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Understanding Concept Mapping

Learning Objectives

- Define concept mapping theory
- Identify the components of concept mapping theory
- Demonstrate how each component can be integrated into nursing education
- Explore how learning styles affect critical thinking
- Demonstrate and discuss how relationship analysis and critical thinking are integral to theory application
- Explain how learning styles and brain processing contribute to learning success
- Discuss the implications and impact of utilizing concept mapping to improve knowledge application
- Reflect on how past utilization of concept mapping has led to its application within nursing education
- Discuss and consider future implications and application of concept mapping in nursing

Introduction

The purpose of this first chapter is to introduce you to what concept mapping is. Every student's knowledge and perception of concept mapping is a little different. Within this chapter you will find answers to the questions you may have and be able to explore concept mapping theory and how it leads to meaningful learning and contributes to a completed concept map. A stepwise process that views the overall theory in addition to the separate segments will open your eyes to a whole other method of integrating meaning into all nursing knowledge. This information will redefine how you study, learn, and apply nursing knowledge. Whether you are a beginner, first-year student, or further along in the educational process, your critical thinking abilities will expand as you integrate this theory into your education. You will learn that asking questions that lead to more questions is not an exercise in frustration, but a sign of critical thinking growth. As your critical thinking skills deepen and grow, the answers will come, your confidence will grow, and you will feel a sense of satisfaction.

All nursing knowledge is based on a continuum from simple to complex. As you progress from the starting point and continue to the end point of graduation, more is demanded from you in terms of the knowledge base you must cultivate as well as the amount and type of knowledge you must apply in caring for patients. You will come to realize how concepts such as learning domains and learning styles strongly affect learning outcomes. As you read through this chapter, your goal should be to reflect on what you are learning and how you can implement that new knowledge to enhance your nursing education.

Although this book is directed at you, the nursing students, there are some sections in this first chapter that may address educational approaches. This allows you to see your education from a faculty perspective as well.

Before going further, we need to explore some of the terminology that will help explain some of the key concepts or thought processes used in the creation of and reflected within a completed map. Understanding those thought processes serves as the foundation of understanding actual map construction. These terms reflect the educational focus of a concept map and mapping theory.

Key Terms and Definitions

- **Critical thinking:** an in-depth thought process utilizing multiple information resources to question, make associations, and analyze data to form conclusions and consider actions and outcomes
- **Relationship analysis:** the process of comparing and contrasting concepts to make associations; interpreting similarities and differences between and among concepts, which allows for comprehensive learning
- **Theory-to-practice application:** the action of establishing a knowledge base and enabling utilization of that knowledge to enact practice decisions; providing rationales for decision making in practice
- **Learning styles:** methods through which one is able to effectively comprehend theory for meaningful learning from input related to aural, verbal, written, or visual information

- **Brain processing:** the brain's ability to accept, categorize, create associations, process, and give meaning and understanding to knowledge input
- **Learning domains:** categories of learning skills, behaviors, and outcomes a student must master within the continuum of learning, from simple to complex, comprising the cognitive, affective, and psychomotor spheres

Critical Thinking

Concept mapping, as it is used in nursing, serves as a pathway to the intersection of critical thinking and theory-to-practice application. To become a successful critical thinker in nursing, one has to be able to apply that thinking to nursing care. It is not enough to know about the pathophysiology of a disease process as stated in a textbook, or the steps followed through when performing a skill. As nurses we have to open up our minds and ask the “why” and “what else” questions that allow us to form a patient problem list, which then becomes the basis for our nursing actions. Yet, effective critical thinking is necessary for effective application, so both of those concepts are interrelated and very much interdependent, and serve as the basis of acceptable practice standards. A completed concept map provides a direct, real-time view of a nurse's thought processes. It allows both the educator and the learner to assess critical thinking abilities and the degree to which theory is being applied to practice. This is the basis of concept map theory.

Critical thinking has many definitions, and no single formal version has been accepted. It is generally defined as a higher level thinking that questions associations, the concepts of cause and effect, and judgment. It is often referred to as thinking about thinking. I like to describe critical thinking as a domino-like effect of a student's thought processes where one question stimulates a multitude of others. As this process continues, the questioning may diverge onto a variety of pathways where reasoning, judgment, and prior knowledge all play a part in considering solutions and answers to the questions. The questions are crucial to determine appropriate nursing actions. This process is actually the start of application, but the student may have difficulty recognizing that.

Although critical thinking is emphasized and integrated into nursing education from the very beginning of any nursing program, the largest growth of it usually occurs in higher educational levels when a student has cultivated a large base knowledge inventory and can now think about applying that to new knowledge in the classroom, as well as within the clinical setting.

In nursing education, the development and growth of critical thinking is necessary because it allows you, the student, to begin asking questions and making associations. Challenging yourself to question and make associations early on not only puts you on a quest for more knowledge but also allows you to gain confidence as your abilities deepen. Deeper critical thinking leads to improved decision making. Although this process begins in the classroom and the nursing lab, it quickly transitions to the clinical area and helps to lay the foundation of theory-to-practice application. Encouraging the process allows students to take an active role in their own learning.

One example of this would be when you question the difference between the textbook presentation of a disease process versus how it actually presents in a patient. For most students this is the first tentative step into the world of critical thinking. A book or

lecture presents concrete facts in black and white (no pun intended). This is the disease process, this is the list of symptoms and how we address them, and so on. You listen and contemplate, take notes, and study the data presented. Some questions may surface, but until the information can be applied you may be uncertain as to what specific questions to ask. Putting that information together while assessing an actual patient is more than a little intimidating until you have the opportunity to examine, ponder, compare, and contrast. One of the main goals of nursing education must be to foster this process often and in as many ways as possible.

I have found that students realize the need for critical thinking, and have often heard the phrase, but really do not have a full understanding of what it means or how to integrate it into their goals for success. Each nursing program has a responsibility to not only define the term, but to define it for students within the context of each program and course. After all, critical thinking expectations assist in defining competencies, and students need to have full understanding of them if they hope to achieve them. Please do not assume that everyone has a full, comprehensive understanding of what critical thinking is and how it is to be applied. Most nursing student populations need an introduction to the concept, with repeated references and examples throughout the course of their nursing education to be able to fully grasp not only the meaning but also how to use critical thinking in application. A gradual approach is essential, because as the student gains knowledge and reaches the point of readiness for deeper application, questions become more involved, more frequent, and require much more consideration of scope and outcomes. During this phase it is very easy for a student to become overwhelmed. Questions are flowing in many directions, much as ripples in a pond after a stone's throw, and students may not know quite how to handle all of the questions, much less the answers. At this point, realization is dawning regarding responsibilities, independent thinking, and scope of practice. While this is what the faculty wants to see, these realizations can be more than a little overwhelming for students.

Another consideration in a gradual reinforcement of critical thinking theory and skill sets related to it is that part of the process involves student progression through the various **learning domains**. These domains increase in difficulty from simple knowledge to application and analysis. Each domain demands more knowledge—knowledge that takes on new meaning when combined with that which was previously learned. It also leads to more questioning and in-depth analysis of information, requiring the development of problem-solving skills concurrently with critical thinking skills. Within those categories are contained the various behaviors affecting learning. The three areas are: cognitive, affective, and psychomotor.

The cognitive sphere equates to knowledge and how it is used. Knowledge gradually progresses from simple memorization to the ability to analyze and apply what is learned. Critical thinking and relationship analysis may not be evident at lower levels on the continuum but should appear when comprehension occurs and continue to grow and expand along with increasing knowledge.

The affective sphere takes into consideration attitudes as part of the learning process and a student's reaction to learning. This may range from simple learning response to the ability to organize information.

Finally, the psychomotor sphere relates to skills in the educational process and how they are used and applied. To better understand this, visualize two paths running side by side. (See **Figure 1-1**.) One path is the continuum of learning domain progression,

while the other is the progression of critical thinking abilities. Beginning nursing education is focused on general knowledge and memorization. Critical thinking at this point is focused on learning medical terminology, simple skills, and considerations of what nursing means. It is highly likely that during this phase, students are comparing their nursing education to past educational experiences, realizing the intensity and hard work needed to reach their goals. It is a time of first exposure to nursing theories and the foundation that will lead to comprehension. This phase would occur during the early portion of their first year of learning. Later on in that year, students will begin to amass more knowledge and begin to be able to consider associations. At this point, these associations would be along the lines of comparing proper steps in completing a procedure with omitted or incorrect steps; they are discovering what they do and do not know about how everything fits together. And so it goes as students travel the path from basic knowledge to application.

It is important to mention here that this process applies to nursing courses in any program type. The pathway described begins with the start of nursing education. Prior to that time, the presence and level of preexisting critical thinking abilities are highly individualized and dependent upon many factors and influences. For many students in either 4-year or community colleges, it is presumed that critical thinking as it applies to higher education is promoted and fostered early on. Thus, it would seem that a student should have some perception of and insight into these skills, but as we have discussed, that is not often the case. While I believe nursing is ahead of the game in this respect, nurse educators cannot lose sight of the fact that not every student comes into a nursing program with advanced critical thinking skills.

From all of this, I think it is easy to see several things. First, critical thinking does not occur in isolation and definitely includes the types of thought processes that lead to further investigation of associations and comparisons. Secondly, critical thinking as a part of nursing actions is a fact of nursing life, and its foundations are laid in nursing education. The way in which both students and faculty lay that foundation determines future successful practice. In fact, it is one of the cornerstones of all nursing practice. Finally, gradual integration serves as the most reliable method for meaningful application of critical thinking.

Figure 1-1 Learning domain and critical thinking ability progression.

Introduction/ Exposure	Beginning Comprehension	Advanced Comprehension/ Review	Application
Basic learning & memorization	Limited associations & comparisons/ questioning	Increased questioning, awareness of nursing actions Integrated relationship analysis	Critical thinking integration into all skills/actions Scope of practice awareness
Critical Thinking Ability Progression			

Relationship Analysis

Relationship analysis may be a separate process within critical thinking, but as mentioned earlier, it is also an extension of critical thinking itself. The term refers to being able to see not only how concepts are associated, but also how they affect each other—questioning associations, outcomes, and actions. If this all sounds familiar, it is because it is closely aligned with what we know as the nursing process. It is also a necessary thought process that must be present for critical thinking to occur. For instance, we could read a paragraph on some type of pathophysiology. If we failed to link its meaning to nursing practice, what critical thinking could occur? Facts taken in isolation do not stimulate or allow for critical thinking. Relationship analysis translates into action—action in thought, reasoning, and judgment related to comparing and contrasting information. Basic relationship analysis occurs when, as a student begins the clinical experience, questions arise comparing theory on disease pathophysiology with the actual manifestations of it in a patient. The clinical experience is also the catalyst for comparing expectations with reality as far as skills and nursing actions are concerned. For example, taking a blood pressure appears to be a fairly simple and straightforward procedure. In the clinical setting, however, other considerations become important to completing the skill, such as cuff placement, prohibited use of an extremity, and equipment accuracy. So, the process is much deeper than simply comparing and contrasting. See **Figure 1-2** for a perspective on questions related to relationship analysis and how they meld with the critical thinking process. It is about examining all the related concepts, establishing associations, and categorizing. Beyond that, it is about taking that information and adding in meaningful learning that leads eventually to application. In many ways, this process of looking at relationships also involves troubleshooting, because the student learns a great deal about practice standards, therapeutic communication, safety, and scope of practice. The act of comparing also considers what is right about what they are doing and what is not. This may seem to be a different way of looking at this process but think about it: Critical thinking and all its components are integral to nursing practice. Because our practice translates into actions and those actions in turn define our practice, it all fits. Relationship analysis emphasizes the interdependence of information on actions and outcomes. This point is where the process begins to involve application.

The process is analogous to putting together a puzzle. Information is gathered, clustered, and separated into categories as needed until relationships appear. Learning that nothing is static in nursing is something I continually stress to students. While they may tire of hearing me say it, it is a statement that sums up concept mapping theory and is essential to the transition from learning to application. For instance, students learn early on in nursing theory that when a disease occurs in one body system, there are repercussions and manifestations in another. This is an early introduction to relationship analysis.

Another way in which relationship analysis is applied in nursing is when associations are made between a patient's diagnosis and abnormal laboratory or diagnostic test results. It is part of higher level thought processes and demonstrates a student's critical thinking abilities. I have seen that many students have difficulty making these associations, especially as they transition from the first year of nursing education to the second. It is not that students are unaware of these associations, but rather that they must condition themselves to think in a detailed way that allows for active thought processes involving relationship analysis. In any program, much more is expected from students in the second year, and rightly so. However, we have to remember that critical thinking growth, with

Figure 1-2 Analysis questions.

Topic	Analysis Questions
Assessment Finding	<p>What meaning does this finding have as part of the patient's disease process?</p> <p>Is this finding a new one or "normal" for this patient?</p> <p>Does this finding necessitate any nursing actions at this time?</p> <p>Is there a difference between the textbook and what I am seeing?</p> <p>Does this finding indicate that my patient may be decompensating?</p>
Skill	<p>What factors must be considered to safely complete this skill?</p> <p>How should I proceed if something unexpected occurs?</p> <p>What nursing actions must occur after the skill is completed?</p> <p>Have I checked the physician's order prior to proceeding if necessary?</p> <p>What resources can be used to review this skill before proceeding?</p>
Treatment	<p>Why am I using these products to treat this wound?</p> <p>What documentation goes along with this type of treatment?</p> <p>What supplies are needed and where do I locate them?</p> <p>Have I educated my patient on how the treatment will be carried out?</p> <p>What follow-up care or action is necessary after completing the treatment?</p>

relationship analysis as part of that, is honed gradually and incrementally. Identifying this process and introducing it early on in nursing education, as well as utilizing concept mapping to demonstrate it (both in lecture as well as clinically), allow for maximum achievement and competency.

It is also important to realize that this process applies to what students already know, compared to what they have yet to learn. While this may be obvious to educators, it is usually not so clear to students, especially those who are on the early pathway of nursing education. Often, students see what they have already learned as "old" material. You must not miss the important point that all nursing education already learned serves as building blocks and the foundation for future application. In any type of nursing program, there is a certain time lapse before this idea is firmly integrated. In fact, it may not totally "click" until the second year. I have had students tell me that they "shelved" previously learned information because they were not "using it!" I think it is extremely important to emphasize from day one that all information is relevant, necessary, and will need to be recalled in the future.

In summary, this process may find its beginnings in classroom theory but quickly extends into clinical practice and occurs in an incremental fashion. First, a student learns how to compare normal and abnormal assessment findings. This is often the focus in the first 2 years of nursing education, regardless of the type of program. As the student continues on the path of learning, other concepts are layered in and the process becomes more complex. The student recognizes the implications that diagnostic testing, laboratory testing, and medication effects have on nursing action and patient outcomes. This is the time when the student begins to truly realize and appreciate the nursing role: recognizing the full responsibility, scope of practice, and knowledge base needed to practice

at appropriate and acceptable standards. It is important for nursing faculty to realize that this analytical ability is directly tied to critical thinking abilities. Educational goals must be focused on an incremental approach throughout the program.

Concept maps have a strong focus on outcomes and actions and lend themselves to use throughout nursing education. This is just a sampling to emphasize how relationship analysis–related thought processes are manifested. You may be able to think of many more related to patient education as well as various other patient care considerations. The meaning behind these questions is that a student asking or demonstrating them has progressed to the point where actions, responsibility for those actions, and outcomes are now being considered. Essentially, they mean that the student is already applying knowledge and critical thinking but may not recognize it. I say that because it is clear that some of the questions are simple, while others are more complex.

Theory-to-Practice Application

Theory-to-practice application is the ability of students to take what they have learned in the classroom and give it meaning at the patient’s bedside. Sure, they may know what a rale is, but do they know what it means when they hear it? Do they know why it is present? How does it fit in with the patient’s diagnoses? These and other similar questions, as we have seen, are all part of critical thinking and relationship analysis. Thinking critically is the jumping off point to students’ realizations that more information is needed and, subsequently, that this information has meaning within the nursing process; it determines what assessments mean, why certain medications are needed, how laboratory and diagnostic tests fit into the equation, and, ultimately, what outcomes are desired. The realization that more information is needed is a big step forward in a student’s growth on that pathway to advanced beginner. It is the point at which “everything clicks,” and the light bulb goes on. From the foundational knowledge laid with previous education stems the essential components related to achieving application—knowledge of necessary nursing actions and outcomes determined through evaluating, revising, and implementing the plan of care; identifying abnormal findings; and following up to complete the process.

The ultimate goal of theory application to actual patient care is putting both critical thinking and relationship analysis into motion as nursing actions when planning the patient’s care—not just the established plan, but the continual plan of care that changes along with the patient’s condition and needs. It is ever changing, depending upon patient responses to treatment, new problems appearing during care, and so forth. This would also include, as stated earlier, a patient’s holistic safety and communication needs, coexistent with any advocacy needs. This is what I like to call “the whole package.” Remember, though, that on a continuum of learning this process is active and needs to be encouraged and stimulated from the beginning of nursing education.

I have found that if I lecture on this and use the phrase *theory-to-practice application*, students may not be able to grasp its meaning. I need to give examples and explain in detail what I mean and how they will carry it out. In their eyes it does not translate into an action, but a thought process. We are talking about second-year students here. They may have adequate base knowledge, but little understanding of how to utilize all that has been learned. While it comprises both of those things, educators must place a strong emphasis on the *action* part. Let’s look at an example to better illustrate this process.

Suppose a student is assigned to a patient with chronic obstructive pulmonary disease (COPD). While the student may have some understanding of the disease process, he or she needs an awareness of how to plan care for that person related to nursing actions, follow up, and outcomes. At this point, questions must be introduced to spark that thinking process. Let's look at how a question-and-answer session could be used:

Q: What factors should be considered besides knowing what COPD is and how its pathophysiology occurs?

A: Before going into the patient's room, think about what this patient will look like. What might be different with his coloring, posture, overall appearance? How would this compare to what your book tells you?

Q: What other information would you need to help you care for this patient and where can you find that information?

A: It would be important to be aware of the patient's oxygen saturation via pulse oximetry and that a probe is in fact in place taking continuous measurements. Another consideration would be how the patient tolerates activity. Some questions to ask would be whether or not he uses oxygen at home or just needs it in the hospital. Be aware of the flow rate, assess that it is correct, and be sure it remains on. The patient may be experiencing a related diagnosis, such as pneumonia, which will exacerbate the COPD, so knowledge of chest x-ray results would be important to determine severity and degree of patient compromise. Also, be aware of the oxygen orders. Many times orders are given to titrate the therapy according to the patient's pulse oximetry. You would then need to document this more frequently, as well as the patient's response to the titration.

Q: How is safety in care managed with a patient with this diagnosis?

A: Suppose you enter the room and the patient is attempting to get to the bathroom. He has taken his oxygen off and placed it on the bed. You note moderate dyspnea and dusky nail beds. This now changes your patient's fall risk score, and safety measures should be instituted. If you note confusion, you should place a bed alarm, document the situation, and be sure to follow up with frequent safety checks and subsequent documentation. The patient will need education regarding limited activity restrictions and have the call bell in place to call the nurse when he needs to get out of bed. A urinal positioned where he can reach it would also be appropriate. Reinforcement of that education is important and may be repeated as needed. A focused assessment of the respiratory system would also be in order to help determine why this status change occurred.

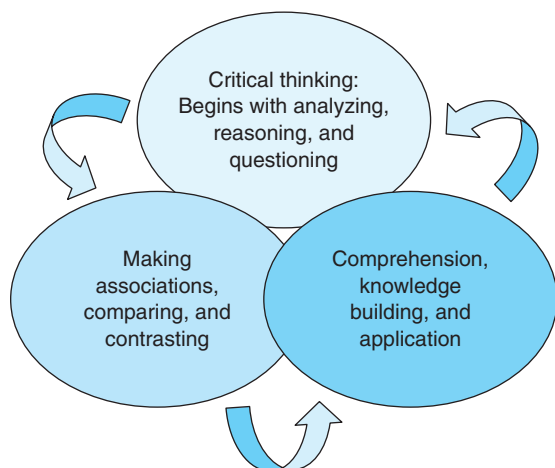
Exercises and examples such as this are a wonderful way to get the students thinking. They are also important in helping them to make connections and think on their feet. In many programs, clinical patient assignments cannot be made prior to the clinical day, so students cannot benefit from researching patient-related information. They may have only 20 minutes or so to think about the diagnosis and their plan of care. This can be very stressful for students but at the same time may contribute to a vigilance that assists with raising care standards as far as student scope of practice is concerned. Deep foundational knowledge provides them with the means to look at all factors needed to determine the best, most effective nursing actions, while considering outcomes.

Another tactic that is beneficial to use when presenting this information is to link actions and decision making to the clinical evaluation tool. This reinforces that requirements are not random, but important in achieving competencies. This will also help to reinforce holistic considerations such as cultural and psychosocial factors influencing nursing actions and care-related decisions. Other important areas that can be drawn into this process are that of patient education and how the past medical history impacts the present plan of care. Concept mapping assists in developing thought processes related to critical thinking, knowledge assessment, and relationship analysis in ways that foster application. It is extremely important to recognize and inform the students that they are already aware of many of these processes and may in fact be applying them on a basic level. I am a firm believer in introducing these concepts from the start of nursing education. A gradual integration is less overwhelming and instills the standard for all three processes we have been considering. Including concept mapping theory and basic, static maps early on facilitates these goals. This also helps with underscoring the important fact that nothing learned in nursing education is without value. None of it is old and without later use or application.

One thing I have learned as an educator is that students need constant and continual reinforcement of information. Theory or skill-related presentations may be clear, but students do not have the knowledge base of faculty and are considering a multitude of knowledge facts at any one time. It is very easy for them to become distracted and miss something. Concept maps are tools that can be used to reinforce information along with learning concepts. This is the ultimate goal in nursing education, and it must be aligned with program competencies and can never occur in isolation. Critical thinking and relationship analysis are the building blocks integral to this process. When presenting concept map theory, it is important to mention that all of this content is already being used by students.

A concept map is a physical creation of those thought processes and thus can be used as a gauge of reasoning, judgment, and critical thinking abilities. **Figure 1-3** shows the interrelationships of these terms and concepts. The statement I make most often to

Figure 1-3 Critical thinking, associations, and comprehension.

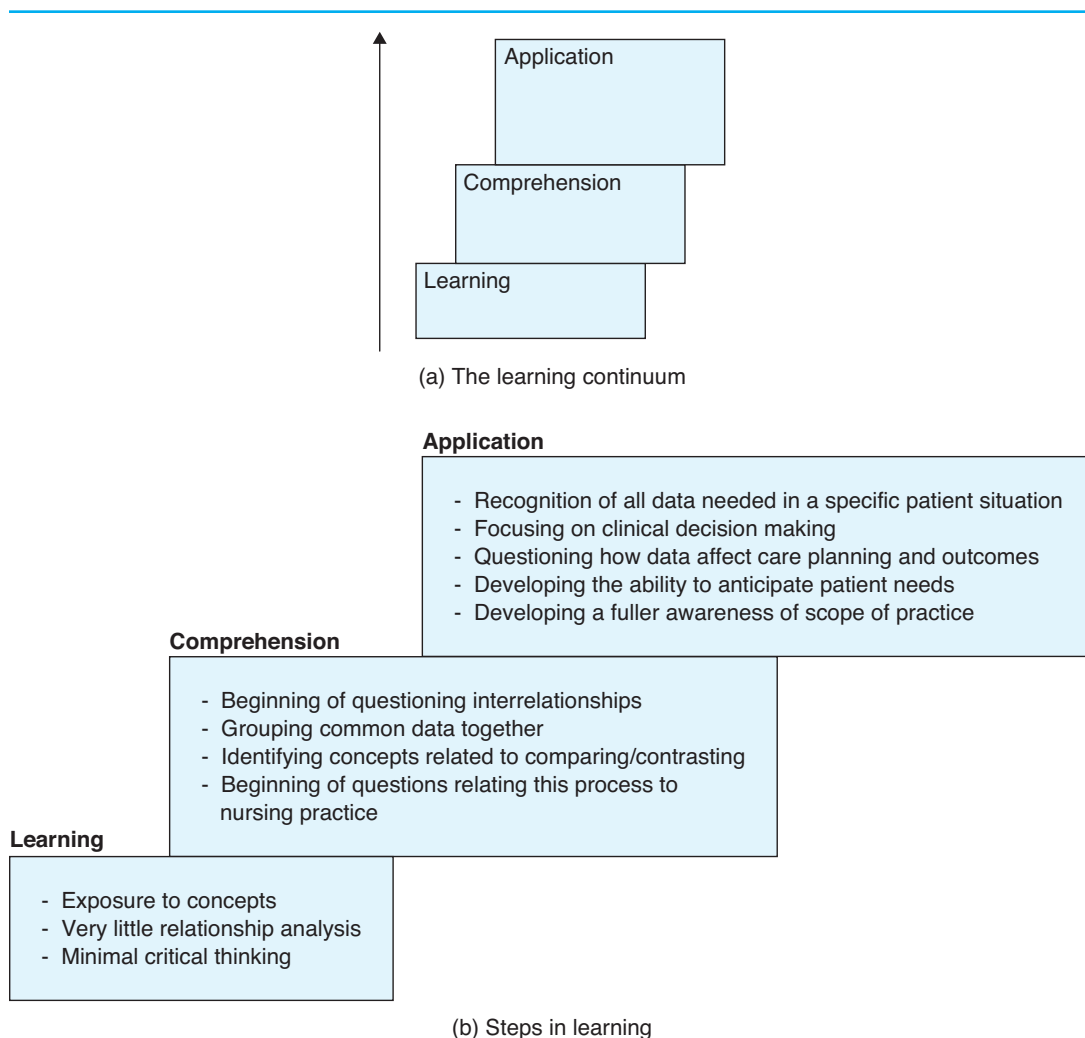


students is, “Nothing is static. What happens in one area of the body invariably affects the other.” The same applies to the entire process just described. One thought leads to another, which leads to questions, which leads to actions, and so on.

In practice, this process is ongoing and occurs on a continuum of learning. With reflection and continued repetition, the student is able to progress in knowledge and the ability to apply it. An essential focus in attaining comprehension in learning is repetition and repeated exposure to a topic. Creating concept maps allows a student to see and utilize similar knowledge and application in a repeated pattern.

Figure 1-4 looks at this process in a different way. Figure 1-4a reiterates that, on a continuum of learning, application is the ultimate goal. Figure 1-4b briefly summarizes a student’s progression to satisfactory attainment of applied nursing knowledge. It alludes to the progression of novice to advanced beginner and critical thinking thought processes evidenced. It can be applied to any type of registered nurse program of study. No matter the length of a program, the goals and competencies to be satisfied are very similar.

Figure 1-4 (a) The learning continuum; (b) Steps in learning.



Learning Styles

Learning styles are methods through which we are able to learn and comprehend knowledge. Each style has an association with how our brains process incoming information. Without brain processing, we would be able to read a page of type, study a graph, or practice a skill, but never be able to organize, categorize, have memory of, or be able to apply that knowledge.

Much has been written and debated about learning styles. Some experts in education, as well as students, feel the whole concept to be myth rather than fact and that identifying learning styles may lead to labeling and compartmentalizing. In addition, there is no consistent agreement by experts on categories of learning styles, and a wide variety of titles have been assigned with overlapping information from different sources in some cases. I have also found that what can greatly affect these opinions is a student's or educator's perception or idea about what specific method is best regarding both studying and theory presentation to ensure comprehension in learning. Preconceived notions still exist that this method entails hours of reading prior to class, attending class and taking notes, then spending many more hours rereading and studying just from the book and the notes. This is an antiquated approach that does no justice to those who learn best through alternative methods.

Research will yield a variety of results, identified types, and characteristics. See **Figure 1-5** for a brief summary of learning styles. When you do research the various styles, please keep in mind that most of us use a combination of styles. It is also a good idea to research by characteristics rather than labels, because labels may be different in various resources and these terms are not the sole identification of our style of learning. It is much more important to recognize that those characteristics will identify behaviors that are more easily recognized than a one- or two-word label. The instant students see a certain set of behaviors within a style, they may exclaim, "that's me!" This is the jumping off point from which they may now start to look more deeply into how study, class preparation, and note-taking time is spent. They will either realize that they are on the right track or take another look and realize that adjustment is in order. So, it is not about pigeonholing or labeling as much as it is about academic success within nursing education. I firmly believe that whatever the program, nursing faculty need to take responsibility for introducing learning style theory, even in a small way. It may be true that others know a bit more about it or have the methods and time to explain it more fully; however, we are the ones who can integrate it successfully into nursing curricula for the best results. We tailor all other education to our student populations, so why not this as well?

Having summarized all of that, the fact remains that we do all learn differently and there are research studies that have proven a link between use of learning styles and enhancement in critical thinking abilities; pairing the correct learning style with each student's brain processing abilities equals academic success. Through my own observations, most students find that a combination of styles is actually the best fit for success. In order to provide equal learning opportunities for all students, faculty needs to ensure that each student has exposure to this concept. Each student, then, needs to make time for opportunities to explore the various styles.

I always find it interesting when I ask students if they are aware of their learning style. I usually find that about 50–60% forget what a learning style is, a small percentage admit to hearing the term but remember nothing else, and the rest know what their style is but have never used it to study! The fact is that most, if not all college campuses, introduce

Figure 1-5 Learning styles.

Visual/Seeing	Although a student may comprehend some concepts from reading, the process is greatly enhanced when photos, graphs, and animations are used.
Auditory/Listening	If this is the dominant learning method, taping notes as well as employing other auditory methods, such as an audio book, are keys to enhance learning.
Verbal/Writing	The printed and written word dominates this style so that learners benefit from reading, rereading, and note taking.
Kinesthetic	This is pure “hands on” learning where sensory interaction is necessary to comprehension and application.

this topic early on in college life, yet many students are not using this valuable resource. I have addressed learning styles in my lectures, as a presentation in a remedial nursing course, and within concept mapping presentations and have witnessed student success in enhancement of critical thinking abilities and thus improvement in clinical and academic performance. I issue a challenge to all nurse educators to become more familiar with learning styles, promote student awareness of them, and integrate them into your curricula. Our goal in nursing education is to attain competency in knowledge application, which defines our scope of practice. It is obvious we cannot reach this goal realistically unless we tailor our educational methods to our future nurses. If a student cannot progress from learning to comprehension, then true application is impossible.

Another point to be aware of with learning styles is that using them is not confined to class preparation time. In addition to aiding comprehension and the process of incoming information, learning styles speak to environmental and social factors in learning, as well as study skills. A learning style must be integrated into all parts of learning to be valuable. Note-taking templates may need to be altered to reflect material organization the way a student “sees” it. This may be different from outline formats as well as presentation formats, but it is what will actually be meaningful to the student. Many students do not realize that learning styles also impact studying. Each style has a component of environmental considerations. These include factors related to effective studying such as choosing a quiet environment versus studying in a group. Some students may benefit from background noise while others need extreme quiet. Those students with a tendency toward oral or audio learning styles may find it helpful to read aloud while studying or reviewing taped lectures. In addition, in auditory learning styles comprehension is affected by the tone of emphasis a speaker uses as well as nonverbal communication. When studying, factors such as background noise and the presence of others play key roles in whether effective studying actually occurs. An example I have used is as follows:

Have you ever read a chapter while studying, only to find yourself reviewing certain portions over and over? Did it seem as though you really weren't retaining anything? More than likely, this occurred because the verbal style of learning is not your dominant style and spinning your wheels using it wasted time and didn't benefit you in the least. Of course, a well rounded knowledge base must be intact before anyone can truly apply a specific style to learning for optimum outcomes. It is very helpful for students to have a

working knowledge of their particular learning style prior to attempting complex, living maps.

In addressing studying, it is also beneficial to emphasize that effective study time is essential for developing a knowledge base within which critical thinking and relationship analysis can occur. One exercise I have used in the past is to have students make a monthly calendar. For each week, three main categories are logged according to hourly increments and color coding. The three main areas are:

1. *Personal time*: This might entail anything from getting a massage or knitting a blanket to having a mammogram.
2. *Family time*: This category may include activities such as taking children to a movie, planning family meals, or spending time with a sibling.
3. *School time*: This area highlights study time allotted related to nursing education.

A student should see a pattern showing that the majority of their time is spent studying. Information gleaned from this activity is valuable as it opens students' eyes to how little they may actually be studying. The color assigned to school time should be seen frequently and take precedence. Adequate time plus effective time equals meaningful study time. Some ground rules for this exercise include that a student must be honest about the data and be willing to use the data as a goal-setting tool for improvement. For instance, sitting with an open book on your lap while watching TV does *not* add up to either effective or adequate study time! Neither does trying to study while eating or making your child's lunch.

I cannot emphasize enough that knowing one's style and employing it in *all* areas of learning are necessary if progression to application can occur. Such multifactorial processes really make effective learning quite a challenge at times, especially when each student learns and processes just a bit differently than the others in a large classroom group, but these multifactorial educational processes are necessary to ensure that all students' needs are met. Although extremely important in theory knowledge, these methods are also integral to skills learning as well.

Learning styles are applied to concept mapping in one way through map formatting. A student will format a map according to how material is processed and organized. In another way, an in-depth knowledge of a learning style allows a student to more easily identify concepts as well as how to organize, cluster, and analyze how all of the pieces fit together. This is in itself an example of comparison/contrast.

Learning Styles and Brain Processing

As we have seen, learning styles are directly related to **brain processing**. A student's map formatting is partially determined through brain processing. While most literature identifies that we definitely use our entire brain for learning and reasoning, one side is usually dominant and determines how we best learn. As you research this topic in more depth, please be aware that this research is ongoing and often updated. The majority of newer research into brain function has shown evidence that both sides of our brains work in harmony to process incoming information from a variety of sources and senses. The

bottom line is that brain processing, however it is defined, is very much a key component in each person's learning style and ability to take in and give meaning to learning. Additionally, a student will learn more regarding how creativity plays a role in education along with insight into how they follow directions.

Knowledge of this process becomes very important when maximizing the potential of concept mapping in nursing education because it will tell us how each student categorizes the information provided, which determines how relationship analysis is carried out. This information is also a predictor of how a concept map is set up for optimal learning. For example, when learning about body system pathophysiology, some students look at the main problem (or the whole), before identifying and separating the process into segments for comparison and relationship analysis. Other students may need to identify each segment of the problem and its relationship to the whole before being fully able to consider and understand the pathophysiology. In other words, understanding brain processing aids both faculty and students in the understanding of learning styles, which opens a window directly into our capacity to pass beyond learning to achieve the ultimate goal of applying knowledge. The entire miracle of learning styles and how our brains process input gives great insight into how learning, and subsequently, comprehension and application are allowed to occur. Once again, their labels are not as important as the behavioral characteristics they define. What is far more important is that students' awareness of how their brains work leads to reflection and introspection. An opportunity is also provided for them to take a more active role in successful and meaningful learning. This should serve to generate more knowledge, leading to increased self-confidence. For instance, if a student is performing suboptimally, either clinically or academically, a part of the problem may be stemming from ineffective studying. A student who consistently attempts to learn and study using a style not congruent with their processing is going to spend a great deal more time studying but getting nowhere. While this will not solve every student's learning difficulties, it is definitely worth addressing. Time involved in research may also be a factor, but it is time well spent.

The brain as a whole is able to accept and store information. It is also able to make its own data associations, draw on past experiences, and cluster and/or separate data into categories. Until incoming information is stored, it cannot be truly processed. Both long- and short-term memory are a part of this process. If we were able to look inside our brains and visualize thought processing, it would no doubt appear as a very complex concept map with far-reaching and ever-expanding associations. If you really think about this, the meaning of it all does become clearer. Let's suppose that you are viewing a photograph. Your mind instantly associates the camera that captured the scene, and many memories surrounding it are triggered. Other associations would include emotions, actions, and feelings about the photograph and its subject. How amazing is that? What the mind does with information and how it works is exactly what a concept map is able to demonstrate! Students learn a most valuable lesson about how they think and can actually see it evidenced on paper. What better learning and teaching tool could we possibly have? Insight into learning is a major component of successful education. Concept mapping allows for the mental multitasking essential to brain processing, critical thinking, and application. All of these things are interconnected.

From a nursing perspective, imagine that students are learning about nursing actions associated with the postoperative patient. Once they know that stasis is a major catalyst for postoperative complications, their minds can now create a link between nursing actions

that would prevent stasis. Creating nursing actions in the plan of care for mobility, anti-embolism stockings, and sequential compression devices would address stasis of blood; incentive spirometry along with coughing and deep breathing would be necessary for preventing stasis of secretions; and finally, mobility and fluid intake would assist with prevention of urinary stasis. Thinking this plan of care through is necessary, but putting it down as a concept map not only reinforces the ideas but also allows students to visualize their choices and where they may have missed a step. It is a reflection of practice and previously learned information all rolled into one. It is sometimes helpful for students to be able to picture a patient in their minds—either someone they have provided care to or a friend or family member. Along with reflection, this assists with solidifying the information relative to nursing actions and allows for application.

This is how learning styles and effective studying are connected with brain processing and aligned with concept map theory. This fact also demonstrates why simple learning and memorization are inadequate for achieving the ability to apply theory. A student needs to move forward and be able to comprehend, make associations, and develop in-depth critical thinking skills prior to applying.

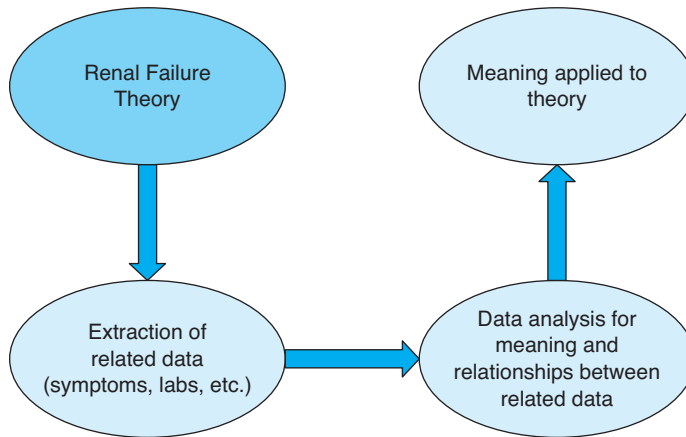
Now, if we isolate how the left sides of our brains take in information, we could see that if this side dominates, the learner prefers written information for information processing.

Learning through the written and spoken word is orderly, sequential, and logical to these individuals. When analyzing data, they will look at each smaller segment of data affecting the whole before being able to consider or understand the larger process. A more detailed example is this: Suppose a student is going to be learning about renal failure. A dominant left brain processor would read the chapter thoroughly, take notes in an outline form, and focus on the symptoms and abnormal assessment findings before considering and analyzing the type of failure or the specific causes. This is a reality-based approach. When considering nursing actions and problem solving for this patient, these students would consider each problem and how to address each one in turn. Data would be somewhat isolated at first so that this learner could derive meaning from each individual piece. Completing each step allows future consideration of the whole and how all of it fits into the pathophysiology of renal failure. See [Figure 1-6](#).

In contrast, right-sided brain processors utilize a more random approach to learning and need specific directions and introductions for concepts to be completely understood. Emotions, sensory input, and short-term memory are dominant methods used in this style of learning. A particular concern with this type of learner is the ability to link data and draw conclusions. These learners may feel that they need multiple attempts when learning for comprehension and become easily frustrated. A hands-on style combined with visual components is best as they process and attempt to understand the main problem, first, to obtain an overview, before smaller segments can have meaning. For this student to best understand renal failure, seeing animations or other visual demonstrations provide for comprehensive learning. They would benefit first from understanding what renal failure is and then what results from it. Outlines and reading will not lead to any meaningful and productive learning. They may have trouble learning as quickly as the left brain processor. See [Figure 1-7](#).

Learning styles and brain processing work hand in hand, playing a major role in advanced learning. Another way this becomes valuable is in application of nursing actions. Learning styles and brain processing play a role in critically analyzing relationships necessary in clinical decision making and care planning. Everything we have been discussing

Figure 1-6 Theory application.

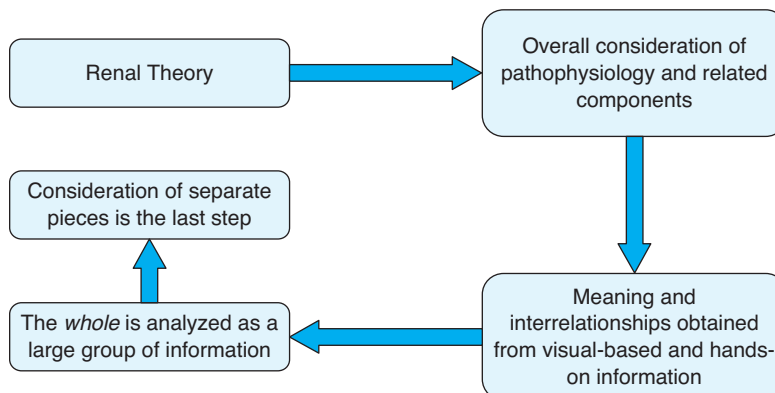


thus far becomes a major part of nursing education, whether academically or clinically. All of this information is essential to achievement of appropriate practice standards. The nursing process embodies all of this as an essential knowledge base that is necessary for assessment of data culled from the physical examination and holistic considerations to plan, implement, and evaluate care.

At this point you may be asking how all students can benefit from the use of concept mapping, given all the variations in learning styles and brain processing. While this will be addressed in more detail in subsequent chapters, I think it is appropriate to consider it here. Keep in mind that each map is a direct transmission of thought processes to paper. That in itself is helpful as it contributes to learning success.

To address all learning styles and brain processing preferences among various student populations, we need to incorporate beneficial types of resources. This is not to say that they be made available, but included as an integral part of presentation and review. As nurse educators, we need to be creative in integrating these resources into lecture outlines,

Figure 1-7 Brain processing and application.



course outlines, and informational resource repositories. School libraries are especially necessary collaborators assisting with obtaining, cataloging, and reserving these materials. The nursing computer lab can be utilized for software-based programs, other forms of stored programs, and web-based resources. Within today's online learning options, such as ANGEL and Blackboard, files and folders containing links to audio, video, and other various learning resources can be posted for students to access off campus, anytime and anywhere. In that same theme, handheld electronic devices are now the rage. They allow a student to download an ebook or other electronic resource, even self-created documents, useful in either classroom learning or clinical situations. While cost may be a factor, the portability of voluminous data is easier than ever and its value cannot be ignored. How many students do you know who would rather lug several heavy books to the clinical site instead of a small, comparatively weightless electronic device?

All of the information discussed in this chapter will directly influence concept map setup. As stated earlier on, all concepts in concept mapping and nursing educational theories are directly interrelated.

A Bit of History

While the use of concept mapping in nursing education is relatively new, its use in other educational arenas has been going on since the 1970s. Initially developed and utilized in the field of science, in time various educational specialties adopted the method for use involving both team and individual work. The eventual and continued development of concept mapping then morphed into a variety of formats appealing to sectors outside education, including business and even the National Aeronautics and Space Administration (NASA). Simply formatted maps were commonplace and used mostly for educating. Eventually, many more formatting types were developed, leading to expanded uses such as problem solving, thought provocation, creativity, and considering possible outcomes based on decision making. As time passed, limited, static maps morphed into more complex, even grandiose living maps used by students and educators in almost every field of education. What began as a simple tool used solely for education by educators has exploded into a movement embracing concept maps in all areas of education from kindergarten through advanced academic settings and beyond. There are as many styles and layouts of concept maps as there are ways to employ their use. Data input for the maps contains everything from numbers, to mini outlines, to pictures and graphs.

Along with this boom has been the development of concept mapping software. For those computer-savvy students, this software is appealing because it is easy for them to understand and speaks to visual learning styles and creativity. Many students find it easier to generate a computer-based map rather than a hand-drawn one. I always advocate free resources included with textbooks, including providing web-based access. Programs are available for purchase, but some can be quite expensive. Why pay when free resources exist? Another reason I say this is because students need time to develop the type of map formatting that is congruent with individual learning styles and suits their learning needs. This process may take a bit of time initially and is best done with pencil and paper. As time progresses and students are comfortable with the process, a transition to computer-based map generation is certainly an option. One such option is the use of office software. An example of this is Microsoft Word.

The nursing profession has used concept mapping for educational purposes since about 2006. Although the list of resources is small, that list grows every year. Just a few years ago Internet searches for the use concept mapping yielded mostly nonnursing references. Today, a search will indicate that programs throughout the country are integrating use of these teaching/learning tools into curricula. Stimulating creativity and critical thinking, concept maps are able to merge knowledge with care planning and outcomes and to encourage questioning that gives rise to more effective and complete critical thinking. From my standpoint, they also assist faculty in evaluating that critical thinking process so important to preparing new graduates for practice. They allow students to evaluate the depth of critical thinking ability and key into areas of strength, building self-confidence while also allowing them to see where they need to work harder. When used in certain ways, concept maps can make a stronger statement about scope of practice and nursing action accountability than any admonishing statement ever could. Maps can be used by educators within lectures, as simple tools for skills learning, and by students for everything from note taking to studying to presentations. They are also beneficial tools in individual or group assignments.

What of the Future?

Because you have decided to purchase this book, it is obvious that you want to learn more about concept mapping and the implications of its use in nursing education. My hope is that your quest for knowledge in this area continues. You may be inspired to create your own uses and integration of the process into your practice. Go for it! The true beauty of the process is the myriad uses and creativity it inspires. Continue to learn and then share that knowledge with others. Collaborative efforts do not exist solely for bedside nursing in patient care, but also in nursing classroom and clinical education settings. Creativity is necessary in all forms of nursing education, and concept mapping theory feeds that need. Whether a map is simple or complex, plain or colorful, a multitude of benefits are provided. I envision future directions and trends for the use of concept mapping in nursing education to include:

- Formal research that demonstrates positive outcomes with use of concept maps in nursing education
- Expanded use of concept mapping in all forms and at all levels of nursing education
- Rapid growth in resources related to concept mapping
- Integration of concept mapping use within healthcare settings
- Continued correlation with skills and theory in nursing textbooks
- Incorporation of maps into patient-based teaching plans
- Nursing programs employing concept map materials as required resources
- Use of concept mapping rubric data to assess learning, specifically critical thinking outcomes

The nursing landscape is changing rapidly. There are more opportunities for nurses than ever before in a wide variety of roles and settings. Technology integration within those roles and settings will continue to expand and grow. While computer-based care

strategies have their benefits and do provide rapid access to useful information, they do not and cannot replace the need for a strong base of nursing knowledge where critical thinking and all its facets comprise the cornerstone of care standards. Nursing care standards must always meet the bar that evidence-based research sets. The Quality and Safety Education for Nurses (QSEN) project, along with the Institute of Medicine (IOM), has established initiatives to improve quality and safety in nursing. Funded by the Robert Wood Johnson Foundation, this initiative includes faculty development promotion and student preparatory strategies to achieve those goals through setting the following competency objectives:

- Patient-centered care
- Teamwork and collaboration
- Evidence-based practice
- Quality improvement
- Safety
- Informatics

As a stakeholder in your chosen profession, personal nursing education goals must reflect these competencies for consistent, quality improvement in care. Knowledge equals safety, assurance of quality care standards, and nursing profession empowerment.

The future use of concept mapping within nursing practice begins now with a single step. That step is the journey you have just begun: to learn about concept mapping theory and then create your own concept maps. It will not take long for you to envision and enact other ways to use the maps for more effective learning. As with anything else, you can never realize all of the possibilities until you try. This is your chance to utilize creativity—to individualize the maps for a multitude of learning objectives. Concept maps are magical tools having the ability to be tailored and shaped into a variety of formats as individualized as the student who creates them.

Summary

Learning about concept mapping theory is the first step on your pathway to further develop a knowledge base with the ultimate goal of applying what you have learned. You have learned that the main components of concept mapping theory are important because they:

- Assist with the development and growth of critical thinking skills
- Demonstrate how to use critical thinking to view differences and similarities among and between data to analyze relationships
- Allow you to consider and set goals for using learned knowledge in practice related to nursing actions and outcomes

These components will be visible within the maps you will create because they contribute to the demonstration of each concept. It is important for you to recognize that all learning is based on this theory, whether you use concept maps or not. The maps are a necessary part of cultivating the skills and critical thinking abilities for successful

application. Through them you will be able to see how you critically think—the steps your mind takes to process and apply education. Think of this as a wonderful tool with multiple uses and a strong contributor to your success in nursing.

Critical Thinking Questions and Activities

1. In your own words, explain what is meant by the term *critical thinking*. Research the definition and compare it with your explanation.
2. How is relationship analysis related to critical thinking?
3. Provide an example of how relationship analysis is used in determining a nursing action.
4. How does eventual theory application stem from critical thinking and relationship analysis?
5. Take a moment to think about how you learn. The last time you studied, what method made it easier for you to start to comprehend it—for example, written, aural, or visual?
6. Reflect on ways you learn currently. How will what you have read change this process?

Case Studies

Directions: Read through each case study and answer the questions using the chapter material provided.

1. Jane is a first-year nursing student who will be performing a Foley catheter insertion for the first time. Although she learned during the skills lab to place the insertion kit on the bed, her patient is confused and not able to consistently follow directions. Jane has decided to use the bedside table because she has a better chance to maintain sterility of the kit and safely perform this procedure.
 - a. How does Jane's decision making demonstrate critical thinking?
 - b. What other considerations are necessary prior to proceeding?
 - c. What types of processes are entering into Jane's decision making and nursing actions?
 - d. What resources and prior knowledge has Jane used to assess the situation and plan the skill completion?
2. Dan is in his second semester as a nursing student and feels as though he is not doing as well academically as he could be. Family obligations take his time away from school, and the time he does spend studying feels futile. Although he reads, he cannot seem to remember what he read and then spends time re-reading until he becomes so frustrated he has to stop. Dan has set aside 5 hours weekly to study but does not feel he has fully comprehended what he read.
 - a. What should Dan's first step be in evaluating his problem?
 - b. What are some valuable resources Dan could use?

- c. What other activities might be used to help Dan?
 - d. What are some goals Dan can set to be successful?
3. Sandy is a second-year student who is studying pulmonary pathophysiology. Although this topic was presented during her first year, more of it will be applied during her clinical experiences this year. In addition, Sandy knows that exam questions will be at a higher level requiring application. She is feeling nervous about how to proceed and maintain her success from last year.
- a. In what ways can Sandy evaluate her knowledge so that she can see that she has comprehended it and can now apply it?
 - b. How can critical thinking assist this process?
 - c. How are nursing actions parts of knowledge application?



For a full suite of assignments and additional learning activities, use the access code located in the front of your book to visit this exclusive website: <http://go.jblearning.com/schmehl>. If you do not have an access code, you can obtain one at the site.

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