the Study Process Questionnaire “deep approach and meaningful learning outcomes can be closely related, so it is deep approach which is the most relevant indicator” (p. 5). “Any innovation which can show an increase in the use of deep approach has, therefore, achieved something quite significant. It even seems to be some sort of achievement in higher education if deep approach scores do not decline” (p. 6).

#### Literature Summary

A nursing theory and an education theory were used to guide the development of this study. Bevis and Watson’s (1989) Theory of Human Caring: Educative Caring Curriculum guides this research by supporting active learning strategies in the educational environment and identifying the importance of the caring interactions between the student and educator. Ausubel et al. (1978) Assimilation Theory guides this research by identifying the importance of building on the prior knowledge of the learner and introducing learning strategies that allow the learner to make the necessary connections between new information and prior knowledge structures.

The independent variables in this study are the traditional nursing care plan and the concept map nursing care plan. The traditional nursing care plans were instituted as a way for students to learn the nursing process with the hope that it would improve nursing care provided to the client. It taught the student to assess and analyze the client's data, identify a nursing diagnosis and client outcomes, plan and provide appropriate interventions, evaluate the client's response to the interventions, and make any necessary changes to the plan. As the body of research has expanded, and the complexities of nursing care have increased, this may not be the most useful tool to use in capturing a holistic, individualized perspective of the client, and contribute to the high level of clinical judgment needed to provide nursing care in the 21<sup>st</sup> century. In addition, one needs to consider the advances in technology that are impacting the healthcare environment in the way of standardized care plans, electronic health records that require standardized languages, quality outcomes monitoring, and potential reimbursement changes that will require a new way of educating and thinking about nursing care.

The concept map nursing care plan provides a visual depiction of the student's thinking on paper related to the care the client needs. Ausubel, Novak, and Hanesian (1978) recommended that a pre-mapping be done to determine the student's current level of knowledge, followed by the learning event, and post-mapping of the knowledge and understanding gained in the learning event. Novak and Gowin (1984) and their research team developed the idea of the concept map as a way of capturing the student's knowledge and meaningful learning as evidenced by the additional concepts identified and the connections made along with the propositions used to describe how the new learning built on the prior knowledge. The concept map allows students to identify

pertinent concepts, organize information, and make valid connections between conceptual elements to reveal their understanding. It also allows for the educator to see where students may not have a good understanding and correct or clarify the student's thinking.

The dependant variable measured within and between both groups and compared was the development of meaningful learning. Hay (2007) and colleagues have continued to use Novak and Gowin's (1984) concept mapping and scoring process to examine concept maps developed by students over the last decade to measure meaningful learning throughout higher education. They are strong proponents of capturing the learners' current level of understanding, and moving away from learning strategies that encourage rote memorization, and toward strategies that encourage active participation, resulting in more meaningful learning. They also support the interaction between the student and educator, and the sharing of knowledge and understanding between these individuals. As well as, documenting the knowledge change through the use of a concept map by seeing how the student integrated the new knowledge into their prior knowledge structure. Concept mapping allows learning to become visible.

#### Identification and Discussion of Need for Research

Nursing has typically used the traditional nursing care plan to teach the nursing process, without question, for over a century. Further research findings have suggested that active learning strategies facilitate greater student learning than passive strategies, and those strategies that give students opportunities to think, reflect, and participate in the learning process result in more meaningful learning, memory, and recall. The education

community has used concept mapping for the past few decades and nursing began considering its use in the early to mid 1990s.

Nursing research has focused on beginning, sophomore, junior, and senior students, sample sizes ranging from 18-91 participants, with most being quasi-experimental designs with convenience samples of participants. Daley (1996) identified that beginning nursing students had difficulty linking theory with clinical practice and Daley et al. (1999) studied students in their senior year that felt concept mapping would have been more helpful had it been introduced earlier in the program. A longitudinal study would be supported to determine if concept mapping may improve beginning student's understanding of the connections between theory and clinical, and to measure long-term outcomes using concept maps throughout the program.

Difficulties were encountered with using critical thinking inventories and in applying consistent, reliable scoring methods to the concept map care plans in nursing. Wheeler and Collins (2003) attempted to use the CCTST inventory and identified that the inventory may not be sensitive enough to detect critical thinking in nursing. Daley et al. (1999) used Novak and Gowin's (1984) scoring method in grading the concept maps the students developed and was able to detect a meaningful change in the student's thinking, however, the sample size was  $n=54$ , so the study could have been strengthened by a larger sample size. Hicks-Moore and Pastirik (2006) used the Holistic Critical Thinking Scoring Rubric to score the concept maps ( $n=18$ ) and despite having a .81 reliability coefficient found them difficult to score without having the students present to explain their thinking, although they identified concept maps improved the student's clinical preparation, critical thinking, and ability to develop a holistic view of the client. The

study could have been strengthened by a larger sample size. Hinck et al. (2006) were plagued by low reliability coefficients (.44-.70) related to grading the concept maps using the grading format developed by the faculty. Hay and Kinchin (2008) developed and used the non-learning, rote learning and meaningful learning scales to assess concept maps for determining concept richness, linkage quality, and structure and complexity of propositions. Abel and Freeze (2006) used Novak and Gowin's scoring system successfully with a .85 reliability coefficient.

Another feature supported in the studies conducted, was the need for educational preparation for students and instructors implementing concept maps, and to provide an opportunity for students to practice initially with concept maps, and be able to develop at least three before measuring any change. Hinck et al. (2006) provided an educational session related to concept mapping and had students develop 8 concept maps throughout the semester, the researcher graded maps 1 and 7 of the small sample of  $n=23$ . August-Brady (2005) provided an educational session for the students and instructors and had the students develop 6 concept maps throughout the semester, and measured the students approach to learning and self-regulation of learning using two pre- and post-questionnaires, Study Process Questionnaire-2 Factor and the Strategic Flexibility Questionnaire. Novak (1998) supported the notion of providing education related to developing a concept map and allowing students to practice. In addition, in his research, he actually saw a decline in cognitive function for a brief period of 2-4 weeks, followed by an acceleration of cognitive ability throughout the semester. Hsu (2004) measured two groups using a concept map as part of a final exam and found a significant difference



between the two groups; however, one group had not received any training or practice in the concept mapping technique which may have contributed to the findings.

A few studies had students develop a concept map in preparation for their clinical experience (Baugh & Mellott, 1998; Kathol et al., 1998; Wheeler & Collins, 2003). This supported Ausubel, Novak, and Hanesian (1978), and Hay and Kinchin's (2008) theory that it is essential to know the student's level of knowledge before you begin and see how they make connections and integrate new information in a meaningful manner into the post-learning event mapping. Students identified the concept map helped them organize the client's data, see the connections, and view their client holistically. The drawback was the time-consuming nature of developing a concept map, it does take time to think about how the information should be laid out, and students reported that sometimes it was difficult to describe their thinking on paper, although, students felt they learned a lot through the experience.

Novak's (1998) definition of meaningful learning was used for this research study. The definition includes identifying relevant prior knowledge the learner holds, actively participating in a relevant learning event where significant information is presented, and where the learner chooses to consciously and deliberately make connections between the new information and integrate it into prior cognitive structures. Hay (2007), in addition to other researchers have used Novak's definition of meaningful learning to develop new terminology called deep, surface, and non-learning, linked to meaningful, rote, and non-learning terminology respectively. Kember et al. (1997) had used The Study Process Questionnaire as a method of measuring meaningful learning, as the deep approach to learning, used by a student, is an indicator of the innovative strategy

producing a meaningful learning outcome. It has been widely tested and used as a multiple measure tool in evaluating deep and surface approaches to learning.

### Summary

Much of the research and literature related to concept maps have been based on Novak's work, the founder of the concept map, and his theory of meaningful learning. He helped strengthen and advance Ausubel's Assimilation Theory that provides the supporting theory for this study. Using concept mapping in the context of nursing is a relatively new learning strategy that will benefit by more research to further determine the contribution concept mapping may have in nursing education. Students in a nursing program need to link nursing theory, science and clinical practice in order to provide safe nursing care to clients. Nursing will continue to use the nursing process to systematically assess and analyze data, formulate nursing diagnoses, plan and implement care, and evaluate the care provided. Should nursing care be planned using a traditional nursing care plans or should a concept map care plan be used to help facilitate the organization of concepts, make connections visible, and integrate new knowledge into the previous knowledge structure. Is there a difference between the two strategies in allowing for more meaningful learning to take place?

## CHAPTER III

### METHODOLOGY

The purpose of this quasi-experimental study was to determine if differences exist in meaningful learning development in baccalaureate nursing students who plan nursing care using a traditional care plan compared to students who plan nursing care using a concept map care plan. The research design, sampling selection and size, instrumentation, method for data collection and management, and plan for statistical data analysis will be described in this chapter.

#### Research Design

The research design for this study was a quasi-experimental, pre-test/post-test, control group design frequently used in educational research (Gall, Gall, & Borg, 2007). Participants in the spring quarter of the Nursing Process II course were assigned to the control group and planned nursing care using a traditional care plan, and participants in the fall quarter of the Nursing Process II course were assigned to the treatment group and planned nursing care using a concept map care plan. All participants completed a demographic survey at the beginning of the study (see Appendix A). The revised two-factor Study Process Questionnaire (R-SPQ-2F) was used as a pre-test and post-test, and was administered to both groups of participants during the first week of the term before the nursing care plan process was introduced in the course and again during the last week of the term (see Appendixes B and C). The R-SPQ-2F provided a baseline for measuring

the approach to learning used by participants in each group. After the designated care plan approach was implemented, over the 10-week quarter, the participants in each group completed the questionnaire again to determine if there had been a change in their approach to learning and if so to determine if that change represented a significant difference between the groups. The questionnaires were scored according to the coding of responses guidelines (see Appendix D) and statistically analyzed using a t-test.

Table 1

*Data Collection Map*

Classes	1	2	3-6	7-17	18	19
			Nursing Process	Clinical Sessions	Exam 3	Final Exam
Spring 09 TNCP	Collected Pre Data Demo & R-SPQ-2F		1 TNCP in class	1 TNCP in Lab and 4 in Clinical	Collected Post Data End of Term & R-SPQ-2F	
Fall 09 CMCP		Collected Pre Data Demo & R-SPQ-2F	1 CMCP in class	1 CMCP in Lab and 4 in Clinical		Collected Post Data End of Term & R-SPQ-2F

The investigator developed the clinical instructions for the students and the educational preparation for the clinical instructors. The control group received standardized information about the traditional care planning process and clinical expectations from their clinical instructors (see Appendix E). The investigator had

developed a standardized self-study educational plan for the clinical instructors of the students in the treatment group to complete in order to learn about concept mapping, as well as, a standardized educational plan the instructors used to provide instruction to the students about the concept map care planning process (see Appendix F). The treatment group participants received education from their course and clinical instructors on how to develop a concept map nursing care plan, had the opportunity to practice the technique using a case scenario example, and were provided an example of a concept map care plan to use as a reference (see Appendix G). Removing the investigator from the educational process of the instructors and students helped minimize any experimenter bias from being introduced into the study.

The participants in the control group developed four traditional nursing care plans (TNCP) throughout the term (see Appendix H). They prepared for their clinical experience by reviewing the medical record, meeting with the client, developing a pre-clinical traditional nursing care plan, and completing the clinical preparation tool. This tool was developed by the participating institution, and provided a comprehensive guide for students to gather the necessary information about their clients the day before clinical. Prior to the students' clinical experience a photocopy of their pre-clinical traditional care plan was made. The students had their clinical experience, which entailed having the opportunity to discuss the care they had planned for the client with their clinical instructor using the TNCP, and confer with the RN assigned to the client. They provided care for their client throughout the clinical time, met with their peers and instructor in clinical pre/post-conference, and reflected on their clinical experience before reconstructing their post-clinical traditional nursing care plan for comparison of their

learning with their pre-clinical care plan. The students were asked to submit a copy of their first and last care plans to the investigator for review.

The participants in the treatment group developed four pre- and post-clinical concept map care plans (CMCP) throughout the term (see Appendix I). Students prepared for their clinical experience by reviewing the medical record, meeting with the client, developing a pre-clinical concept map care plan, and completing the clinical preparation tool. Before the start of the students' clinical experience, a photocopy of their pre-clinical concept map care plan was made. The students had their clinical experience, which entailed having the opportunity to discuss the care they have planned for the client with their clinical instructor using the CMCP, and confer with the RN assigned to the client. They provided care for their client throughout the clinical time, met with their peers and instructor in clinical pre/post-conference, and reflected on their clinical experience before reconstructing their post-clinical concept map care plan that could be used for comparison of their learning with their pre-clinical care plan. The students were asked to submit a copy of their first and last care plans to the investigator to assess for treatment fidelity.

Based on the literature, the students' level of interest in the subject matter, which in this case is a nursing course, and their level of satisfaction with the classroom and clinical teaching/learning environments influences their approach to learning. This information was collected in the End of Term Summary as well as, students' comments about their understanding of the traditional care plan or concept map care plan process, their satisfaction of the process, and their recommendation for use in future clinical experiences to plan care (see Appendixes J and K).

### *Internal Validity*

Throughout every research study there is the possibility of threats to internal and external validity that are important to control or minimize. Controlling for extraneous variables allows the investigator to determine more confidently that the observed effect is from the treatment intervention rather than from a variable outside the experiment (Houser, 2008).

The greatest threat to internal validity in this study was selection bias. The participating program could accommodate the study only if the researcher collected data from the control group who was using the traditional nursing care plan during the spring quarter and collected data from the treatment group who was using the concept map care plan during the fall quarter as their students were just learning the nursing process within the course where the study was conducted. They felt it would be too confusing for the students within one course to be using two different care planning methods. Agreeing to that accommodation eliminated the possibility of randomly assigning participants to one group or the other as students who were asked to participate were taking the nursing process course in a certain sequence within their program. However, the participants from each quarter were at the same point within their educational programs at the time of their participation, having had similar coursework up to that point.

Having the control group from one quarter and the treatment group from another quarter did reduce the possibility of treatment diffusion that can occur when the control and treatment groups are participating in the study at the same time (Gall et al., 2007). This enabled participants within an identified quarter to develop the assigned traditional care plans or concept map care plans. The interactions between students and instructors,

students and peers, questions about the traditional care plans or concept mapping care plans, and presentations at pre/post-conference were all similar and were focused on the learning strategy everyone in the course that quarter was using, which further minimized treatment diffusion.

The research instrument was completed in a pre-test/post-test format using a self-administered questionnaire, posing a minimal risk to internal validity as students may have become familiar with the instrument being used. The R-SPQ-2F provided an objective measurement of the student's personal approach to learning at two different points in the student's educational program. The instrument has been used effectively in repeated measures studies to assess the effectiveness of learning interventions (Kember et al., 1997).

Whenever one administers a pre-test/post-test procedure there is always a threat of statistical regression, where extreme scores change to a score nearer the mean when the variable was measured again (Gall et al., 2007). However, a pre-test/post-test research design adds strength to the study when it is used to compare the student's approach to learning before and after the intervention was implemented.

Historical threats to internal validity can be issues if the study runs over an extended period of time when events affecting the study are likely to occur. Maturation can be an issue if physical or psychological changes occur in the participants that would affect the study (Houser, 2008). Both these threats were controlled or minimized by having the study run over one term of time with continued monitoring for events in the educational environment that could affect the outcome of the study. The student



maturation that naturally occurs over the course of the term is expected to be similar within the participants of both control and treatment groups.

There was always a possibility of experimental mortality if participants drop out of the study or drop out of the course during the semester (Houser, 2008). However, the flexibility of the research design allowed for students to miss a day of clinical and still be able to complete the necessary number of traditional or concept map care plans and remain in the study. If participants did leave the study during the term, the researcher attempted to determine the reason, and analyze if the attrition has compromised the validity of the study (Houser).

From an ecological validity perspective, several issues need to be considered. It was essential for the researcher to thoroughly describe the treatment in detail in the event others want to replicate the study in another population. There could be Hawthorne effects for the students in the treatment group who may feel they are receiving special attention as they implement a new learning strategy. This could lead to novelty and disruption effects especially if they find the strategy helpful or a hindrance, or have a strong interest or strong dislike of the technique (Gall et al., 2007). The literature identified that it may take more time for students to complete the concept map care plan assignment at least initially, which may influence how students perceive the learning activity. The use of a control group and pre-test/post-test design helped to neutralize these effects.

The experimenter bias, where the researcher's expectations unintentionally influence the outcome of the study, needs to be controlled (Gall et al., 2007). To control this effect, the investigator developed a standardized, self-study, educational program for

the clinical instructors who used the concept map care plans in their clinical groups, and had the instructors educate the students on the process. That removed the investigator from causing any undue influence with the instructors or students involved in the process. The R-SPQ-2F instrument provided an objective measurement of deep approach versus surface approach to learning that correlated with the dependant variable, meaningful learning versus rote learning, before and after the implementation of the care plan approach.

### *External Validity*

“External validity is the extent to which the findings of an experiment can be applied to individuals and settings beyond those that were studied” (Gall et al., 2007, p. 388). The population identified for this study was students in an accredited baccalaureate-nursing program enrolled in a nursing course. These student nurses were in a nursing course where they were learning the nursing process. The control group was taught to use the traditional nursing care plan and the treatment group was taught to use the concept map care plan for clinical preparation. The concept map care plan was a process that the instructors and students, with a short session of instruction (Novak, 1998), should be able to implement successfully without adding undue stress to the educational environment. The generalizability was to prelicensure nursing students enrolled in a nursing course of an accredited baccalaureate program in the Midwest.

### Description of Data Collection Methods

#### *Sampling Procedure*

The population of interest for this study was undergraduate, prelicensure, baccalaureate students in a nursing course of accredited nursing programs in the region.

Inclusion criteria were those students who willingly volunteered and sign an informed consent to have their data used in the study. All participants were 18 years of age or older and represented any racial, ethnic, gender, religious, or socioeconomic background. Participants were not from a typical vulnerable population (i.e.: children, pregnant women, prisoners, etc.). Exclusion criteria consisted of students from a nursing program that had already used concept mapping for their clinical care plans in previous terms. The goal was to have 40 participants in the study.

Potential programs were identified through the State Boards of Nursing and the accrediting body of the American Association of Colleges of Nursing. A letter of inquiry was sent to the Deans of the programs in the region inviting them to participate (see Appendix L). A letter of permission was obtained from the Associate Dean indicating an agreement that the study could be implemented at the institution and the clinical groups would implement the care plan approach assigned to that group. The researcher obtained the necessary approval from the Institutional Review Board at the participating university. Of the program that expressed an interest in participating, the nursing course instructors were contacted, and a meeting was arranged with them and the clinical instructors, to explain the study process, and consent was obtained to participate in the study as described (see Appendix M). A unique identifier was randomly assigned to each clinical group in the study. Students were kept in their established clinical groups and were assigned within their program to either the control group during the spring quarter or the treatment group during the fall quarter. The researcher collaborated with the course instructors to establish a time to enter the class to meet with students and explain the study, obtain consent, and administer the demographic survey and pre-questionnaire, and

to determine when it would be best to return to collect the end of term summary and post-questionnaire data.

### *Instrumentation*

The revised two-factor Study Process Questionnaire (Biggs, Kember, & Leung, 2001) was used to measure meaningful learning in baccalaureate nursing students to determine if there was a difference between those students who use a traditional nursing care plan and those students who use a concept map to plan nursing care. The literature review on meaningful learning in Chapter II provided the basis for correlating meaningful learning to deep approach and rote learning to surface approach. The R-SPQ-2F measures the deep and surface approaches to learning. The deep approach to learning was defined in a similar fashion to meaningful learning, where the students “attempt to understand key concepts or the underlying meaning.... relate together the concepts to make a coherent whole.... [and relate] new knowledge... to previous knowledge and to personal experiences” (Kember, Leung, & McNaught, 2008, p. 44). The surface approach to learning is similar to rote learning where the student is minimally interested in the task, “and there is no attempt to reach understanding of key concepts; instead reliance is placed upon memorization of model answers or key facts perceived as likely to appear in tests or examinations” (pp. 44-45). In general, the arts, humanities, and social science disciplines are “more conducive to students cultivating a deep approach to learning” (p. 43).

Hay (2007) developed a definition of deep learning based on Novak’s definition of meaningful learning, and applied it to his study of concept maps in postgraduate students in a research methods course. The criteria included showing both newly learned concepts and prior knowledge with new knowledge linked in meaningful ways such as

“better organization, higher linkage and richer exposition of meaning” (p. 43). The definition for surface learning he used described new knowledge concepts identified that were not linked to prior knowledge and failed to demonstrate improvement in “structural richness (linkage) or explanatory power (meaning)” (p. 44). The concepts were not integrated into the person’s understanding similar to how rote-learning facts are treated. Learning is change and through concept maps this change in student’s learning can become visible. Hay and Kinchin (2008) described this as meaningful learning, a personal process unique to each student that can be measured through the use of concept maps. When change is not visible, then rote learning or non-learning can be identified.

Students may have a preferred or predominate approach to learning that is relatively stable, although students can “adapt their approach to suit their perception of what is required for a particular learning task or in response to the prevailing learning environment” (Kember et al., 2008, p. 45). The instructor’s conceptions and approach to teaching can influence the student’s approach to learning. Concept mapping was identified as an active learning strategy that links theory to practice and facilitates a holistic application of information from the classroom setting to the clinical setting. Therefore, the question remains, did the learning strategy of concept mapping used to plan nursing care influence the student’s approach to learning and result in a deep approach or meaningful learning development that is statistically significant compared to those students who plan care using the traditional nursing care plan?

Originally developed as the Study Process Questionnaire (Biggs, 1987), the R-SPQ-2F was revised by Biggs, Kember, and Leung in 2001 through the vigorous parametric testing of items, and was reduced to two factors, each with 10 items that

yields two main scales, Deep Approach (DA), and Surface Approach (SA), with four subscales, Deep Motive (DM), Deep Strategy (DS), Surface Motive (SM), and Surface Strategy (SS). A Cronbach alpha was computed for each subscale and revealed DM=0.62, DS=0.63, SM=0.72, and SS=0.57. The researchers who developed the questionnaire report that all the subscales values reached acceptable levels, which can be interpreted as internally consistent. “The Cronbach alpha values [for the two main scales] are 0.73 for DA and 0.64 for SA in the sample, which are considered as acceptable” (Biggs, Kember, & Leung, 2001, p. 142). However, ideally, Cronbach alphas should be above 0.7, and a value between 0.4-0.7 shows a weak reliability (Houser, 2008). Therefore, because it was not reliable, a Cronbach alpha was tested on this study sample and reported, and a measure of test-retest reliability was run to determine if the instrument was stable over time. Gijbels, Van de Watering, Dochy, and Van den Bossche (2005) have used this instrument and have shown moderate internal reliability with Cronbach alpha values of 0.73 for DA and 0.75 for SA in a study looking at “the relationship between students’ approaches to learning and students’ qualitative learning outcomes” (p. 327). Gijbels, and Dochy (2006) used this instrument in another study that showed Cronbach alphas of 0.77 for DA and 0.76 for SA in their study related to approaches to learning and formative assessment, so there was reason to believe that this study sample could have better reliability as well and it was tested as part of the analysis.

The R-SPQ-2F has 20 questions that can be answered by the students in less than 20 minutes, and students can be directed to answer the questions in relation to the subject most important to them or the course of interest. In this case the students were asked to complete the pre-questionnaire based on their current approach to studying and the post-

questionnaire was based on their approach to studying for this nursing course. There are five responses on a Likert scale ranging from “A--this item is *never* or *only rarely* true of me,” to “E--this item is *always* or *almost always* true of me” (Biggs, Kember, & Leung, 2001, p. 148). The responses are scored from A=1, B=2, C=3, D=4, E=5, and the main scale scores were calculated by adding the 10 specific deep approach response items together, and the 10 specific surface approach response items together. The subscales were calculated by adding the specific 5 responses together for each of the scales.

### Operational Definitions

#### *Variables*

Traditional Nursing Care Plan is an independent variable that was used by the control group of participants to plan nursing care for the clinical experience. The students were taught how to develop a traditional nursing care plan used by the educational facility and the one in which the students used for this course and submitted as part of their clinical work (see Appendix H).

Concept Map Care Plan is an independent variable that was used by the treatment group of participants to plan nursing care for the clinical experience. The students were taught how to develop a concept map care plan through the use of a standardized educational process during this course and they submitted it as part of their clinical work (see Appendix I).

Meaningful Learning is the dependent variable that was measured by the R-SPQ-2F instrument to determine the Deep Approach to learning that correlates with meaningful learning, and the Surface Approach to learning that correlates with rote

learning. Deep Approach has two subscales, Deep Motive and Deep Strategy. Surface Approach has two subscales, Surface Approach and Surface Strategy.

### *Treatment Fidelity*

A Knowledge Structure Score was to be used by the researcher on a sample of concept maps to determine if the treatment intervention was implemented as planned. The criteria were to measure the quality of knowledge change from pre-clinical map to post-clinical map after the clinical experience. The framework developed by Hay (2007) after Jarvis (1993) and Novak (1998) identified three criteria:

- *Non-learning*. Defined by an absence of cognitive change. Non-learning was therefore measured by the lack of new concepts in the second map and by an absence of new links in the extant prior knowledge structure.
- *Rote-learning* [Surface learning]. Defined in two ways. First by the addition of new knowledge. Second by absence of links between the newly acquired concepts and those parts of the prior knowledge repeated in the second map.
- *Meaningful learning* [Deep learning]. Defined by a non-trivial change in the knowledge structure. Thus evidence of meaningful learning comprised the emergence of new links in parts of the prior knowledge structure developed in the course of learning and/or the meaningful linkage of new concepts to parts of the pre-existing understanding (Hay & Kinchin, 2008, p. 173).

Non-learning was be assigned a score of 1, rote learning was be assigned a score of 2, and meaningful learning was be assigned a score of 3.

Complexity Score was used on a sample of care plans to determine if the control and treatment interventions were implemented as planned. The score given to each care



plan was based on concept richness, structure and complexity of propositions that provide the nature of the connection or relationship between concepts, and linkage quality (Hay & Kinchin, 2008). It was organized according to the elements of the nursing process, which are assessment, analysis/nursing diagnoses, planning/client goals, interventions, and evaluation. The complexity score was based on Novak and Gowin's (1984) scoring system that gives Hierarchy 5 points, Propositions 1 point, Cross links 10 points if significant and valid, and 2 points if they are valid but do not show a synthesis between concepts.

#### Data Generation

A demographic survey was administered to each participant for completion at the beginning of the term. The survey asked the participant's program level, previous degrees, gender, marital status, age, number of children, number of hours worked per week, number of credit hours taken in the current term, grade point average, and ethnicity. It was important to collect information about her/his previous experience with concept mapping, explaining whether her/his experience was either in the classroom or clinical setting, what it entailed, and determine if she/he fit the exclusion criteria.

The revised two-factor Study Process Questionnaire provided a score for each student related to a Deep Approach and Surface Approach to learning as well as each of the subscales Deep Motive, Deep Strategy, Surface Motive, and Surface Strategy. These are the elements that were analyzed to determine if a change in learning approach occurred between the pre-test and post-test within each group, and if there was a statistically significant difference between the two groups for the main scales and each of the subscales when the groups were compared.

The End of Term Summary was developed to gather data related to the student's level of interest with this nursing course, her/his level of satisfaction with the classroom and clinical teaching/learning environments, and workload of the course. It was important to gather student comments about the traditional nursing care plan and concept map care plan process, such as the effectiveness of the preparation for the care planning process, satisfaction with the process, and her/his recommendation it be used in future clinical experiences to plan care.

The clinical instructors were asked to complete a short demographic survey at the end of the term to gather data related to the number of clinical sessions, the setting(s), number of students in a group, number of care plans each student completed, and to determine if there were any unusual or unexpected events in the educational environment during the term. It was also helpful to gather information related to the effectiveness of the educational preparation for the clinical instructors and the students for those in the concept map care plan group. Also, an overall effectiveness rating about the teaching strategy used in their clinical group and comments were solicited (see Appendixes N and O).

#### Data Management

Data must be handled in an ethically sound manner that protects the participant's identity, keeps her/his responses confidential, protects her/his rights and minimizes risk to the participants. Approval to conduct the proposed study was given by the Dissertation Committee and the Institutional Review Board for the Protection of Human Participants in Research at University of Northern Colorado, as well as, the Institutional Research Board of the participating university prior to the start of this research study (see

Appendix P). The participants were asked to voluntarily participate in the study and the purpose, design, and procedures were explained. Their questions were answered, they were informed that they could choose to withdraw their data from the study at any time, and there would not be any repercussions from their decision; it will not affect their grade or clinical evaluation in any way. An informed consent was signed by participants explaining the study and provided a contact number for questions or concerns (see Appendix Q).

Responses were reported in aggregate form and no individual's identity was released. Each participant created a unique identifier from the last two digits of their social security number and the last four digits of their phone number that they used on the demographic survey, questionnaire, and end of term summary, as well as, their clinical care plans. The investigator was the only one privileged to the identifiers and kept all surveys, questionnaires, written work, and summaries locked in a file cabinet and all electronic data were password protected. Plans to keep all written and electronic data for a period of five years are in place.

A codebook was developed containing data definitions and identified how data were entered into the database. All forms were checked for completeness, and questionnaires that were incomplete were not included in the database. The data were carefully entered into a database by the investigator, and a second person checked the accuracy of the data entered. Frequencies were run on the data to check for outliers; however, there were no outliers detected. If there had been any, they would have been rechecked against the raw data, and errors corrected (Houser, 2008).

### Data Analysis with Descriptive Terminology

It is important to have appropriate statistical power analysis in the study to have a greater chance of rejecting the null hypothesis when it is false. Four factors need to be considered; sample size, level of significance, directionality, and effect size. The level of significance for this study was  $p$  set at .05, which would be the significance level at which the null hypothesis would be rejected. It is the level commonly used in educational research (Gall et al., 2007). The null hypothesis for this study is neutral indicating the use of a nondirectional hypothesis of statistical significance, which is “a more rigorous test...than directional hypotheses” (Houser, 2008, p. 126). The sample size was determined by the effect size, which was an estimate of the magnitude of the difference in the population. An independent samples t-test was used at an  $\alpha = .05$ , with an estimated large effect size and a statistical power of .7 since “we want to be fairly certain to reject a false null hypothesis” (Gall et al., 2007, p. 146). The effect size indicated that a sample size of 40 participants (20 per group) was needed to attain appropriate statistical power (Olejnik, 1984).

To confirm this estimate, a statistical formula for estimating power and sample size was used to calculate sample size with a two sided hypothesis and  $\alpha = .05$ . Using an estimate of the effect size or difference between the sample means of 2.5-3 divided by an estimated standard deviation of 4.3 at .8 power, squared and multiplied by 2 indicates that a sample size of 32-46 should be used (Cohen, 1970), further supporting the above estimation. The following formula was used to estimate the sample size:

$$n = \frac{(\delta)^2}{2(\mu_1 - \mu_2)^2} \sqrt{\frac{N}{2}}$$

This formula was a standard formula for calculating sample size where the difference between the sample means is divided by the standard deviation that is divided into 2.80, which is the identified delta value at an alpha = .05 and power of .8. The resulting number is squared and multiplied by 2 to arrive at the necessary sample size (Cohen, 1970).

The descriptive variables provided an account of the type of participants in the study. The demographic survey yielded nominal data of gender, marital status, and ethnicity that can be placed in categories. Ordinal data included the participants' age, number of children, number of hours worked per week, number of credit hours taken this quarter, and grade point average. The frequencies and percentages for the data were reported related to these elements. The end of term summary yielded interval data for the areas of interest in nursing course, level of satisfaction with classroom and clinical learning environment, workload of the course, effectiveness of the preparation for the care-planning process, level of satisfaction of the care planning process, and recommendations for future use. The mean, standard deviation and confidence interval for the data were reported related to these elements.

The R-SPQ-2F instrument produced ordinal data for each participant on a scale ranging from 10-50 for the main scales, and 5-25 for the subscales. Descriptive statistics were presented for the control and treatment groups on the R-SPQ-2F instrument in relation to the main scales of Deep Approach and Surface Approach, as well as each of the four subscales to include Deep Motive, Deep Strategy, Surface Motive, and Surface Strategy. The measure of central tendency was reported as mean, and the measure of

variability was reported as standard deviation that was the most stable measure of variability. Inferential statistics and standard error were calculated to reveal if a difference is present and can be attributable to the treatment variable.

“A test statistic is a ratio that compares differences in the data to those that would occur purely by chance because of sampling error” (Houser & Bokovoy, 2006, p. 150). A test of statistical significance is calculated using the sample means and standard deviations to produce a critical value. “The t-distribution... is used to determine the level of statistical significance of an observed difference between sample means” (Gall et al., 2007, p. 139). The z-value is a procedure used to determine if the test statistic value is greater than the (+) critical value or less than the (–) critical value for a two-tailed test. If it is, then it is considered to be statistically significant and the null hypothesis is rejected. If the test statistic is large, there is a large effect size and vice versa. The researcher determines if the difference represents an important effect in practice (Houser, 2008).

A confidence interval was determined to indicate how precise the estimates of the findings were in relation to reality. A confidence interval was calculated for the difference between the two means. “Confidence intervals get larger as they get more precise; they get smaller as they get more accurate” (Houser, 2008, p. 465). The confidence interval will give the researcher the ability to decide if the findings are precise enough to be generalized.

### Summary

A quasi-experimental research design was planned using a convenience sample of students from an accredited baccalaureate program in the Midwest. All participants completed a demographic survey initially, the revised two-factor Study Process

Questionnaire at the beginning and at the end of the quarter, along with an end of term summary. The control group used a traditional nursing care plan during the spring quarter and the treatment group used a concept map care plan during the fall quarter to plan nursing care. Both groups received education by their instructors related to the type of care plan they used for clinical preparation and care planning that quarter.

The study was conducted using appropriate ethical considerations. The dissertation committee and Institutional Review Board for the Protection of Human Participants in Research at University of Northern Colorado and the Institutional Research Board of the university who agreed to participate provided approval of this proposed dissertation research before the study was implemented. The participants signed an informed consent, and the data were collected and stored appropriately. Data were systematically entered into a database, checked for accuracy, and entered into a statistical program. The data were analyzed using statistical tests commonly used for the type of data collected and addressed the null hypothesis. A final report of this analysis, summary, and discussion was written in subsequent chapters, and defense was presented to the dissertation committee and scholarly community.

## CHAPTER IV

### ANALYSIS

The research study was conducted at an accredited baccalaureate-nursing program in the Midwest as planned. The data were gathered from each of the student participant's demographic survey, the pre- and post-questionnaires, and end of term summary, entered into a Microsoft Excel table, and was double-checked for accuracy. The data were entered and analyzed using SAS (Statistical Analysis Software, 1999, version 8) to determine if there was a statistically significant difference in meaningful learning between the control group who used the traditional nursing care plan throughout the spring quarter and the treatment group who used the concept map care plan throughout the fall quarter. In this chapter, the results of the demographic characteristics, the pre- and post-questionnaire findings, the end of term summary, and the care plans of the participants in both the control and treatment groups are presented. Also, the findings from the demographic survey for the clinical instructors are included.

The participating university gave permission to the researcher to invite the 105 students who were enrolled in the Nursing Process II course in the spring and fall quarters the opportunity to participate in the research study. The spring course (control group) initially had 28 participants; although 9 students did not complete the post-questionnaire giving that group a 32% drop out rate. The fall course (treatment group) initially had 66 participants; although 43 students did not complete the post-questionnaire



giving that group a 65% drop out rate. The results are based on the student participants for whom the data were available both pre- and post-intervention: 19 in the traditional nursing care plan (control group), and 23 in the concept map care plan (treatment group).

### Demographic Survey

The demographic findings from the control and treatment groups are presented (see Table 2). As is typical for the profession of nursing, 89 and 91% of the participants were female, with 9 and 11% of participants being male. Most of the participants (83 and 84%) were at the junior level and had no previous degree. The majority of the participants were single (53 and 74%), in the traditional college student age range of 18-24 years (53 and 74%), did not have children (74 and 83%), and were of Caucasian American ethnicity (83 and 95%). One person from each group did not answer the ethnicity question. Twenty-six percent of the participants did not work, with a fairly even distribution working between 1-10 hours, 11-20 hours, and 21-30 hours; however, the control group did have 16% who worked 31-40 hours. There were statistically significant differences  $p=.02$  in the credit hours the participants were enrolled in with 87% of the concept map group taking 13-18 credit hours of classes, while 53% of the traditional nursing care plan group took 13-18 credit hours, and 5% took 1-6 credit hours. Also, 61% of participants in the concept map group held a grade point average (GPA) of 3.6-4.0, 9% held a GPA of 2.6-3.0, and 4% held a GPA less than 2.5, and 74% of the participants in the traditional care plan group held a grade point average of 3.1-3.5% with a  $p=.01$ . This could be explained by the fact that more of the participants in the traditional nursing care plan group were married, worked, were of a nontraditional age, and had increased demands, so took fewer credit hours, and had a lower grade point average. The

demographic characteristics were compared between groups using Fisher's Exact tests due to the small expected cell counts (Agresti, 1991). The data are presented as frequency and percentage for each group.

Table 2

*Demographic Characteristics of Participants*

	Concept Map n=23		Traditional n=19		Compare Groups (Fisher's Exact Test)
	frequency	%	frequency	%	P-value
Program Level					1.0
Junior	19	83%	16	84%	
Senior	4	17%	3	16%	
Previous Degree					0.1
Yes	4	17%	8	42%	
No	19	83%	11	58%	
Gender					1.0
Female	21	91%	17	89%	
Male	2	9%	2	11%	
Marital Status					0.2
Single	17	74%	10	53%	
Married	4	17%	8	42%	
Divorced/Separated/ Widow	2	9%	1	5%	
Age					0.3
18-24 years	17	74%	10	53%	
25-31 years	4	17%	6	32%	
32-38 years	2	9%	1	5%	
39+ years	0	0%	2	11%	

	Concept Map n=23		Traditional n=19		Compare Groups (Fisher's Exact Test)
	frequency	%	frequency	%	P-value
Children					0.6
None	20	87%	14	74%	
1-2 children	2	9%	3	16%	
3-4 children	1	4%	2	11%	
Hours employed					0.5
None	6	26%	5	26%	
1-10 hours	5	22%	4	21%	
11-20 hours	7	30%	4	21%	
21-30 hours	5	22%	3	16%	
31-40 hours	0	0%	3	16%	
Credit hours					0.02
1-6 credits	0	0	1	5%	
7-12 credits	3	13%	8	42%	
13-18 credits	20	87%	10	53%	
Grade point avg.					0.01
< 2.5 GPA	1	4%	0	0%	
2.6-3.0 GPA	2	9%	0	0%	
3.1-3.5 GPA	6	26%	14	74%	
3.6-4.0 GPA	14	61%	5	26%	
Ethnicity					0.08
Caucasian America	21	95%	15	83%	
Asian/Oriental American	1	5%	0	0%	
Other/Multi Racial American	0	0%	3	17%	

### Pre- and Post-Questionnaire

The outcomes were measured using the main scales (deep approach and surface approach) and subscales (deep motive, deep strategy, surface motive, and surface strategy) of the R-SPQ-2F before and after intervention in both groups. Main scale scores and subscale scores were not significantly different between groups before (Deep Approach  $t=-1.39$ ,  $df\ 40$ ,  $p=0.17$ , Surface Approach  $t=0.33$ ,  $df\ 40$ ,  $p=0.74$ ) (see Table 3) or after (Deep Approach  $t=-0.48$ ,  $df\ 40$ ,  $p=0.64$ , Surface Approach  $t=0.59$ ,  $df\ 40$ ,  $p=0.56$ ) (see Table 4) intervention; all  $p$ -values  $> 0.05$ . The changes from pre to post were not significant within or between groups (Deep Approach  $t=-0.58$ ,  $df\ 40$ ,  $p=0.56$ , Surface Approach  $t=-0.35$ ,  $df\ 40$ ,  $p=0.73$ ) (see Table 5). Lack of statistical significance could be due in part to the small sample sizes (low statistical power); however, the magnitude of the changes from pre to post was not substantial regardless of their statistical significance.

The mean scores for the R-SPQ-2F main scales and subscales were compared between groups' pre-intervention, post-intervention, and as the change from pre to post. After assessing the assumptions of normality with Shapiro-Wilk tests (see Table 6) (Shapiro & Wilk, 1965), groups were compared using Student's T-test (Neter, Wasserman, & Kutner, 1985); two-sided  $p$ -values are reported. Data are presented as mean, standard deviation (SD), and 95% confidence interval (CI) for the mean of the control and treatment groups. The 95% confidence intervals on the mean changes within a group also provide a mechanism to evaluate significant change within that group alone. A CI that contains 0 indicates no significant change from pre to post within that group.

Table 3

*Pre-Intervention Mean Response to R-SPQ-2F Scales for Concept Map Care Plans versus Traditional Nursing Care Plans*

	Concept Map (treatment group) n=23			Traditional (control group) n=19			Compare Groups df=40	
	mean	SD	95% CI	mean	SD	95% CI	Test Statistic	P- value
<b>Main Scales</b>								
Deep Approach	29.57	4.95	[27, 32]	31.58	4.32	[29, 34]	-1.39	0.17
Surface Approach	22.57	4.25	[21, 24]	22.05	5.84	[19, 25]	0.33	0.74
<b>Subscales</b>								
Deep Motive	15.17	2.55	[14, 16]	16.11	1.94	[15, 17]	-1.31	0.20
Deep Strategy	14.39	2.90	[13, 16]	15.47	2.76	[14, 17]	-1.23	0.23
Surface Motive	9.52	2.63	[8, 11]	8.89	2.60	[8, 10]	0.77	0.44
Surface Strategy	13.04	2.80	[12, 14]	13.16	3.96	[11, 15]	-0.11	0.91

SD standard deviation; CI is confidence interval for the mean; test statistic is from

Student's T-test and p-value is two-sided.

Table 4

*Post-Intervention Mean Response to R-SPQ-2F Scales for Concept Map Care Plans versus Traditional Nursing Care Plans*

	Concept Map (treatment group) n=23			Traditional (control group) n=19			Compare Groups df=40	
	mean	SD	95% CI	mean	SD	95% CI	Test Statistic	P- value
<b>Main Scales</b>								
Deep Approach	29.78	6.19	[27, 32]	30.68	5.95	[28, 34]	-0.48	0.64
Surface Approach	24.30	5.61	[22, 27]	23.16	7.01	[20, 27]	0.59	0.56
<b>Subscales</b>								
Deep Motive	15.70	3.24	[14, 17]	15.68	3.53	[14, 17]	0.01	1.0
Deep Strategy	14.09	3.30	[13, 16]	15.00	2.77	[14, 17]	-0.96	0.34
Surface Motive	11.39	3.68	[10, 13]	10.42	3.95	[9, 12]	0.82	0.42
Surface Strategy	12.91	3.26	[12, 14]	12.74	3.71	[11, 15]	0.16	0.87

SD standard deviation; CI is confidence interval for the mean; test statistic is from

Student's T-test and p-value is two-sided.

Table 5

*Mean Change (pre minus post) in Response to R-SPQ-2F Scales for Concept Map Care Plans versus Traditional Nursing Care Plans*

	Concept Map (treatment group) n=23			Traditional (control group) n=19			Compare Groups df=40	
	mean	SD	95% CI	mean	SD	95% CI	Test Statistic	P- value
<b>Main Scales</b>								
Deep Approach	-0.22	5.95	[-3, 2]	0.89	6.42	[-2, 4]	-0.58	0.56
Surface Approach	-1.74	5.81	[-4, 1]	-1.11	5.85	[-4, 2]	-0.35	0.73
<b>Subscales</b>								
Deep Motive	-0.52	3.15	[-2, 1]	0.42	3.37	[-1, 2]	-0.94	0.36
Deep Strategy	0.30	3.44	[-1, 2]	0.47	3.58	[-1, 2]	-0.16	0.87
Surface Motive	-1.87	3.65	[-3, 0]	-1.53	3.73	[-3, 0]	-0.30	0.77
Surface Strategy	0.13	3.31	[-1.3, 2]	0.42	3.89	[-1, 2]	-0.26	0.79

SD standard deviation; CI is confidence interval for the mean; test statistic is from

Student's T-test and p-value is two-sided.

Table 6

*Shapiro-Wilk Tests for Normality*

	Pre		Post		Change	
	Concept map	Traditional	Concept map	Traditional	Concept map	Traditional
Deep Approach	0.95 P=0.25	0.94 P=0.26	0.98 P=0.89	0.96 P=0.48	0.94 P=0.20	0.94 P=0.26
Surface Approach	0.96 P=0.53	0.96 P=0.61	0.98 P=0.84	0.93 P=0.15	0.97 P=0.65	0.97 P=0.75
Deep Motive	0.93 P=0.11	0.92 P=0.13	0.97 P=0.71	0.96 P=0.51	0.96 P=0.39	0.95 P=0.40
Deep Strategy	0.97 P=0.63	0.97 P=0.68	0.95 P=0.26	0.96 P=0.62	0.97 P=0.77	0.91 P=0.08
Surface Motive*	0.86 P=0.004	0.9 P=0.06	0.97 0.59	0.92 P=0.13	0.96 P=0.44	0.97 P=0.79
Surface Strategy	0.93 P=0.09	0.96 P=0.64	0.96 0.53	0.94 P=0.26	0.94 P=0.16	0.94 P=0.30

Data presented as Shapiro-Wilk test statistic and P= p-value

\* The PRE surface motive data suggest a non-parametric test might be necessary.

However, the Wilcoxon rank sum test statistic of 374 and p-value 0.39 are consistent with the t-test. For continuity of the table, will rely on the robustness of the t-test and leave the t-test statistics as is. Otherwise, the p-values are above .05 so fail to reject the null hypothesis that the data are normally distributed.



A Cronbach alpha (Cronbach, 1951) was calculated as a measure of internal consistency of the items within a scale pre- and post-intervention. The internal consistency as measured by Cronbach alpha, for the main scales were acceptable at 0.78 each on the post-questionnaire (see Table 7). However, Cronbach alpha levels were low (less than 0.70) on the pre-questionnaire and for most of the subscales on the post-questionnaire. Typically, values of 0.70 or higher are desirable.

Table 7

*Cronbach Alpha*

	Pre	Post
N	42	42
Deep Approach	0.64	0.78
Surface Approach	0.67	0.78
Deep Motive	0.15	0.65
Deep Strategy	0.51	0.54
Surface Motive	0.46	0.74
Surface Strategy	0.62	0.65

Since the Cronbach alpha values were low, a Pearson's Correlation was performed as a test-retest for reliability correlation between the pre and post scores for each group and the group overall (see Table 8). Correlations of .6 to .8 indicate a moderately strong relationship; otherwise there is a concern with the reliability of the instrument. Most of the values in the Pearson Correlation were under .6, those .4 to .6 indicate a moderate relationship, and those .2 to .4 indicate a weak relationship.

Table 8

*Pearson Correlation Between Pre and Post Score-Overall and by Group*

	Overall N=42	Concept Map N=23	Traditional N=19
Deep Approach	0.37	0.45	0.25
Surface Approach	0.49	0.33	0.60
Deep Motive	0.38	0.43	0.35
Deep Strategy	0.32	0.39	0.16
Surface Motive	0.40	0.37	0.41
Surface Strategy	0.45	0.41	0.49

## End of Term Summary

There was not a significant difference between groups in the areas of interest in nursing course, satisfaction with classroom and clinical learning environments, and workload. The End of Term Summary revealed a statistically significant difference between the students in the control group who used the traditional nursing care plan and the students in the treatment group who used the concept map care plan. The traditional nursing care plan participants reported higher levels of effectiveness of preparation for their respective care plan process (Wilcoxon = 498.5,  $p < 0.001$ ), higher satisfaction with their respective care plan process (Wilcoxon = 481.5,  $p < 0.001$ ), and higher recommendation for use in the future (Wilcoxon = 461.5,  $p < 0.001$ ). The End of Term Summary questions are described with the mean, standard deviation, 95% confidence interval, median, and interquartile range by group, and compared using Wilcoxon two-sample test statistic (see Table 9). Levels of satisfaction were rated on a scale from 1 (low) to 5 (high).

Table 9

*End of Term Summary*

	Concept Map (treatment group) n=22			Traditional (control group) n=17			Compare Groups	
	Mean SD Median		95% CI IQR	Mean SD Median		95% CI IQR	Wilcoxon 2-sample Test Statistic	P- value
Interest in nursing course	4.3 mean	0.6 SD	[4.0, 4.6] CI	4.1	1.1	[3.5, 4.7]	336.0	0.92
	4.0 median		[4, 5] IQR	5.0		[3, 5]		
Satisfaction... classroom learning environment	3.9	0.7	[3.5, 4.2]	3.6	1.1	[3.0, 4.2]	311.0	0.40
	4.0		[4, 4]	3.0		[3, 5]		
Satisfaction with clinical learning environment	4.5	0.6	[4.2, 4.7]	4.4	0.8	[4.0, 4.8]	343.5	0.92
	4.5		[4, 5]	5.0		[4, 5]		
Satisfaction with workload	3.8	0.8	[3.4, 4.1]	3.5	0.7	[3.1, 3.8]	300.5	0.24
	4.0		[3, 4]	3.0		[3, 4]		
Effectiveness of preparation for ... care plan process	2.3	1.0	[1.9, 2.8]	4.1	0.7	[3.7, 4.4]	498.5	<0.001
	2.0		[2, 3]	4.0		[4, 4]		
Satisfaction with ... care plan process	2.5	1.1	[2.0, 2.9]	4.0	0.8	[3.6, 4.4]	481.5	<0.001
	3.0		[2, 3]	4.0		[4, 4]		
Recommend for future use	2.5	1.1	[2.0, 3.1]	3.9	0.9	[3.4, 4.3]	461.5	<0.001
	3.0		[2, 3]	4.0		[3, 4]		

SD standard deviation; CI is confidence interval for the mean; IQR is interquartile range [25<sup>th</sup>, 75<sup>th</sup> percentile], test statistic is from Wilcoxon two-sample test, t-approximation two-sided p-value.

Students were invited to share their comments about the care planning process they used during the study. One student in the traditional nursing care plan group commented, “I realize it’s valuable to effectively learn care plans, however, nurses working on the floors ‘in real life’ state they never go into much depth-especially the kind we did. The length of time going into the care planning process was astronomical (to perform a well thought out one). I can’t imagine doing this for more than one patient.” The students in the concept map care plan group commented, “I believe the template [example of concept map care plan] in class was more in depth and made more sense than the concept map,” “They were difficult to follow. I was concerned I would forget something and provide poor care,” “Concept maps are worthless and too confusing to read,” “Didn’t have time to focus on it after doing regular care plan,” and “It was difficult to set up a template. Just need handouts instead of having nursing students create them on word or draw them out.”

#### Demographic Survey for Clinical Instructors

There were six clinical instructors for 13 different clinical groups for the control group in the spring quarter, and seven clinical instructors for 14 different clinical groups for the treatment group in the fall quarter with each instructor having between one and four clinical groups. Demographic surveys from two clinical instructors were returned for six clinical groups during the control group quarter, and from two clinical instructors for five clinical groups for the treatment group quarter. There were two new clinical instructors during the fall quarter for the treatment group (see Table 10).

The TNCP group (control group) had a mean of 4 clinical sessions in which they cared for clients. They reported a mean of 7.8 students per clinical group, and completed

a mean of 4.5 traditional nursing care plans. There were no unusual or unexpected events during the quarter, and one instructor reported that he had one student drop the course. Levels of effectiveness were rated on a scale of 1=poor, 2=average, 3=good, and 4=very good. The effectiveness of the traditional nursing care planning process was rated a mean of 3.

The CMCP group (treatment group) had a mean of 4.8 clinical sessions in which they cared for clients. They reported a mean of 7.4 students per clinical group, and completed a mean of 2 concept map care plans. There were no usual or unexpected events during the quarter, and one instructor commented that many clients were discharged by the clinical day and the work the students did on the concept maps reflected their preparation for clinical the night before. Levels of effectiveness were rated on a scale of 1=poor, 2=average, 3=good, and 4=very good. The effectiveness of the concept map care plan process was rated a mean of 1.2. The instructors rated the effectiveness of their educational preparation a mean of 2.8, and the effectiveness of the student's preparation 1.2. One instructor commented that the "concept maps are a new format for students and many found them hard to fill out. Since this is the first clinical it is hard for students to understand how all the pieces connect." Another instructor had a similar comment, "Just feel it's hard for them at this level to complete. Most have trouble coming up with a good nursing diagnosis, since they just learned about it. I feel it would be more successful at a higher level class."

Table 10

*Demographic Survey for Clinical Instructors*

	Traditional Nursing Care Plan	Concept Map Care Plan
Clinical Instructors	6	7 (5 from previous quarter)
Surveys Returned	2	2
Clinical Groups	13	14
Surveys Returned	6	5
Clinical Sessions	4	4.8
Students per Group	7.8	7.4
Number of Care Plans Completed in Clinical	4.5	2
Effectiveness of Care Plan Method	3 on 1-4 scale	1.2 on 1-4 scale
Effectiveness of Instructor's Educational Preparation		2.8 on 1-4 scale
Effectiveness of Student's Educational Preparation		1.2 on 1-4 scale

## Students' Care Plans

Students were encouraged to submit their first and last care plans for review to confirm they had completed the identified care plan for that quarter. The researcher reviewed the care plans for treatment fidelity, as well as, changes between the first and last care plans related to the student's level of thinking and depth of understanding. In the traditional nursing care plan group, there were fourteen students who submitted their first care plan, and ten students who submitted their last care plan for review. In the concept

map care plan group there were fourteen students who submitted their first care plans, and twelve students that submitted their last care plans (see Table 11).

The researcher evaluated the traditional nursing care plans and the concept map care plans for completeness using a complexity score. The complexity scores were determined by using Novak and Gowin's (1984) scoring method where hierarchy was given 5 points, propositions were given 1 point, cross links were given 10 points if significant and valid, and 2 points if valid but did not show synthesis into the map as a whole.

Ten students (52.6%) in the traditional nursing care plan group submitted their first and last care plans for review. The mean score of their first care plans was 26 with SD 2.1, and ranged in scores from 25-30, and the last care plans had a mean score of 28.4 with SD 2.17, and ranged in scores from 25-30. Six students showed an increase in their scores from first to last, and four student's scores remained the same. Overall, there did seem to be improvements in the completeness of the nursing diagnoses and nursing interventions from the first to the last, although it does appear, based on the dates of the care plans, that these were completed two weeks apart. The traditional nursing care plans received seemed to be a mixture of pre- and post-clinical care plans.

Twelve students (52.2%) in the concept map care plan group submitted their first and last care plans for review. The mean score of the first care plans was 30.58 with SD 10.78, and ranged in scores from 10 to 43, and the last care plans had a mean score of 33.08 with SD 10.93, and ranged in scores from 11 to 43. Eight students showed an increase in their scores from first to last, two student's scores remained the same, and two student's scores showed a decrease between the first and last care plan. Overall, there did

seem to be improvement in concept richness and structure from the first to the last care plans completed despite having only one week between the two care plans.

The care plans could not be evaluated based on knowledge structure scoring as planned, due to the researcher not receiving pre-clinical and post-clinical concept maps for comparison. The concept map care plans received appeared to be a mixture of pre- and post-clinical care plans. Previous research conducted by Daley, et al. (1999) and Novak and Gowin (1984) also revealed an increase in complexity of the concept map over time.

Table 11

*Students' Care Plans*

	Traditional Care Plan			Concept Map Care Plan		
	n=10 (52%)			n=12 (52.2%)		
	Mean	SD	Range	Mean	SD	Range
First Care Plan	26	2.1	25-30	30.58	10.78	10-43
Last Care Plan	28.4	2.17	25-30	33.08	10.93	11-43

### Summary

The results of the findings from the Demographic Survey, Pre- and Post-Questionnaire, and End of Term Summary from the student participants were provided in written and table formats. The Demographic Survey for Clinical Instructor findings with comments, and the students' care plans with comments were provided in written and table formats. The next chapter will present the summary and discussion of the analysis, limitations, and conclusions.



## CHAPTER V

### SUMMARY AND DISCUSSION

This quasi-experimental research study was conducted to determine if there was a significant difference in meaningful learning development between baccalaureate nursing students who plan nursing care using a traditional nursing care plan compared to those who plan nursing care using a concept map care plan. The revised two-factor Study Process Questionnaire (R-SPQ-2F) was used in a pre-test/post-test design to collect data from baccalaureate nursing students from an accredited nursing program in the region that were enrolled in a Nursing Process II course during the spring (control group) and fall quarters (treatment group). The control group used a traditional nursing care plan, and the treatment group used a concept map care plan in the classroom and clinical setting to plan and deliver nursing care. The findings revealed there was no statistically significant difference in meaningful learning development between the two groups of students. However, it is highly likely that a type II error exists, due to both sampling and measurement error. The following chapter will present the summary and discussion of the results, along with the discussion of the probability of a type II error and the implications it has on the findings. The challenges encountered in the research process will be explained, and the limitations of the study will be presented along with suggestions for future research. The strengths of the research, the implications for nursing education, and the conclusions will close the chapter.

## Significance of the Data Found

### *Pre- and Post-Questionnaire*

The revised two-factor Study Process Questionnaire was used to measure the students approach to learning before and after they learned about the type of care plan method they would use for that quarter. The R-SPQ-2F questionnaire measures the degree to which the students use the deep and surface learning approaches in the educational environment. The deep approach to learning equates to the intention of seeking to understand information in a meaningful way, and the surface approach to learning equates to the intention of memorizing information in a rote-learning manner. The data revealed there was no statistically significant difference in meaningful learning between the groups who used the traditional nursing care plan, and those who used the concept map care plan in the clinical setting.

The pre-questionnaire scores in both groups for the Deep Approach were similar as were the Surface Approach scores for both groups, with the Deep Approach scores being higher than the Surface Approach scores in both groups, and having less variability in the responses. This indicates the students were using primarily a Deep Approach to learning. The greatest component of that score was the Deep Motive subscale for each group that indicates the students are intrinsically motivated, and approach studying in a manner to achieve a level of competency in their academic subjects of interest. The Deep Strategy subscale scores were the next highest in both groups, indicating there was an intention to relate new knowledge with previously learned, relevant knowledge. The Surface subscale scores were similar as well, with the Surface Strategy scores revealing that there were times when the students learned through rote memorization with the

intention of reproducing targeted, essential information, for example, information that could be on an examination. The Surface Motive scores from each group were the lowest, and contributed the least to the Surface Approach scores. This indicated that fewer students had the intention of only doing what is necessary to minimally meet the requirements for their classes (Kember et al., 1995).

The post-questionnaire scores in both groups continued to show higher Deep Approach scores than Surface Approach scores. However, there was a decrease in the Deep Approach scores for the traditional nursing care plan group, and an increase in the Deep Approach scores for the concept map care plan approach. The Surface Approach scores for both groups increased, and there was more variability in the scores in general. The subscale scores remained in the same relative order as the pre-questionnaire with Deep Motive and Deep Strategy being the highest, and Surface Strategy and Surface Motive being lower. However, Surface Motive had increased in both groups suggesting more of an intention to do only what is minimally required by the end of the quarter.

The control group who used the traditional care plan had a decrease in the mean score for the Deep Approach scale (pre minus post of 0.89, SD 6.42,  $p= 0.56$ ), and an increase in the Surface Approach scale (pre minus post of  $-1.11$ , SD 5.85,  $p= 0.73$ ) from pre to post measurements. This group had a decrease in the subscales mean scores for the Deep Motive (0.42, SD 3.37,  $p= 0.36$ ), Deep Strategy (0.47, SD 3.58,  $p= 0.87$ ), and Surface Strategy (0.42, SD 3.89,  $p= 0.79$ ), and an increase in the mean scores for the Surface Motive ( $-1.53$ , SD 3.73,  $p= 0.77$ ) scales from pre to post measurements. Ignatavicius (2004) has identified the traditional nursing care plan to be a less active learning strategy that would typically result in a promotion of a surface learning

approach, and a lessening of the deep or meaningful learning approach. In a study by August-Brady (2005) where she tested the mega-cognitive intervention of concept map care plans, a similar finding was revealed in the control group that demonstrated a statistically significant decrease in the Deep Approach to learning, and an increase in the Surface Approach to learning used by students.

The treatment group who used the concept map care plan had an increase in both the mean scores for the Deep Approach (pre minus post  $-0.22$ , SD 5.95,  $p=0.56$ ), and Surface Approach (pre minus post  $-1.74$ , SD 5.81,  $p=0.73$ ) scales from pre to post measurements. This group had an increase in the mean scores for Deep Motive ( $-0.52$ , SD 3.15,  $p=0.36$ ), and Surface Motive ( $-1.87$ , SD 3.65,  $p=0.77$ ) scales, and decrease in the mean scores for Deep Strategy ( $0.30$ , SD 3.44,  $p=0.87$ ), and Surface Strategy ( $0.13$ , SD 3.31,  $p=0.79$ ) scales from pre to post measurements. Novak and Gowin (1984) in their research related to the use of concept maps have shown more of a dramatic change in the learner's understanding that would have been demonstrated as an increase in deep or meaningful learning, and a decrease in the surface approach to learning.

There is a tendency over time for deep approach scores to decrease, especially in higher education. Students may have a predominately deep or surface approach to learning, "however this preferred approach can be modified by the teaching context or learning environment for individual course or particular learning tasks" (Kember et al., 1997, p. 4). Efforts should be made to introduce more meaningful forms of learning, and measure the effectiveness over time. If an innovation can demonstrate an increase in the deep approach score it is considered to have "achieved something quite significant" (Kember, et al., p. 6). There is also value in the deep approach scores not decreasing, and

indicates some level of achievement. Since there was no statistically significant change in the deep approach scores for either type of nursing care plan used in this study, the data provided insufficient evidence to determine which method of care planning would offer the most meaningful learning development for students.

Kember (1996) has researched and introduced another aspect for consideration, “the intention to both memorize and understand” (p. 341). The evidence he cites suggests that some students who have the intention to learn meaningfully use the deep approach, as well as, the surface approach when they determine it fits the situation. For example, when the educational environment requires students to reproduce information for examinations, as most do, or complete certain learning tasks, students may employ both approaches to learn. The student begins with the intention to understand, but finds it useful to memorize specific facts that will help her/him to do well on the exam at a later time. Likewise, students who have the intention to memorize or use a surface approach to learning can use a deep approach to learning or seek to understand the information in a more meaningful way if it helps to facilitate the memorization process. It would be reasonable for nursing students to perhaps use both approaches to learning because of the nature of nursing, and the need to acquire and maintain knowledge for an extended period of time, for course exams, the National Certification Licensure Examination for Registered Nurses, and their future nursing careers. The data from this study supports a predominately deep approach used by students, with students identifying the surface approach responses as ‘sometimes true of me’ to a lesser extent. “The learning environment [and, the need to develop a foundation of knowledge] influences the study approach which students adopt” (p. 352).

Whenever the findings in a research study do not demonstrate a statistically significant difference, a concern must be raised that a type II error has occurred. A type II error is “the probability of failing to detect a difference that actually exists” (Verrill & Durst, 2005, p. 287). In this study, it is highly likely that there is a type II error from a sampling error, as well as, a measurement error.

The probability that a sampling error has occurred will be explored first. The initial power analysis estimate was based on a  $p = .05$  (5% type I error), a nondirectional hypothesis, estimated large effect size, and statistical power of .7 (30 % type II error) that supported a sample size of 40 participants. The large estimated effect size was based on the literature findings, and previous studies that suggested concept maps used in the educational setting were a powerful learning tool. Novak (1998) identified that students could be educated easily by their instructors, and with some practice over a two to four week period could use this tool that would exponentially impact their learning ability. This study was designed to detect a “useful,” large difference. This study was not designed to detect small effect sizes, and would educators be interested in small effect sizes? Even if the study would have had enough subjects to show a statistically significant difference, would the small-observed differences be compelling enough to advocate for one type of care plan over the other? It is important to have a balance between statistical significance and substantial differences.

If one increases the number of participants, one will increase the power of the study, and in turn decrease the risk of a type II sampling error. It would be worthwhile in the future to conduct this study again using a larger sample size. If the power analysis was calculated using  $p = .05$  (5% type I error), large effect size of .8, and .8 power (20%

type II error) then  $n = 25$  per group or a sample of 50 would be indicated. If the power analysis was calculated using  $p = .05$  (5% type I error), large effect size of .8, and .9 power (10% type II error) then  $n = 33$  per group or a sample of 66 would be necessary. If there was fear that the effect size was still being overestimated, and if a medium effect size was being estimated, using  $p = .05$ , and statistical power was .7 (30% type II error), then the sample size would need to be 100, and even larger as the power was increased in an effort to decrease the chance of a type II sampling error.

The probability that a type II measurement error occurred needs to be considered as well. Cronbach's alpha was run on the data to determine the internal reliability of the revised two-factor Study Process Questionnaire instrument. The Deep and Surface Approach main scales on the post-questionnaire were above the desired level of .7 as both were .78, and the Surface Motive subscale value on the post-questionnaire was .74 demonstrating moderate reliability, otherwise, the remaining values were between .4 to .7 showing weak reliability, and Deep Strategy subscale on the pre-questionnaire was unacceptable as it was below .4. This indicates a large amount of measurement error within the instrument, although this can be sensitive to sample size as well.

A test-retest for reliability of the instrument was computed using a Pearson Correlation between pre and post scores, and overall by group. The Surface Approach scale in the traditional care plan group demonstrated a moderately strong relationship at .6, the goal of this testing; otherwise, half the scales demonstrated a moderate relationship as they measured between .4 to .6, and half the scales demonstrated a weak relationship as they measured between .2 to .4, and the Deep Strategy scale was less than .2 indicating no relationship. Overall, the revised two-factor Study Process Questionnaire through both

the Cronbach alpha and the Pearson Correlation analysis demonstrated a moderate to weak reliability, with only a few data points being in the desired moderately strong range.

Whenever one is using sums of ordinal data as in the R-SPQ-2F, where the participants' answers are based on a Likert scale, one must determine that the data is normally distributed. Frequency distributions were analyzed and depicted as histograms (see Appendix R) to demonstrate the data were normally distributed. A t-test was used to analyze the pre- and post-questionnaire data, which is dependant on a normal distribution. Therefore, it is important to determine that the data were normally distributed, and confirm that the correct statistical test was run on the data. Also, the data were analyzed using the Shapiro-Wilk test for normality with the stated null hypothesis that the data is normally distributed. The p values were all above .05 (except one) so the findings fail to reject the null hypothesis. A Wilcoxon rank sum test statistic was run on the one value that was below .05, and it demonstrated a value of 374 and  $p = 0.39$  that were consistent with the t-test. Based on these findings, and the robustness of the t-test, the t-test statistic was left as is. The histograms provided a visualization of the actual distributions, and the Shapiro-Wilk test statistics support the data were normally distributed indicating the proper test statistic was used in the analysis of the data.

In designing a research study care must be taken to reduce the risk of a type II error from both sampling and measurement error perspectives. This study should be conducted again with a larger sample size, so that a type II error can be definitively ruled out. Also, finding a measurement tool that has reliability statistics that demonstrate stability over time is important to the reduction of measurement error, and to increase the reliability of the findings.



*End of Term Summary*

In the End of Term Summary, the concept map care plan group reported similar, although slightly higher scores than the traditional nursing care plan group with the interest in nursing course, satisfaction with the classroom and clinical learning environments, and workload of the course, although there was not a statistically significant difference in the scores revealed between the groups. There was a statistically significant difference in scores related to the effectiveness of the preparation for the care plan process, satisfaction with the care plan process, and recommendation for future use, with the concept map care plan group scoring these much lower than the traditional nursing care plan group.

The fall quarter was the first time the course and clinical instructors had taught and used the concept map care plan in the course. Potentially, this was felt to be a strength of the study, as the students would not have previous influence of any other type of care plan, and would be purely influenced by the concept map care plan process. However, apparently the instructors were not comfortable with the concept map care plans, and had a difficult time accepting the new method as agreed upon in our meetings and informed consent. In class, they chose to teach the students the traditional nursing care plan method first, and then branch off and teach the concept map care plan method. The use of the traditional nursing care plan continued into the clinical setting and instead of just having the students complete the concept map care plans, there was evidence the students were completing both kinds of care plans with the concept map being “extra work.” The evidence supporting these findings are the students’ comments, “It was a hard process to learn during the time I was learning and implementing the other process,” “I

didn't have time to really focus on it after doing the regular care plan," and the researcher received student assignments that had both types of care plans included. Using both types of care plans throughout the fall quarter had the potential of diluting out the affects the concept map care plan could have had independently on the findings of the post-questionnaire, and could have prevented the data from demonstrating a greater difference in the student's approach to learning.

#### *Demographic Survey for Clinical Instructors*

The self-study educational plan for clinical instructors appeared to prepare the instructors with average to good knowledge about concept map care plans. The clinical instructors (n=2) of five clinical groups rated the preparation for the concept map care plan process as a mean of 2.8 with 2 being average and 3 being good. However, it did not appear to prepare the instructors adequately to be able to teach the students about the concept map care plan process. This resulted in the students feeling that they were not effectively prepared for the process. They struggled with understanding it and would not recommend it to be used in the future. Removing the researcher from this educational process was an effort to prevent bias from being introduced into the study. In a study by August-Brady (2005), she provided a two-hour educational session for the instructors, and a one-hour session for students related to the concept map care plan process. The data in that study revealed statistically significant differences between pre- and post-questionnaire findings in the areas of deep and surface learning approaches.

This lack of a full understanding on the part of the instructors and students may have been responsible for the students only completing two concept map care plans in clinical rather than four as they had agreed upon. The evidence supporting this was the

fact that the dates on the care plans were one week apart and were suppose to be the first and last care plans. The Demographic Survey for Clinical Instructors revealed a mean of 2 concept map care plans completed, and the students confirmed this as well, compared to the mean of 4.5 in the traditional care plan group reported by the clinical instructors in the control group, with students reporting a mean of 3.9 TNCP being completed in clinical. However, the course instructor did use a case study to teach the students the care planning process in class, and the researcher had provided a case scenario practice activity that the clinical instructors used as part of clinical lab for a teaching example. So the students did complete four concept map care plans in total between classes and clinical during the quarter. Novak (1998) has identified that students need to learn and become comfortable with the process over at least 2-4 weeks after which time there is an acceleration of meaningful learning development.

There is a possibility the course and/or clinical instructors were biased against the concept map care planning process, since they insisted on teaching the students the traditional nursing care plan method in class, and continued to use it in the clinical setting. These were course and clinical instructors who had taught this course before, and most were very familiar and comfortable with the traditional nursing care plan method. Perhaps gathering data related to the instructor's age, teaching experience, educational backgrounds would have been helpful in analyzing this aspect of the findings. Also, implementing an interrater reliability that would confirm their level of educational preparation of learning to teach the concept map care plan method, and an evaluation of what they found to be most useful or least useful in teaching the concept map care plan method to the students would have been helpful data to measure.

The results of this study failed to reject the null hypothesis as the data were unable to detect a difference in meaningful learning development among baccalaureate students who used traditional nursing care plans and those who used concept map care plans however, there was a possibility of a type II error present. The deep approach or meaningful learning scores did increase in the CMCP group, and the concept map care plan complexity scores were higher lending support to the proposed model that the CMCP method leads to meaningful learning development. The study did show that care must be taken to be sure the care plan process is taught and implemented in a manner that the students understand, and the students are given the opportunity to practice the method as a way of mastering the process. The effectiveness of the initial educational process used to teach the care plan method may have influenced whether the students were satisfied with the care plan method, got the most educational benefit from it, and saw value in recommending the method for use in the future. The student care plans revealed improvements in the development of nursing diagnoses, outcomes, nursing interventions, and concept richness and structure from the first to the last care plans submitted.

#### General Comments

The researcher encountered several challenges in implementing this study. The first challenge was finding an institution that was interested in implementing the study as proposed. After inviting every AACN accredited program within two states, one program emerged as a willing participant, and agreed to make a change in their care plan method to investigate whether one method or the other was better in developing more meaningful learning. Some institutions were already using concept map care plans, and therefore met the exclusion criteria. However, some administrators cited academic freedom as an issue,

and were not comfortable asking their faculty if they would be interested in participating in the research project, and using a different type of care plan for the term of the study. Other institutions did not respond at all.

After reaching an agreement with the Associate Dean of the institution, it was important to be sure everyone understood the requirements of the study. A meeting was held with the course and clinical faculty, the study explained, and an informed consent was signed. In the future, it would be best to set an earlier meeting with both the administrator and faculty who will be implementing the change, and discussing what the study involves. This process would have allowed for developing a relationship with the faculty, determine the feasibility of implementing the study, and identifying strategies for successfully enrolling their students in the study. It would have allowed for a greater understanding of the new teaching strategy being implemented, and ensure a commitment to the study so that the study could be carried out as planned. This would have prevented having to make multiple revisions to the Institutional Review Board application. As a result, a major change in the study from experimental to quasi-experimental was necessary since students were not randomly assigned to their groups. The students were assigned by when they were scheduled to take the course and because of using students new to the clinical area, the number of care plans needed to be adjusted.

Enrolling adequate numbers of students in the study, important for the reliability of the data findings, posed another issue. In the future, it would be important to give students information about the study ahead of time in a manner that is appealing to them, and allows them enough time to consider participating. This study could have benefited by informing the students ahead of time. In the spring quarter, the Institutional Review

Board approval for the revised application was completed just before the data were scheduled to be collected from the control group. That did not permit the advanced notice. The instructors allowed time for the researcher to attend the first day of class, explain the study, and gave the students time during class to complete the questionnaire. However, the time allotted was at the end of the class so many students got up and left. For the treatment group, the students were given advanced notice, and the researcher came to the beginning of the second class to meet with them. This initially resulted in many more students completing the pre-questionnaire; however, many chose not to remain in the study. Another issue may have been the complexity of the consent form that some students may have felt too intimidated to sign, despite taking the time to review the elements of the consent and addressing questions. It may have been helpful to e-mail them a copy of the consent to read prior to the class meeting.

Despite giving the students time during class to complete the pre- and post-questionnaires, the students for both groups showed little interest in participating and remaining in the study. Initially, the clinical instructors had felt that some students might have dropped out of the study because they did not want to share their care plans. Unfortunately, the researcher was not aware of that until after the post-questionnaire control group data were collected so, she was unable to clarify with them that it was still important to complete the post-questionnaire whether they submitted their care plans or not. An announcement was made when speaking with the treatment group; however, it did not seem to make a difference. The timing of the data collection could be improved so that the pre-questionnaire does not fall on the first day of class, and the post-

questionnaire completion does not occur during a class when an exam is scheduled.

Students do not want to be distracted while they are trying to concentrate on their exam.

#### Limitations of the Research

The study has several limitations that should be recognized. The study design and sampling procedure provided a limitation for the study. The quasi-experimental design where participants are not randomly assigned to either the control or treatment group creates a situation where one is unable to definitively determine that the change is caused solely by the treatment variable. Unfortunately, the research site could not accommodate the study being done using an experimental design.

Sample sizes were small, although initially thought to be adequate based on the estimate of power and large effect size that was apparently overestimated. Therefore, statistical power was limited and the ability to detect significant differences was compromised resulting in a type II sampling error. The observed effect sizes for change within groups and between groups were small. That is, the groups' scores did not change appreciably from pre to post and were not much different from each other. To detect effect sizes of these magnitudes with 5% type I error and 80% power, sample sizes of between 175 and 1570 per group would be required.

There was a high rate of attrition when completing the post-questionnaire leading to the potential for selection bias. However, the demographics and pre-questionnaire main scales and subscales were compared between the 42 students who completed both pre- and post-questionnaires and the 52 students who completed only the pre-questionnaire. No statistically significant differences (i.e. potential biases) were detected at the  $p < 0.05$  level.

The revised two-factor Study Process Questionnaire may have imposed limitations in the study. The Cronbach alpha was tested for the main and subscales for the pre- and post-questionnaire. Acceptable levels, above .70 were achieved for the Deep and Surface Approach main scales on the post-questionnaire, but most other values were below .70 indicating the questionnaire may not have been sensitive enough to detect changes between the groups. A test-retest for reliability correlation was completed using a Pearson Correlation between pre, post, and overall by groups. The Cronbach alpha and Pearson Correlation both demonstrated a moderate to weak reliability, with a few data points being moderately strong, which is suggestive of a type II measurement error.

There were several course and clinical faculty involved in this study (eight total) that could have imposed a limitation due to the variability in how they introduced the concept map care plans versus the traditional nursing care plans to the students. There could have been variations in their previous experience with concept maps, how well they learned about concept maps, and how they approached the student's questions in clinical. If they were biased or uncertain about the effectiveness of the approach they could have imposed those thoughts or beliefs on the students, and inadvertently influenced the students participation in the research study.

Providing a template for the students to use for their concept map care plans may have limited the student's creativity, and made the process more restrictive and difficult to understand. A concept map care plan example was given to the students and electronic version provided to the instructors for student access despite a comment from one student that he had to create his own template and felt that this should have been provided. Some students reported that they understood the template when presented in class; however,



they did not feel they could confidently use the template to plan care for the client in the clinical setting.

This study has limited generalizability to a population due to the small sample size and low power. It would have been interesting to have students from more than one institution or geographical area participating as well, to see if there were differences between institutions of higher education. It would have increased the number of students in the study, and strengthened the findings to better detect differences in meaningful learning development related to the implementation of the care planning method.

#### Recommendations for Future Research

There would be several recommendations for strengthening a study like this in the future. First, use participants who already understand the nursing process, so it becomes more feasible to conduct an experimental study that randomly assigns the students to the control and treatment groups in order to test both care planning methods at the same time. Next, be sure the students are informed of the study opportunity ahead of time so they are more willing to participate in the study to increase numbers of students, and negotiate with them the best times to complete the pre- and post-questionnaires. Finally, have the students complete at least four and preferably six care plans over the term, preferably during a semester, so more time is available for students to have a better understanding of the method being instituted. It would be interesting to determine what issues prevented students from participating in the research study and, if changes were made, would they be more willing to participate. Increasing the number of participants in the study would decrease the risk of having a type II error, and would increase the reliability of the findings. Nurse educators need to continue to build on, and use evidence-based strategies

that offer the most effective learning opportunities for students. Educational research has the potential to better prepare students for safe clinical practice, and strengthen the profession of nursing.

### Strengths of the Research

The strength of this study was the experience it gave the researcher in learning the research process. There were challenges related to finding a research site, negotiating with the administrators and faculty, developing a research proposal, going through the Institutional Review Board process, meeting with the students and collecting data, analyzing, and discussing the data. But, throughout the process the researcher has learned some valuable lessons to apply to future research projects. Other strengths were the even sample sizes of the groups, the consistent course and clinical instructors, and the comprehensive clinical preparation tool that guided the students' preparation well. Also, the traditional nursing care plan was one in which the instructors were comfortable using during the clinical experience. Initially, using a group of students who were just learning the nursing process was believed to be a strength, and given an experimental design with a more effective preparation for the new care plan process may have supported this thought.

### Implications for Nursing Education

It is important for nurse educators to use teaching methods that provide meaningful learning opportunities for students. The findings in this study demonstrated that in the traditional nursing care plan group the mean scores for the deep approach decreased, and in the concept map care plan group the mean scores for the deep approach increased. Kember, et al. (1997), experts in evaluating educational innovations using the

Study Process Questionnaire believe that any innovation that demonstrates an increase in deep approach to learning is remarkable. The clinical preparation tool used at this institution was well developed and comprehensive, and guided the students in their preparation for the clinical experience. The instructors were familiar and comfortable with this tool, and it may have had a positive influence on the learning environment. The instructor's expectations that this would contribute to the students' learning may have influenced the students to rise to the challenge and meet the demand.

The concept map care plan may be a viable option for teaching the nursing process. It may be more complicated to teach initially, but when students are provided the opportunity to practice the technique, they can master it quite well. Novak and Gowin (1984) have found an initial learning curve to using a concept map that rapidly moves the student toward a more meaningful way of learning. Daley, et al. (1999) supported having students complete at least three concept map care plans to learn the technique. The deep and surface approaches increased in the concept map group. Although not statistically significant educational experts support the usefulness of this teaching method especially since the deep approach scores increased.

Nurse educators are challenged to evaluate their current teaching and assessment methods to determine if these techniques promote meaningful learning development in students. Accrediting bodies recommend using those teaching/learning methods that are most effective in promoting student's learning. In addition, we must consider the manner in which we assess or evaluate students' learning, as those methods may determine the type of approach students' use to accomplish the task and be successful.

## Conclusions

Demographic data support that the participants represent the Caucasian American, female population typically seen in the nursing profession. The demographic data were compared between the control group and the treatment group, and the participants and the students who dropped out of the study. There were no appreciable differences noted.

The students identified statistically significant differences with the effectiveness of the preparation for the care planning process, their satisfaction with the care planning process, and recommendation for future use with the scores for the concept map care plan being significantly lower than the traditional nursing care plan group. Despite the clinical instructors rating their educational preparation for the concept map as acceptable, it did not translate into their being able to effectively teach the students to implement the concept map care plan process. The instructors were unable to abandon the idea of their traditional care plan method that led to difficulty implementing the concept map care plan process independent of the traditional nursing care plan. These issues could have affected the students' responses on the post-questionnaire, and led to the lack of statistically significant changes in meaningful learning development between the two groups.

The data in this study did not reveal a statistically significant difference in meaningful learning development in baccalaureate student nurses between those who used a traditional nursing care plan, and those who used a concept map care plan approach. Although, there is evidence to support that students in the treatment group did not complete the specified number of concept map care plans in the clinical setting, they did complete four concept map care plans between class and clinical. Daley et al. (1999) had identified the importance of having students complete at least three concept maps in

order to learn the skill. Also, the treatment group students appeared to have used both the traditional nursing care plan and the concept map care plan together, and they used only the traditional care plans on the other clinical weeks as well. This could have affected the students' learning and may have diluted the effect of just using the concept map care plans during the quarter.

In addition to the issues described above, the high probability that a type II error exists for both sampling and measurement error is a great concern. Ensuring that the study is carried out as planned with sufficient numbers of participants, using a measurement tool that demonstrates reliability is important in ensuring the findings are reliable. It will be necessary to conduct this study under more appropriate conditions to decrease the risk of type II error, and be able to draw more reliable conclusions about the findings.

Despite the limitations of this study, there was a small increase in the deep approach scores in the concept map care plan group, and a small decrease in the deep approach scores in the traditional nursing care plan group even though both methods were actually used in the concept map care plan quarter. This may indicate that even with little exposure to the concept map care plan the students were overcoming the decline in scores seen in the traditional care plan quarter, and were beginning to demonstrate an increase toward meaningful learning. A larger sample size, or following these students for a longer time frame may have revealed a trend toward a more meaningful learning approach.

Because of the propensity in higher education for students to begin using a more surface learning approach throughout their educational experience, it would be important

to be sure a type II error is not responsible for the increase in surface approach to learning revealed in this study. The fact that neither method of care planning revealed a statistically significant change in the deep or surface approach to learning demonstrates a lack of evidence to support one method or the other. The students seemed to improve in both styles of their care plan development over the course of the quarter, although the concept map care plan complexity scores were higher than the traditional nursing care plan complexity scores. The last care plan mean score was higher in both groups than the mean score of the first care plan.

Nursing students in both groups use primarily a deep approach to learning, but also believe that there are situations that require a surface approach to learning as well. This was supported by an increase of Surface Motive scores in both groups indicating more of an intention to do what is minimally required over the course of the quarter. Nursing students need to acquire and maintain knowledge for an extended period of time to be successful throughout their nursing programs, licensure exams, and nursing careers. The findings in this study support that students use primarily a deep approach to learning and to a lesser extent a surface approach to learning. This research was the first step in determining whether one care plan method was more effective than another in promoting meaningful learning development in student nurses. A larger sample size would strengthen the evidence in order to draw a more reliable conclusion.

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APPENDIX A  
DEMOGRAPHIC SURVEY



**Demographic Survey**

ID: \_\_\_\_\_

Please complete the following survey by filling in the blanks with the appropriate answer code.

	Code	
_____ Program Level	1	Freshman
	2	Sophomore
	3	Junior
	4	Senior
_____ Previous Degree	1	Yes
	2	No
_____ Gender	1	Female
	2	Male
_____ Marital Status	1	Single
	2	Married
	3	Divorced/Separated/Widowed
_____ Age	1	18-24 years
	2	25-31 years
	3	32-38 years
	4	39+ years
_____ Number of children	1	No children
	2	1-2 children
	3	3-4 children
	4	5+ children
_____ How many hours are you employed per week? (If the number varies, use an average)	1	None
	2	1-10 hours
	3	11-20 hours
	4	21-30 hours
	5	31-40 hours
_____ Number of credit hours of enrollment for current term	1	1-6 credits
	2	7-12 credits
	3	13-18 credits
_____ Overall grade point average	1	< 2.5 GPA
	2	2.6-3.0 GPA
	3	3.1-3.5 GPA
	4	3.6-4.0 GPA

ID: \_\_\_\_\_

_____ Ethnicity	1	Caucasian American
	2	African American
	3	Hispanic/ Latin America
	4	Asian/ Oriental American
	5	Native American
	6	Other/ Multi Racial American

Have you had previous experience using concept maps? Yes \_\_\_\_\_ No \_\_\_\_\_  
Please explain.

In Classroom: \_\_\_\_\_

In Clinical: \_\_\_\_\_

APPENDIX B

PRE-QUESTIONNAIRE R-SPQ-2F

Pre-questionnaire

ID: \_\_\_\_\_

**Revised Two-Factor Study Process Questionnaire (R-SPQ-2F)<sup>1</sup>**

This questionnaire has a number of questions about your attitudes toward your studies and your usual way of studying.

There is no *right* way of studying. It depends on what suits your own style and the course you are studying. It is accordingly important that you answer each question as honestly as you can. If you think your answer to a question would depend on the subject being studied, give the answer that would apply to the subject(s) most important to you.

Please fill in the appropriate circle alongside the question number on the 'Answer Sheet.'

\*\*The letters alongside each number stand for the following responses\*\*

- A—this item is *never* or *only rarely* true of me
- B—this item is *sometimes* true of me
- C—this item is true of me about *half the time*
- D—this item is *frequently* true of me
- E—this item is *always* or *almost always* true of me

Please choose the one most appropriate response to each question. Fill the oval on the Answer Sheet that best fits your immediate reaction. Do not spend a long time on each item: your first reaction is probably the best one. Please answer each item.

Do not worry about projecting a good image. Your answers are CONFIDENTIAL. Your responses will not be shared with your clinical / classroom instructors or anyone at your college. Thank you for your cooperation.

1. I find that at times studying gives me a feeling of deep personal satisfaction.
2. I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.
3. My aim is to pass the course while doing as little work as possible.
4. I only study seriously what's given out in class or in the course outlines.
5. I feel that virtually any topic can be highly interesting once I get into it.
6. I find most new topics interesting and often spend extra time trying to obtain more information about them.
7. I do not find my course very interesting so I keep my work to the minimum.

8. I learn some things by rote, going over and over them until I know them by heart even if I do not understand them.
9. I find that studying academic topics can at times be as exciting as a good novel or movie.
10. I test myself on important topics until I understand them completely.
11. I find I can get by in most assessments by memorizing key sections rather than trying to understand them.
12. I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.
13. I work hard at my studies because I find the material interesting.
14. I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.
15. I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics.
16. I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.
17. I come to most classes with questions in mind that I want answered.
18. I make a point of looking at most of the suggested readings that go with the lectures.
19. I see no point in learning material which is not likely to be in the examination.
20. I find the best way to pass examinations is to try to remember answers to likely questions.

<sup>1</sup> From "The revised two-factor Study Process Questionnaire: R-SPQ-2F," by J. Biggs, D. Kember, and D. Y. P. Leung, 2001, *British Journal of Educational Psychology*, 71, p. 148. Copyright 2001 by John Biggs and David Kember. Reprinted with permission.

APPENDIX C

POST-QUESTIONNAIRE R-SPQ-2F

Post-questionnaire

ID: \_\_\_\_\_

**Revised Two-Factor Study Process Questionnaire (R-SPQ-2F)<sup>1</sup>**

This questionnaire has a number of questions about your attitudes toward your studies and your usual way of studying.

There is no *right* way of studying. It depends on what suits your own style and the course you are studying. It is accordingly important that you answer each question as honestly as you can. If you think your answer to a question would depend on the subject being studied, give the answer that would apply to your nursing course.

Please fill in the appropriate circle alongside the question number on the 'Answer Sheet.'

\*\*The letters alongside each number stand for the following responses.\*\*

- A—this item is *never* or *only rarely* true of me
- B—this item is *sometimes* true of me
- C—this item is true of me about *half the time*
- D—this item is *frequently* true of me
- E—this item is *always* or *almost always* true of me

Please choose the one most appropriate response to each question. Fill the oval on the Answer Sheet that best fits your immediate reaction. Do not spend a long time on each item: your first reaction is probably the best one. Please answer each item.

Do not worry about projecting a good image. Your answers are CONFIDENTIAL. Your responses will not be shared with your clinical / classroom instructors or anyone at your college. Thank you for your cooperation.

1. I find that at times studying gives me a feeling of deep personal satisfaction.
2. I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.
3. My aim is to pass the course while doing as little work as possible.
4. I only study seriously what's given out in class or in the course outlines.
5. I feel that virtually any topic can be highly interesting once I get into it.
6. I find most new topics interesting and often spend extra time trying to obtain more information about them.
7. I do not find my course very interesting so I keep my work to the minimum.

8. I learn some things by rote, going over and over them until I know them by heart even if I do not understand them.
9. I find that studying academic topics can at times be as exciting as a good novel or movie.
10. I test myself on important topics until I understand them completely.
11. I find I can get by in most assessments by memorizing key sections rather than trying to understand them.
12. I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.
13. I work hard at my studies because I find the material interesting.
14. I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.
15. I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics.
16. I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.
17. I come to most classes with questions in mind that I want answered.
18. I make a point of looking at most of the suggested readings that go with the lectures.
19. I see no point in learning material which is not likely to be in the examination.
20. I find the best way to pass examinations is to try to remember answers to likely questions.

<sup>1</sup> From "The revised two-factor Study Process Questionnaire: R-SPQ-2F," by J. Biggs, D. Kember, and D. Y. P. Leung, 2001, *British Journal of Educational Psychology*, 71, p. 148. Copyright 2001 by John Biggs and David Kember. Reprinted with permission.



APPENDIX D  
CODING OF RESPONSES FOR THE R-SPQ-2F

### Coding of Responses for the R-SPQ-2F<sup>2</sup>

The response items are scored as follows:

A = 1, B = 2, C = 3, D = 4, E = 5

To obtain main scale scores add item scores as follows:

Deep Approach = 1 + 2 + 5 + 6 + 9 + 10 + 13 + 14 + 17 + 18

Surface Approach = 3 + 4 + 7 + 8 + 11 + 12 + 15 + 16 + 19 + 20

Subscale scores can be calculated as follows:

Deep Motive = 1 + 5 + 9 + 13 + 17

Deep Strategy = 2 + 6 + 10 + 14 + 18

Surface Motive = 3 + 7 + 11 + 15 + 19

Surface Strategy = 4 + 8 + 12 + 16 + 20

<sup>2</sup>From “The revised two-factor Study Process Questionnaire: R-SPQ-2F,” by J. Biggs, D. Kember, and D. Y. P. Leung, 2001, *British Journal of Educational Psychology*, 71, p. 149. Copyright 2001 by John Biggs and David Kember. Reprinted with permission.

APPENDIX E  
INSTRUCTIONS FOR STUDENTS USING A  
TRADITIONAL NURSING CARE PLAN

### **Instructions for Students Using a Traditional Nursing Care Plan**

Objective: At the end of this instructional session, the student will be able to: A. create a nursing care plan for their client/family for use during the clinical experience, B. understand what the expectation is for this clinical assignment during the term.

1. The clinical instructor will explain the nursing care planning process to you and answer any questions. You will prepare four care plans during the term.

2. Clinical preparation: Students will prepare for their clinical experience by reviewing the client's medical record, introducing self to client and family, and looking up information in their textbook about the pathophysiology, nursing care, medical care, and related laboratory studies, and diagnostic studies. The student will develop a pre-clinical care plan that reflects the nursing process (assessment, analysis/nursing diagnoses, outcomes, nursing interventions), integration of laboratory and diagnostic studies, medications, teaching, and growth and development considerations. A photocopy will be made before the clinical experience begins.

3. Clinical Experience: During the clinical experience you will have discussions with your clinical instructor and RN assigned to the client, care for your client throughout the clinical time, meet with peers and instructor in pre/post-conference.

4. Post-Clinical Assignment: Reflect on your clinical experience before reconstructing a post-clinical care plan that includes all components of the nursing process (assessment, analysis/nursing diagnoses, outcomes, nursing interventions, evaluation of interventions), and integration of laboratory and diagnostic studies, medications, teaching, and growth and development considerations. Turn the completed care plan into your instructor by the due date.

APPENDIX F  
EDUCATIONAL PLAN FOR CLINICAL INSTRUCTORS

## **Educational Plan for Clinical Instructors**

### Concept Map Nursing Care Plans

Objective: At the end of this educational session, clinical instructors will be able to educate students on the use of concept maps for nursing care planning.

Assignment: From [www.uiowa.edu](http://www.uiowa.edu)

1. View Concept Maps: Learning made Visible, presentation by Allison BrckaLorenz.

2. Read U C M T T: Concept Maps as Teaching Tools,

<http://centeach.uiowa.edu/documents/ConceptMapsasTeachingTools.pdf>

3. Read S I C M C S: How to Introduce Concept Mapping,

<http://centeach.uiowa.edu/documents/HowtoIntroduceConceptMapping.pdf>

4. Read C M T G C F: Concept Maps and Technology,

<http://centeach.uiowa.edu/documents/ConceptMapsandTechnology.pdf>

5. Read C M R: Concept Map Rubrics (recommend Novak and Gowin's scoring), if you feel it is necessary to score your student's maps, however, it is not part of the requirement for the research study <http://centeach.uiowa.edu/documents/ConceptMapRubrics.pdf>

6. Read H B C M: How to Build a Concept Map,

<http://centeach.uiowa.edu/documents/HowtoBuildaConceptMap.pdf>

7. Read Concept Maps Key Elements,

<http://centeach.uiowa.edu/documents/ConceptMapsKeyElements.pdf>

8. Explain the process to the students and have them work individually or in groups on the sample case scenario provided. Have the students comment on the elements they included in their concept map care plans. Share with them the handout listing the

expectations of information they should include in their concept maps. Share with them the example of the concept map care plan.

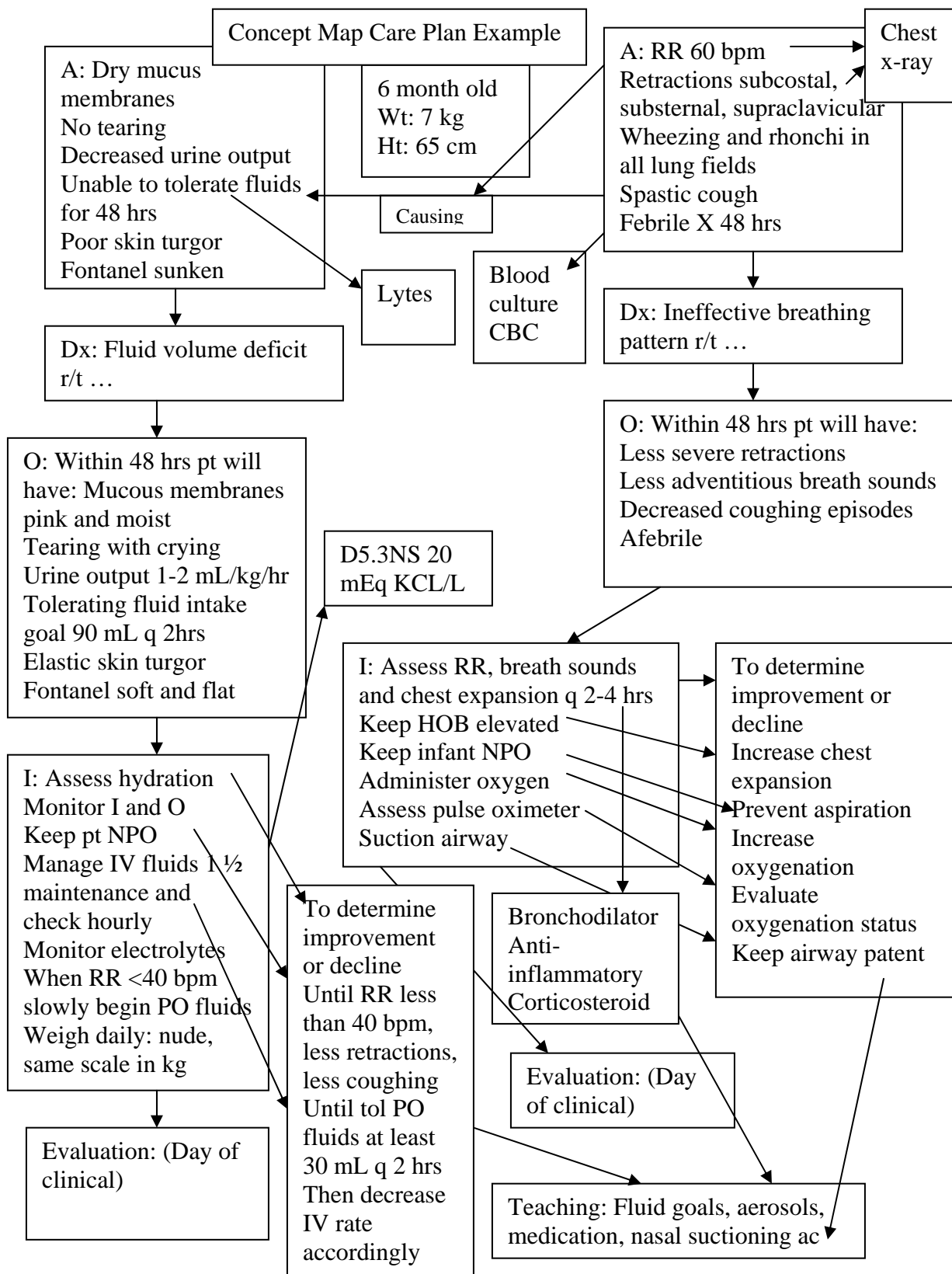
### Case Scenario Practice Activity

A 6-month-old infant is admitted to the hospital with a medical diagnosis of respiratory syncytial virus (RSV). The infant weighs 7.2 KG. The parent reports the baby has been struggling to breathe, has audible wheezing, a severe cough with vomiting, has been running a fever, and has been unable to tolerate any fluid for the past two days.

Your assessment reveals T 38 C, HR 140 bpm, RR 60 bpm, the infant is alert but irritable, skin is flushed and warm, mucous membranes are dry and pale, no tearing is noted with crying, fontanel is sunken, poor skin turgor, there are subcostal, substernal, and supraclavicular retractions, wheezing and rhonchi in all lung fields, with spastic, choky cough. Heart tones rapid and bounding, peripheral pulses weak, distal extremities cool and pale, capillary refill 3 sec, abdomen soft with hypoactive bowel sounds.

The physician orders and IV D5.3NS with 20 mEq KCL/L at 45 mL/hr (1 ½ maintenance), chest x-ray, CBC, blood culture, electrolytes, nasal washing for RSV antigen, Albuterol aerosol q 2 hours, Xopenex aerosol q 2 hrs, Budesonide aerosol q 2 hrs, Prednisolone 7 mg q 6 hrs IV.

1. Use the nursing process to develop a concept map care plan for this infant.
2. Create a visual diagram mapping out those elements important in the care of this infant and draw arrows connecting related concepts where appropriate.
3. Discuss with your instructor and peers the various elements you have identified.
4. Review the example of one way of showing the relationships between the important elements of the case study example.
5. A concept map is your own thinking and understanding on paper. Let your own thinking guide your concept map care plan.





APPENDIX G

INSTRUCTIONS FOR STUDENTS USING A CONCEPT MAP CARE PLAN

### **Instructions for Students Using a Concept Map Care Plan**

Objectives: At the end of this instructional session, the student will be able to:

A. Create a concept map of the nursing care planned for their client/family during the clinical experience,

B. Understand what the expectation is for this clinical assignment during the term.

1. The clinical instructor will explain the concept map care plan process to you, have you work through a case scenario followed by discussion, and provide an example of one way you could show the relationships between the important elements of the case scenario.

You will prepare four pre- and post-clinical concept map care plans during the term.

2. Clinical preparation: Students will prepare for their clinical experience by reviewing the client's medical record, introducing self to client and family, and looking up information in their textbook about the pathophysiology, nursing care, medical care, and related laboratory studies, and diagnostic studies. The student will develop a pre-clinical concept map that reflects the nursing process (assessment, analysis/nursing diagnoses, outcomes, nursing interventions), integration of laboratory and diagnostic studies, medications, teaching, and growth and development considerations. A photocopy will be made before the clinical experience begins.

3. Clinical Experience: During the clinical experience you will have discussions with your clinical instructor and RN assigned to the client, care for your client throughout the clinical time, meet with peers and instructor in pre/post-conference.

4. Post-Clinical Assignment: Reflect on your clinical experience before reconstructing a post-clinical concept map care plan that includes all components of the nursing process (assessment, analysis/nursing diagnoses, outcomes, nursing interventions, evaluation of

interventions), and integration of laboratory and diagnostic studies, medications, teaching, and growth and development considerations that identifies the links between elements on the map. Turn the completed concept map care plan into your instructor by the due date.

APPENDIX H  
TRADITIONAL NURSING CARE PLAN

### Traditional Nursing Care Plan

Student Name: \_\_\_\_\_ Date: \_\_\_\_\_ Patient's Initials: \_\_\_\_\_

Medical Diagnosis: \_\_\_\_\_

Nursing Diagnosis: \_\_\_\_\_ R/T \_\_\_\_\_

AEB \_\_\_\_\_

Expected Outcomes:

1. \_\_\_\_\_

2. \_\_\_\_\_

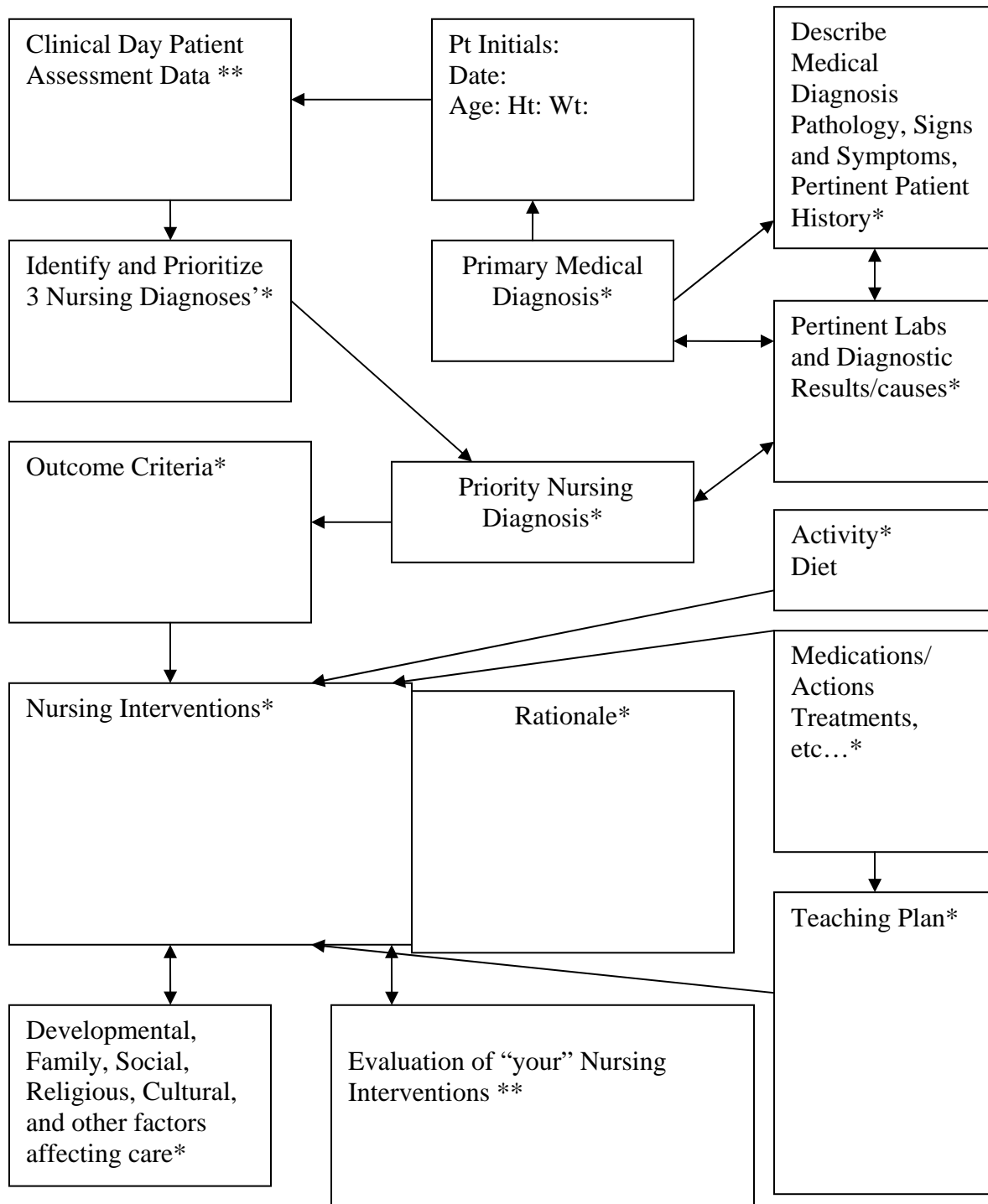
3. \_\_\_\_\_

NURSING INTERVENTIONS (List in order of priority)	SCIENTIFIC RATIONALE (Cite source, include page #)

Evaluation: (Evaluation achievement or movement toward achievement of stated outcomes.)

APPENDIX I  
CONCEPT MAP CARE PLAN

Concept Map Care Plan: Student's Name: \_\_\_\_\_



\*Researched the day before clinical and due upon arrival to clinical.

\*\*Add after clinical

Assignment: Complete Clinical Preparation Worksheet, Med Cards, and Concept Map Care Plan (Change arrows to reflect specific connection or link).

APPENDIX J

END OF TERM SUMMARY: TRADITIONAL NURSING CARE PLAN



**End of Term Summary: Traditional Nursing Care Plan ID:** \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

<b>Please answer the following questions:</b>	<b>Low</b>	<b>Medium</b>		<b>High</b>	
	1	2	3	4	5
Indicate your level of interest with this nursing course.	1	2	3	4	5
Level of satisfaction with classroom learning environment.	1	2	3	4	5
Level of satisfaction with clinical learning environment.	1	2	3	4	5
Level of satisfaction with the workload of this course.	1	2	3	4	5
Effectiveness of preparation for nursing care plan process	1	2	3	4	5
Level of satisfaction with nursing care plan process.	1	2	3	4	5
Level of recommendation for use in future to plan care.	1	2	3	4	5

Number of pre- and post-clinical care plans you completed \_\_\_\_\_

Comments related to nursing care planning process:

APPENDIX K

END OF TERM SUMMARY: CONCEPT MAP CARE PLAN

**End of Term Summary: Concept Map Care Plan**

ID: \_\_\_\_ \_

**Please answer the following questions:****Low      Medium      High**

1    2    3    4    5

Indicate your level of interest with this nursing course.    1    2    3    4    5

Level of satisfaction with classroom learning environment.    1    2    3    4    5

Level of satisfaction with clinical learning environment.    1    2    3    4    5

Level of satisfaction with the workload of this course.    1    2    3    4    5

Effectiveness of preparation of concept map care plan process    1    2    3    4    5

Level of satisfaction with concept map care plan process.    1    2    3    4    5

Level of recommendation for use in future to plan care.    1    2    3    4    5

Number of pre- and post-clinical concept map care plans you completed \_\_\_\_\_

Comments related to concept map care planning process:

APPENDIX L  
PROGRAM RECRUITMENT LETTER

Dear Dr. \_\_\_\_\_,

I am a Doctoral Candidate at University of Northern Colorado. As part of my doctoral dissertation work, I am inviting accredited baccalaureate programs to participate in my research study entitled “Meaningful Learning Development in Student Nurses: The Traditional Nursing Care Plan versus the Concept Map Care Plan Approach” Students from your program would be eligible to participate as long as they have not used concept map care plans in previous quarters or semesters (‘terms’). I would like to conduct this study during the spring 2009 term.

Your participation would entail having the students in the nursing courses you have identified be randomly assigned by clinical group to either a group that would use your traditional nursing care plan throughout the term, or to a group who would be taught how to develop and use concept map care plans throughout the term. The clinical instructors for the groups who have been assigned the concept map care plans will be required to complete a web-based, self-study educational plan designed by University of Iowa that will take them about an hour. Instructions for the students along with an activity designed to teach the students how to develop a concept map care plan will be provided that will take about 30-minutes to complete. Instructions for the students in the group using the traditional nursing care plan will also be provided.

The students, if they volunteer to be part of the study and sign an informed consent, will be asked to complete a demographic survey, a pre- and post-questionnaire, and end of term summary that will take about 20 minutes at the beginning and end of the term. The students will need to complete 6-8 of their assigned traditional or concept map care plans during the term and submit copies of their first and last care plans. The clinical instructors will be asked to complete a short demographic survey at the end of the term. Confidentiality will be maintained by assigning a unique identifier to each participant that will be used on the survey, questionnaires, summaries, and care plans. All data will be stored in a locked file cabinet and electronic data will be password protected.

I would be grateful to have the support of your program and faculty for this research study. Please submit a letter of permission on letterhead from your institution identifying that your program and faculty are interested in participating in this study. An application to conduct this research study has been submitted to the Institutional Review Board at University of Northern Colorado. Once approval has been granted, I will contact you about initiating the educational plan for your clinical faculty, and approaching your students to invite them to participate in this study. Thank you for your consideration in this matter.

Sincerely,

Deborah Karns, PhD(c), MSN, RN, CNS

University of Northern Colorado

Home: 419-389-9630, Office: 419-251-1718 E-mail: [karn0672@bears.unco.edu](mailto:karn0672@bears.unco.edu)

APPENDIX M  
INFORMED CONSENT CLINICAL INSTRUCTOR



Informed Consent for Participation in Research  
University of Northern Colorado

Project Title: Meaningful Learning Development in Student Nurses: The Traditional Nursing Care Plan versus the Concept Map Care Plan Approach

Researcher: Deborah Karns, PhD(c), MSN, RN, CNS, University of Northern Colorado, Nursing

Home: 419-389-9630; Office 419-251-1718; E-mail: [karn0672@bears.unco.edu](mailto:karn0672@bears.unco.edu)

Research Advisor: Vicki Wilson, PhD, RN, Professor, University of Northern Colorado, Nursing

Office: 970-351-1295; E-mail: [Vicki.Wilson@unco.edu](mailto:Vicki.Wilson@unco.edu)

Dear Clinical Instructor,

Your program has agreed to allow me to conduct my dissertation research study in the course you teach and ask you and your students to volunteer to be participants. If you agree to participate, your clinical group will use a concept map care plan throughout the fall 2009 quarter and will use the traditional nursing care plan throughout the spring 2009 quarter. Students volunteering to participate will complete a demographic survey and pre-questionnaire that will take about 20 minutes at the beginning of the quarter.

Your commitment to this research will entail completing a web-based, self-study educational plan developed by University of Iowa that will prepare you for the concept map care planning process that will be used during fall 2009 and will take about an hour of time to complete. You will be given instructions for your students and an educational activity to use to prepare them for this process that includes a case scenario practice activity and an example of one way a concept map care plan could be designed. Educating the students about the concept map care plan process is expected to take you about 30 minutes of time. The traditional nursing care plan will be used spring 2009 and you will be provided instructions for those students as well. Each clinical group will complete four pre-clinical and post-clinical care plans as assigned throughout the term and students will submit their first and last care plans and allow their Evolve Fundamentals of Nursing HESI exam score to be shared with the researcher. At the end of the term the students will be asked to complete the post-questionnaire and end of term summary. You will be asked to complete a brief demographic survey related to your clinical group, educational plan process and instructions for students, unexpected events during the term, and the effectiveness of the care planning process used in your group.

Confidentiality will be maintained by assigning a unique identifier for you and your students to use on all written documents and all data will be stored in a locked file cabinet and electronic data will be password protected. The names of programs and participants will not appear in any professional report of this research. The risks inherent in this study are no greater than those normally encountered during regular classroom or clinical participation. There will be no direct benefits to participants in this study. There will be no costs incurred by participants.

Your participation is voluntary. You may decide not to participate in this study and if you begin participation, you may decide to withdraw at any time. In either situation, you will remain with your assigned clinical group however if you no longer are willing to use the assigned care plan for the remaining time in the term, the students in your group will no longer be considered participating in the study. Your decision will be respected and will not affect your standing at the college, or result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please sign below if you would like to participate in this research. A copy of this form will be given to you to retain for future reference. If you have any concerns about your selection or treatment as a research participant, please contact the Sponsored Programs and Academic Research Center, Kepner Hall, University of Northern Colorado, CO 80639; 970-351-1907. If you have general questions about giving consent or your rights as a research participant in this research study, you can call the Wright State University Institutional Review Board at 937-775-4462. The name of the local investigator/contact person is Carol Holdcraft, DNS, RN, Assistant Dean, Wright State University-Miami Valley who can be reached at 937-775-3134.

Please feel free to telephone me at either of the numbers listed above if you have questions or concerns about this research. Thank you for assisting me with this research study.

Sincerely,

Deborah Karns, PhD(c), MSN, RN, CNS

---

Participant's Signature

---

Date

---

Researcher's Signature

---

Date



APPENDIX N  
DEMOGRAPHIC SURVEY FOR CLINICAL INSTRUCTORS:  
TRADITIONAL NURSING CARE PLAN

### Demographic Survey for Clinical Instructors: Traditional Nursing Care Plan

ID: \_\_\_\_\_

Please complete a survey for each clinical group you were responsible for:

Number of clinical sessions this term: \_\_\_\_\_

Setting(s): \_\_\_\_\_

Number of students in the group: \_\_\_\_\_

Number of traditional care plans completed by students: \_\_\_\_\_

Unusual /unexpected events occurring in the educational environment during the term:

\_\_\_\_\_

Poor Average Good Very Good

Rate effectiveness of traditional care planning process. 1      2      3      4

Other comments:

APPENDIX O  
DEMOGRAPHIC SURVEY FOR CLINICAL INSTRUCTORS:  
CONCEPT MAP CARE PLAN



APPENDIX P  
INSTITUTIONAL REVIEW BOARD APPROVAL

UNIVERSITY of  
**NORTHERN COLORADO**  
 Institutional Review Board (IRB)

November 6, 2008

TO: Spencer Weiler  
 School of Educational Research, Leadership & Technology

FROM: Gary Heise, Co-Chair *GHR*  
 UNC Institutional Review Board

RE: Expedited Review of Proposal, *Meaningful Learning Development in Student Nurses,  
 The Traditional Nursing Care Plan versus the Concept Map Care Plan Approach,*  
 submitted by Deborah Karns (Research Advisor: Vicki Wilson)

First Consultant: The above proposal is being submitted to you for an expedited review. Please review the proposal in light of the Committee's charge and direct requests for changes directly to the researcher or researcher's advisor. If you have any unresolved concerns, please contact Gary Heise, School of Sport and Exercise Science (x1738). When you are ready to recommend approval, sign this form and return to me.

I recommend approval as is

*Spencer Weiler* 12/1/08  
 Signature of First Consultant Date

- See email communications and revised application.

The above referenced prospectus has been reviewed for compliance with IRBS guidelines for ethical principles in human subjects research. The decision of the Institutional Review Board is that the project is approved as proposed for a period of one year: 12/6/08 to 12/6/2009

*Gary D. Heise* 12/6/2008  
 Gary Heise, Co-Chair Date

Comments:

UNC INSTITUTIONAL REVIEW BOARD  
Request for Change in Protocol

UNIVERSITY of  
NORTHERN COLORADO

Date of Original IRB Approval: 12/06/08

Project Title: Meaningful Learning Development in Student Nurses: The Traditional Nursing Care Plan versus the Concept Map Care Plan Approach

Lead Investigator Name: Deborah Karns, PhD(c), MSN, RN, CNS  
Department: Nursing  
Telephone: 419-389-9630  
Email: karn0672@bears.unco.edu

Research Advisor (if applicable) Name: Vicki Wilson, PhD, RN  
Department: Nursing  
Telephone: 970-351-1295  
Email: Vicki.Wilson@unco.edu

On a separate page, describe and provide justification for the changes being proposed. Be concise and specific in describing methodological changes that affect the experience of participants and/or relate to the risks/benefits of participation. Explain why these changes are necessary.

Yes  No The proposed changes in protocol will necessitate changes in documents such as recruitment flyers, consent forms, debriefing forms, or other project-related documents.

Yes  No If yes, copies of the revised documents with changes highlighted are attached to this request.

CERTIFICATION OF LEAD INVESTIGATOR

I certify that information contained in this request is complete and accurate.

Deborah Karns 3-1-09  
Signature of Lead Investigator Date of Signature

CERTIFICATION OF RESEARCH ADVISOR (If Lead Investigator is a Student)

I certify that information contained in this request is complete and accurate.

Vicki Wilson PhD 3-2-09  
Signature of Research Advisor Date of Signature

Approved by: [Signature] 3-3-09  
Chairperson, Institutional Review Board Date

Date Request Received by SPARC: 3/2/09

**UNC INSTITUTIONAL REVIEW BOARD**  
**Request for Change in Protocol**

UNIVERSITY OF  
 NORTHERN COLORADO

Date of Original IRB Approval: 12/06/08

Project Title: Meaningful Learning Development in Student Nurses: The Traditional Nursing Care Plan versus the Concept Map Care Plan Approach

Lead Investigator Name: Deborah Karns, PhD(c), MSN, RN-CNS  
 Department: Nursing  
 Telephone: 419-389-9630  
 Email: karn0672@bears.unco.edu

Research Advisor (if applicable) Name: Vicki Wilson, PhD, RN  
 Department: Nursing  
 Telephone: 970-351-1295  
 Email: Vicki.Wilson.unco.edu

On a separate page, describe and provide justification for the changes being proposed. Be concise and specific in describing methodological changes that affect the experience of participants and/or relate to the risks/benefits of participation. Explain why these changes are necessary.

Yes  No The proposed changes in protocol will necessitate changes in documents such as recruitment flyers, consent forms, debriefing forms, or other project-related documents.

Yes  No If yes, copies of the revised documents with changes highlighted are attached to this request.

**CERTIFICATION OF LEAD INVESTIGATOR**

I certify that information contained in this request is complete and accurate.

Deborah Karns 3-23-09  
 Signature of Lead Investigator Date of Signature

**CERTIFICATION OF RESEARCH ADVISOR (if Lead Investigator is a Student)**

I certify that information contained in this request is complete and accurate.

Vicki Wilson 3-23-09  
 Signature of Research Advisor Date of Signature

Approved by: M. K. J. R 4/7/09  
 Chairperson, Institutional Review Board Date

Date Request Received by SPARC: 3/31/09



APPENDIX Q  
INFORMED CONSENT STUDENT



Informed Consent for Participation in Research  
University of Northern Colorado

Project Title: Meaningful Learning Development in Student Nurses: The Traditional Nursing Care Plan versus the Concept Map Care Plan Approach

Researcher: Deborah Karns, PhD(c), MSN, RN, CNS, University of Northern Colorado, Nursing

Home: 419-389-9630; Office 419-251-1718; E-mail: [karn0672@bears.unco.edu](mailto:karn0672@bears.unco.edu)

Research Advisor: Vicki Wilson, PhD, RN, Professor, University of Northern Colorado, Nursing

Office: 970-351-1295; E-mail: [Vicki.Wilson@unco.edu](mailto:Vicki.Wilson@unco.edu)

Dear Student,

As part of my doctoral dissertation work, I am seeking volunteers to participate in a study to determine if there is a difference in meaningful learning development over the course of either a quarter or semester ('term'), between students who use a traditional nursing care plan and those who use a concept map care plan for their clients. Nurse educators want to use the most effective teaching and learning strategies that will prepare students for safe, clinical practice. The findings revealed in this study will contribute knowledge about the learning process and will be submitted for publication in a professional journal.

If you agree to participate, you will be asked to complete a demographic survey and the revised two-factor Study Process Questionnaire at the beginning of the term that will take approximately 20 minutes. You will be instructed on the care planning process that will be used in the clinical setting. At the end of the term, you will be asked to complete the revised two-factor Study Process Questionnaire and an end of term summary based on your experience in this course that will take approximately 20 minutes. Also, you will be asked to submit your first and last clinical care plans to the researcher and allow your Evolve Fundamentals of Nursing HESI exam score to be shared with the researcher. Confidentiality will be maintained by assigning a unique identifier for you to use on the survey, questionnaires, summary, and clinical care plans, and all data will be stored in a locked file cabinet and electronic data will be password protected. The names of participants will not appear in any professional report of this research. The risks inherent in this study are no greater than those normally encountered during regular classroom or clinical participation. There will be no direct benefits to participants in this study. There will be no costs incurred by participants.

Your participation is voluntary. You may decide not to participate in this study and if you begin participation, you may decide to withdraw at any time. In either situation, you will remain in your assigned clinical group and continue to use the type of care plan your group is using, however, your data will not be collected and any data already collected at the time of withdraw will not be used in the data analysis. Your decision will be respected and will not affect your grades, standing at the college, or result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please sign below if you would like to participate in this research. A copy of this form will be given to you to retain for future reference. If you have any concerns about your selection or treatment as a research participant, please contact the Sponsored Programs and Academic Research Center, Kepner Hall, University of Northern Colorado, CO 80639; 970-351-1907. If you have general questions about giving consent or your rights as a research participant in this research study, you can call the Wright State University Institutional Review Board at 937-775-4462. The name of the local investigator/contact person is Carol Holdcraft, DNS, RN, Assistant Dean, Wright State University-Miami Valley who can be reached at 937-775-3134.

Please feel free to telephone me at either of the numbers listed above if you have questions or concerns about this research. Thank you for assisting me with this research study.

Sincerely,

Deborah Karns, PhD(c), MSN, RN, CNS

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Participant's Signature

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Date

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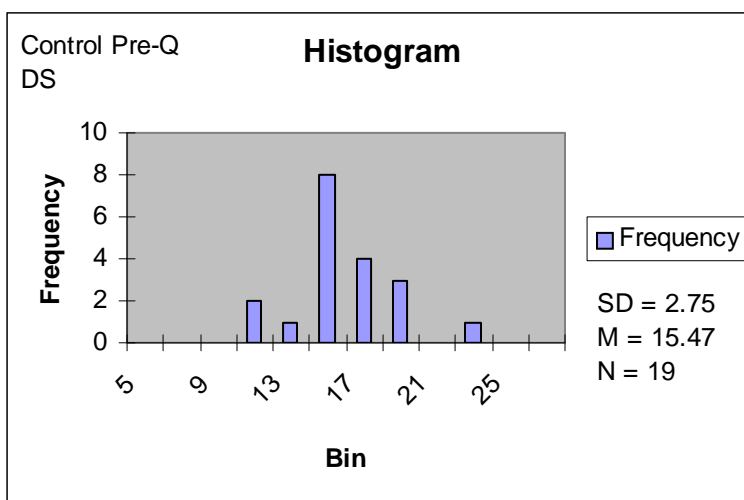
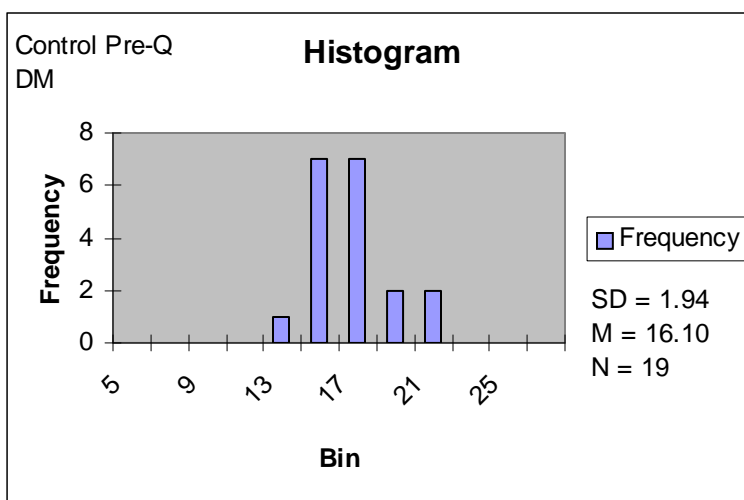
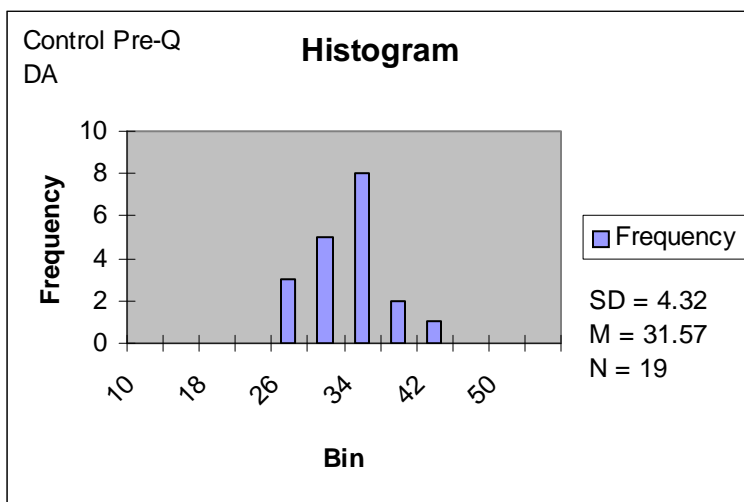
Researcher's Signature

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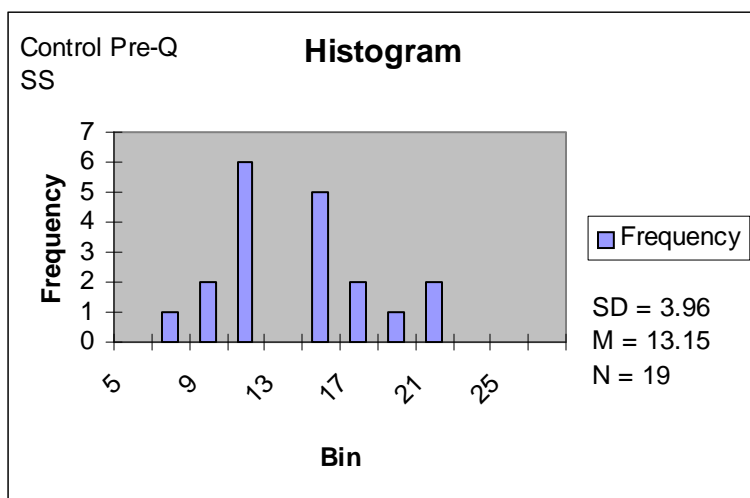
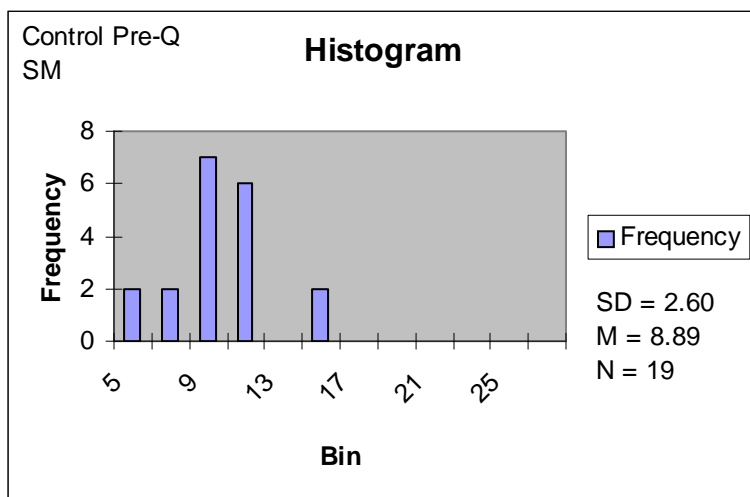
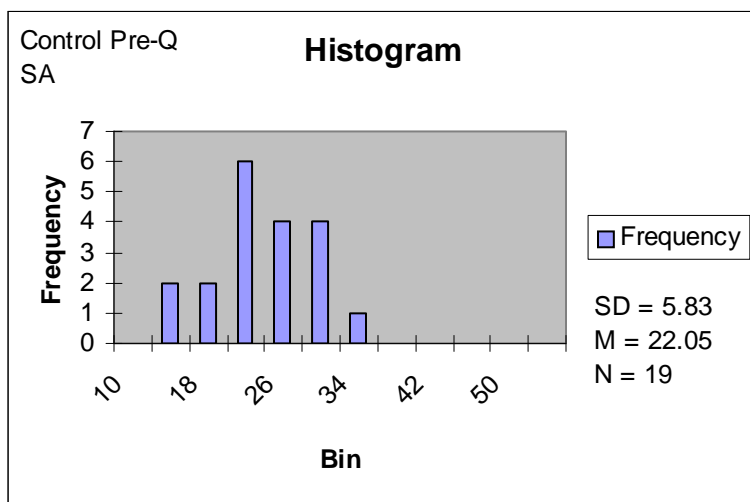
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APPENDIX R  
FREQUENCY DISTRIBUTION HISTOGRAMS

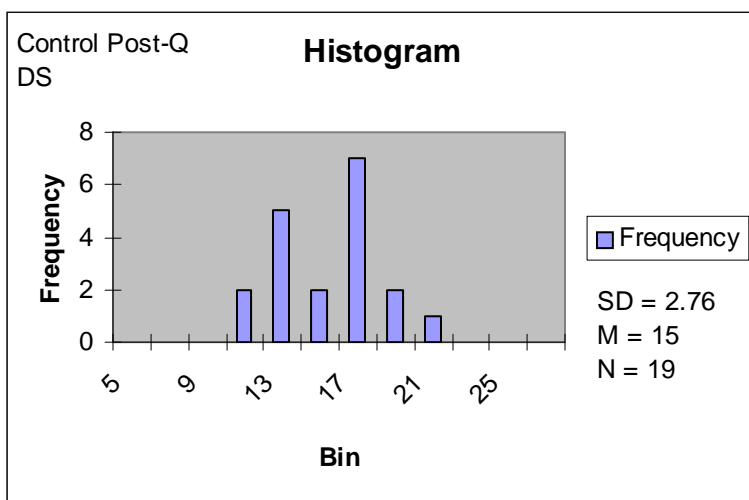
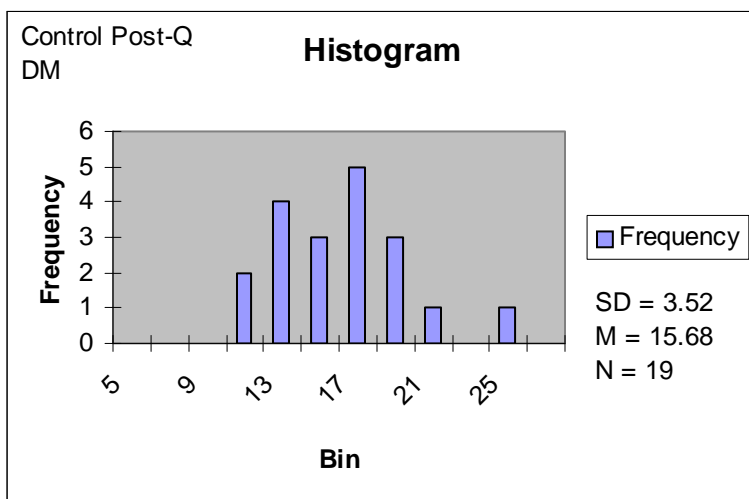
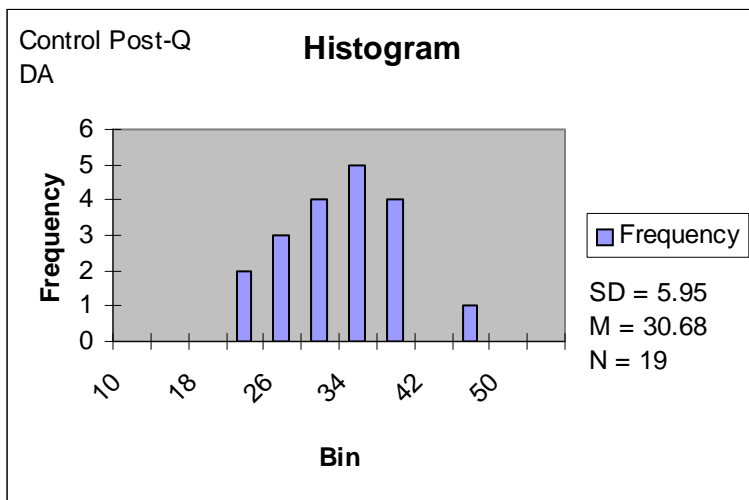
## Traditional Nursing Care Plan: Pre-Questionnaire: Deep Approach, Motive, Strategy



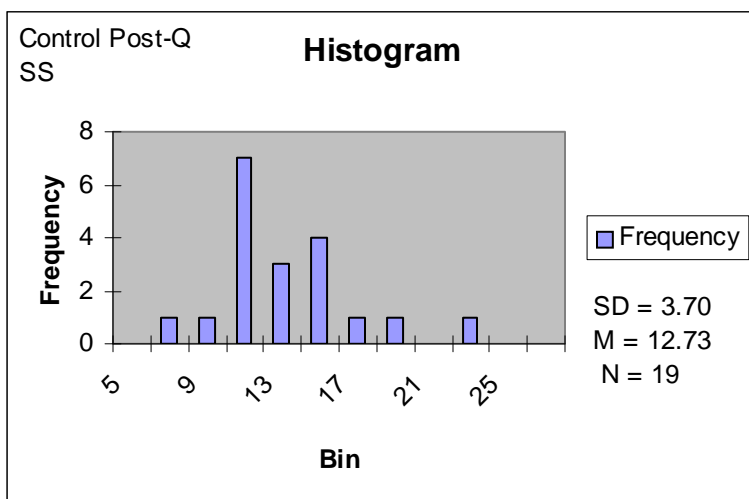
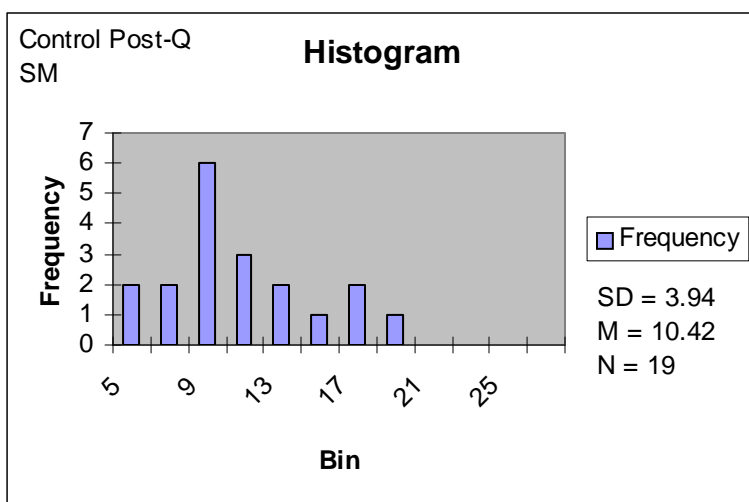
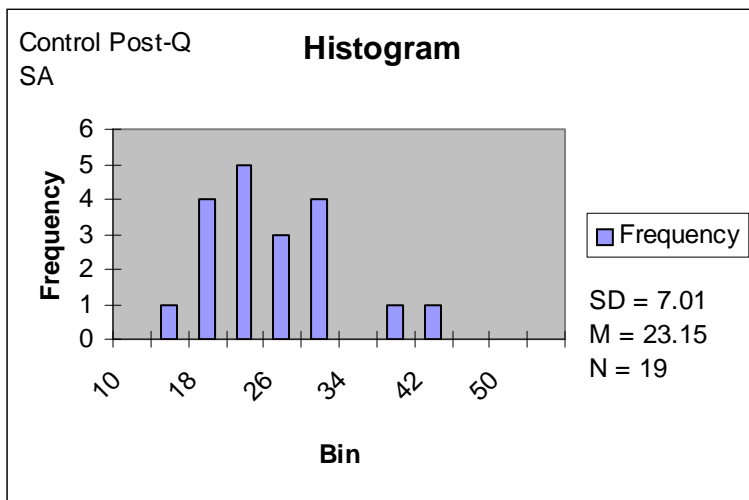
## Traditional Nursing Care Plan: Pre-Questionnaire: Surface Approach, Motive, Strategy



Traditional Nursing Care Plan: Post-Questionnaire: Deep Approach, Motive, Strategy

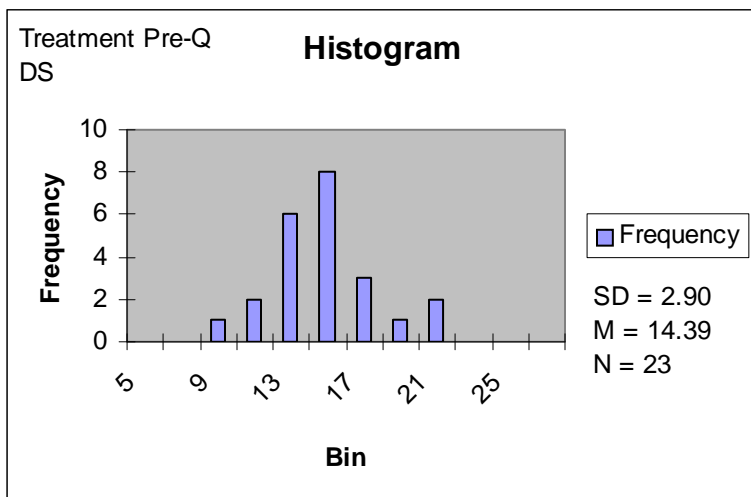
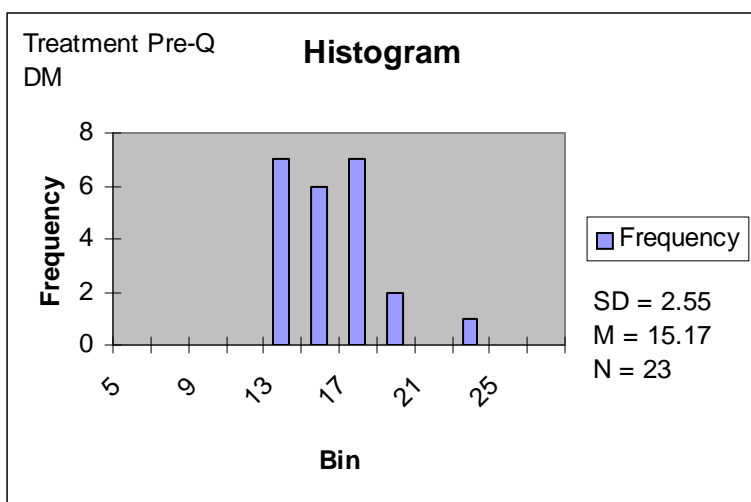
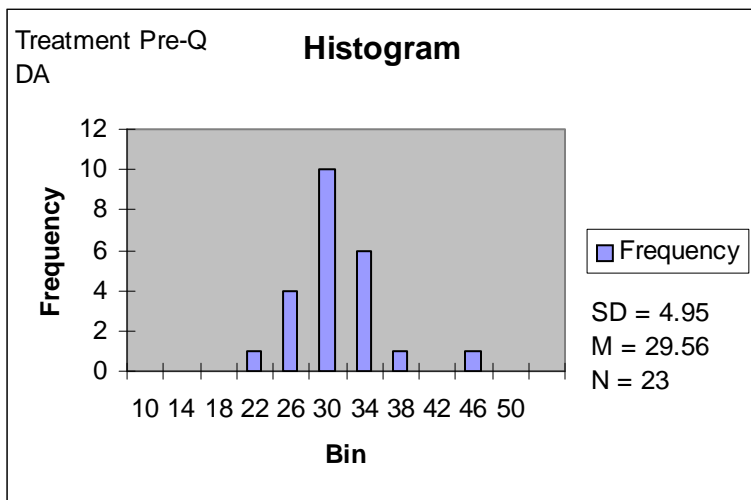


## Traditional Nursing Care Plan: Post-Questionnaire: Surface Approach, Motive, Strategy

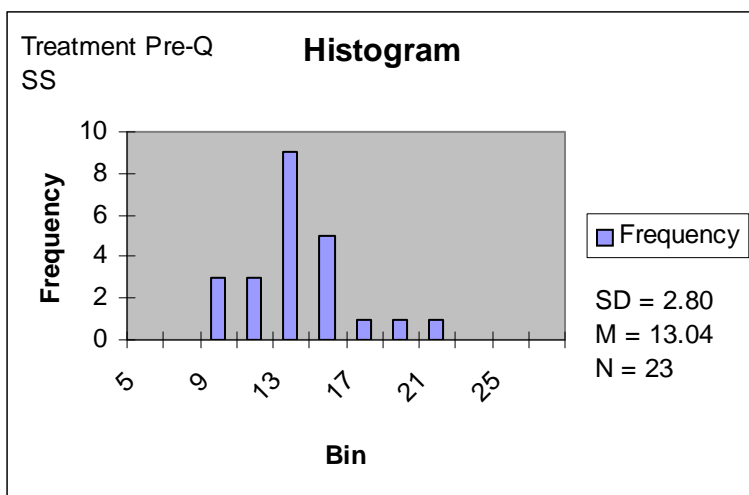
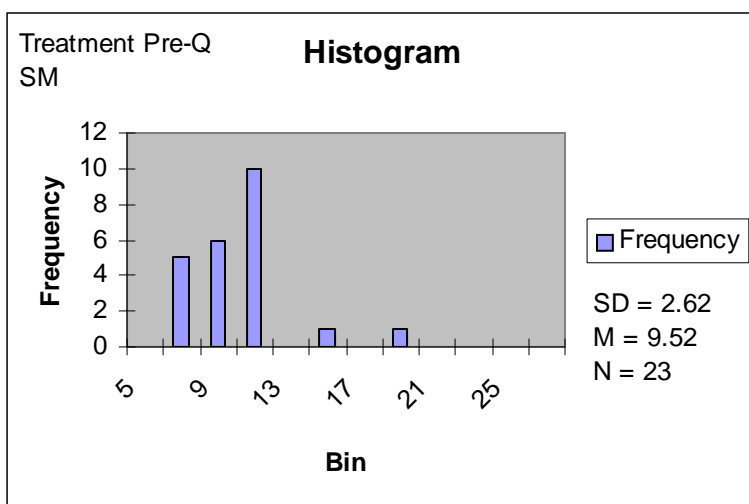
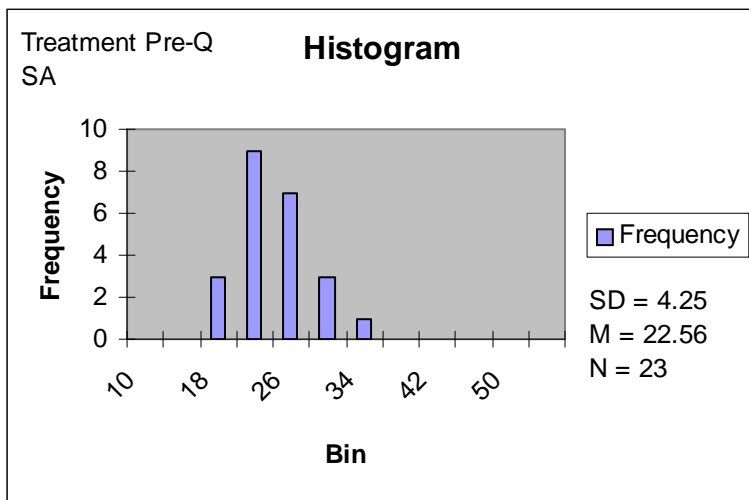




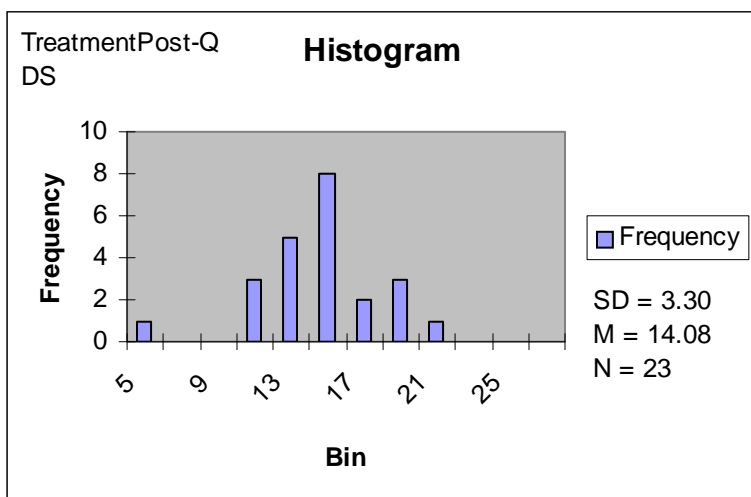
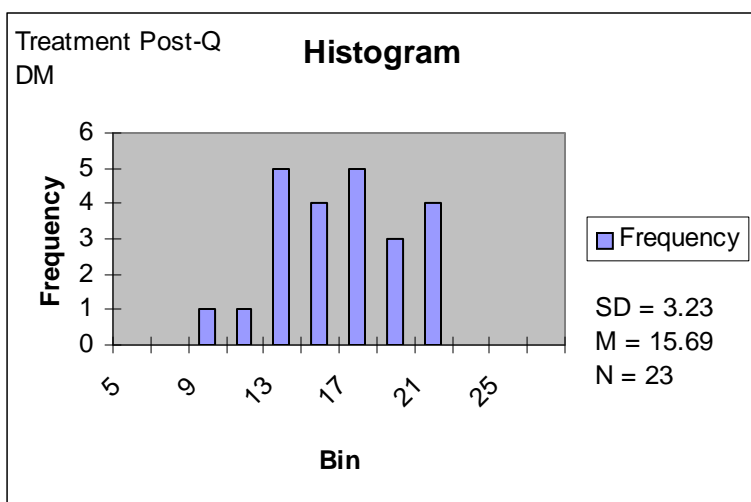
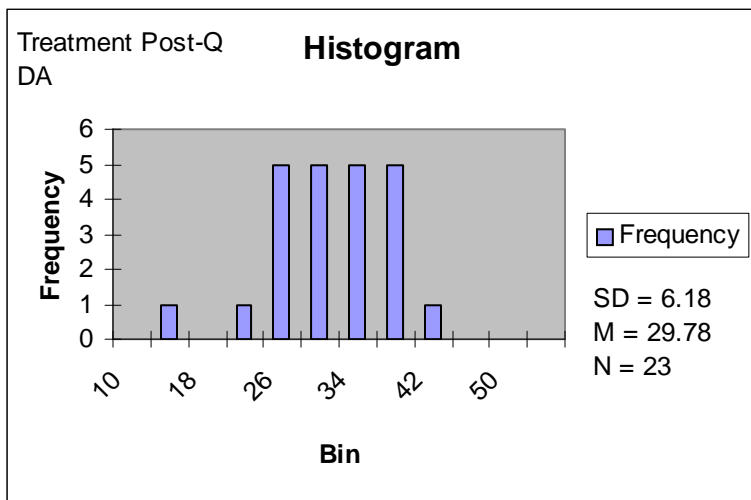
## Concept Map Care Plan: Pre-Questionnaire: Deep Approach, Motive, Strategy



## Concept Map Care Plan: Pre-Questionnaire: Surface Approach, Motive, Strategy



Concept Map Care Plan: Post-Questionnaire: Deep Approach, Motive, Strategy



## Concept Map Care Plan: Post-Questionnaire: Surface Approach, Motive, Strategy

