

A review article on concept mapping



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A concept is a perceived regularity in events or objects designated by a label. Concept maps are graphical tools for organizing and representing knowledge in networks of concepts and linking statements about a problem or subject (Novak & Canas 2006).

Novak and Gowin first introduced concept mapping in 1984 to facilitate the process of meaningful learning. They defined the concept map as a schematic diagram that represents key concepts in a framework of propositions. The authors also outlined criteria that can be used by nurse educators when evaluating the student's concept map. These specifically address the student's understanding and linkage of concepts.

In order to achieve meaningful learning, Ausubel (1963) asserts that the student must have an appropriate learning set or intention, which means that the student must consciously decide to learn the material meaningfully, rather than in a rote fashion. Students should take responsibility for their own learning. They should choose to learn meaningfully and have the emotional commitment to integrate new meanings with existing, relevant knowledge, rather than simply memorizing concept definitions or propositional statements.

Formats for concept maps vary greatly according to their purpose. In teaching students about pathophysiology of a disease, the name of the disease is in the center box and there are arrows from the disease to the major physiologic processes that are caused or affected by the disease. Lines and arrows between the physiologic process boxes would show how they relate to each other. Phrases such as leads to, occurs simultaneously, or

increases can be indicated on the lines to further explain how one process relates to another.

The format for a concept map that is applied to nursing care called a care map may look somewhat different. The central box or circle can be the patient. Lines and arrows coming from the patient can lead to medical and nursing diagnoses. Additional concepts such as symptoms, goals, interventions, and evaluation strategies can all be added. When too much information is added to a single concept map, it can become much too complex for a reader to decipher. It might be better to divide the assignment into two concept maps; one for pathophysiology and one for care planning. It is sometimes easier to follow a care map if diagnoses, goals and interventions are placed in different shaped figures such as circles, octagons, and triangles.

Concept mapping is used broadly in nursing education. Nursing faculty may employ them as a teaching strategy in the classroom and students may use them as a note taking or study tool. There are multiple structures used for concept mapping. They are an effective way to teach learners how to think about concepts and to see the big picture of how the many facts and variables in a situation fit together.

Objectives

Concept maps have been used in nursing education as a method for students to organize and analyze data. This review article examines empirical studies on the use of concept maps as a metacognitive tool, as a tool improve students' critical thinking abilities and as a teaching-learning

method in nursing and discusses the effectiveness of using concept mapping in the nursing education. Its implications to research and implications for nursing education will also be discussed.

MATERIALS AND METHOD

Inclusion Criteria

In order to identify the studies to be included in the review article, studies used were from empirical literature or researches and undergone peer reviewed by other researchers. The studies provide useful information about concept maps being used in nursing education. They include the use of concept mapping as a metacognitive tool that enhance students' academic performance, as a way to improve students' critical thinking skills and a tool that serves as an appropriate teaching – learning method. The studies also include the theoretical foundation used in developing concept maps. Among 15 studies, 9 met the inclusion criteria. Other studies were excluded because of duplication of data reported in various articles. Articles that are not focused in the nursing education are also excluded. Finally, after having added all the articles, nine studies published between 2004 and 2010, originating from United States, Canada, South Africa and Taiwan were analyzed in the review article.

Search Strategy

A literature review was conducted to identify research studies on the use of concept mapping as a tool in nursing education. The search strategy identifies the databases that were used to select the studies to be included in the review article. Electronic databases from CINAHL, EBSCO, IJNES, and Sage databases were used. Key words used to retrieve articles were concept
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mapping and nursing education. The goal was to find evidence on using concept map as a metacognitive tool, a tool in improving critical thinking and as a teaching- learning method.

Data Extraction and Analysis

Initially there were 15 studies that were retrieved and reviewed. Articles were included in the review if the studies reflect the effects of concept mapping as a metacognitive tool, it improves critical thinking and as a teaching – learning method. The articles must also include the theoretical foundation that they used in developing concept maps. Only 9 articles met the inclusion criteria. Data were extracted by the completion of evidence tables regarding the study period, location of the study, design of the study, the theoretical background use in formulating concept maps and student exposure in developing concept maps. The themes that emerged from students' use of concept mapping were also included. Lastly, the overall results were also analyzed. Analysis was done by collating data from 9 studies on concept mapping used in nursing education.

RESULTS

Nine studies met the inclusion criteria and these studies describe the use of concept mapping in the nursing education. The characteristics of the studies are shown in Table 1. Nine studies were found, eight focuses on the use of concept mapping in undergraduate nursing courses such as fundamentals, maternal and child and medical-surgical nursing. One study focused on novice graduate nurses. Six studies were conducted in the United States, one in Canada, one in South Africa and one in Taiwan. Of the nine studies,

four involved the use of pre tests and post test design, one used an experimental design and four uses a descriptive design.

Theories have been used to explain the development of concept maps. Concept-mapping as a metacognitive tool, as a teaching method to promote critical thinking and as a teaching – learning method, can be based on the theoretical foundation of Ausubel (1963), Piaget (1972), Vygotsky (1978), Novak and Gowin (1984) and Benner (1984). Most studies have used Ausubel (1963) and Novak & Gowin (1984) as a basis of their theoretical foundation in concept mapping (Table 2).

The student exposure and development of concept maps as well as the effects of concept mapping in nursing education were illustrated in Table 3. Student exposure to concept map development occurred in a variety ways. In eight studies, students were exposed to concept maps through classroom instruction, handouts, case studies and examples. And in one study the nurses were exposed to concept mapping thru an orientation program in a hospital. The effects of concept mapping to nursing students appear to be positive. The students reported that concept mapping enhanced their ability to integrate knowledge and helped them retain complex information. The studies identified evidence of concept mapping as an appropriate teaching-learning strategy. The teachers reported that the use of concept mapping assists in the assessment of students' knowledge and critical thinking skills and in evaluation of clinical performance.

Table 4 describes the overall results of concept mapping in the nursing education. The use of concept maps was shown as a metacognitive tool that

encourages students to think reflectively about what they know through concept maps. It also appears to foster the development of critical thinking abilities. And it appears from the studies that concept mapping is an effective teaching – learning method.

DISCUSSION

Multiple theories have been used to explain concept mapping as shown in Table 2. Concept-mapping as a metacognitive tool and a teaching – learning method to promote critical thinking can be based on the theoretical foundation laid down by educational psychologists (Ausubel, 1963; Piaget, 1972; Vygotsky, 1978; Novak and Gowin, 1984 and Benner, 1984).

Concept mapping, which is based on Ausubel's (1963) Assimilation Learning Theory, in which prior knowledge is described as an important factor in the ability to learn about new concepts, was later developed by Novak. Novak and Gowin (1984) defined a concept map as a schematic device for displaying a set of concept meanings embedded in a framework of propositions. The concept map is developed from concepts that are linked together in a hierarchical manner, that is, from the most general to the more specific concepts. In the studies of Chabeli, M., 2010, Vacek, J., 2009, Kostovich, C., et al., 2007, MacNeil, M., 2007, Taylor, J. & Wros, P., 2007, Abel, W., & Freeze, M., 2006, and August- Brady, M., 2005, students were required to develop a concept map, within the context of the nursing process, based on the primary nursing care needs of their assigned clients.

Benner's (1984) theory was used in the study of Wilgis, M., & McConnell, J. (2008) to identify and incorporate appropriate critical thinking elements that

would facilitate graduate nurses' transition from novice to more advanced critical thinking processes, which can be evaluated using concept maps. In addition, Benner's Novice to Expert Theory is an appropriate and useful framework when evaluating concept mapping as a strategy to improve critical thinking of new nurses in the hospital setting. Based on the findings of the study, nursing educators should design and evaluate teaching strategies that will enable nurses to develop these cognitive and conceptual abilities, which will lead to improved performance and patient care outcomes. Focusing on educational strategies, such as concept mapping, appropriate to the learning needs of novice and advanced beginner nurses, facilitates the transformation of novice nurses into competent professionals.

Cognitive theory views learners as active sense-makers, seen from the study of Hsu, L. (2004). The construction of conceptual relationships between students' current structures of knowledge and understanding new information is critical for meaningful learning. Constructivism means that learning is an active process in which learners construct new ideas or concepts based on their current and past knowledge. To constructivists, the concept of knowledge is based on the developmental theories of Piaget (1972) and Vygotsky (1978). Both believed that learners construct knowledge by interacting with their environment. Piaget believed that all constructions are made in the mind of the learner. Vygotsky felt strongly that learning occurs when knowledge is mediated by knowledgeable social agents.

Analysis of the nine studies about the effects of concept mapping yielded three major themes (Table 3) that emerged from students use of concept

maps: 1) Concept mapping as a metacognitive tool (Chabeli, M. 2010, Taylor, J. & Wros, P., 2007 and August- Brady, M. 2005); 2) Concept mapping improves critical thinking (Chabeli, M., 2010, Vacek, J., 2009, Wilgis, M., & McConnell, J., 2008, Abel, W., & Freeze, M., 2006 and Hsu, L., 2004); and 3) Concept mapping as a teaching- learning method (Chabeli, M., 2010, Wilgis, M., & McConnell, J., 2008, Kostovich, C., et al., 2007, MacNeil, M., 2007 and Abel, W., & Freeze, M., 2006).

Concept mapping as a metacognitive tool

Concept maps have been described as “ metacognitive tools” that encourage students to think reflectively about what they know through the visual representation of concept meanings and relationships. Harpaz, et al., (2004) stressed that the mapping technique enables the learner to understand the main concepts of the area of knowledge and the connections between them, and to represent the concepts in a way that shows his or her way of understanding. Concept maps are metacognitive tools that assist learners to “ see” their own thinking and reasoning about a topic as they depict relationships among factors, note causes and effects, identify predisposing factors, formulate expected outcomes, and so on. The process of creating and modifying a concept map involves making decisions about the different ways concepts are related to one another, leading the individual to reflect on prior knowledge as it relates to new material (McAleese, 1998).

Due to the metacognitive nature of concept mapping, students were able to gain greater insight into their understanding of, or clarifying their understanding of the nursing process as it relates to the care of their clients. Therefore, learning was considered relevant to the participants’ needs, as

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illustrated from the study of August- Brady, M. (2005). The approach to concept mapping described in the article of Taylor, J. & Wros, P., (2007) is unique because it is based on a nursing model of health and illness and places the reason the client requires nursing care at the center of the map. It describes how educators can use concept mapping to teach students how to organize nursing assessment data to develop a plan for nursing care. As a metacognitive tool it reveals students' thinking patterns.

The author, Chabeli, M., (2010) believes that concept-mapping is an integral teaching method to facilitate metacognitive thinking. Concept-mapping encourages meaningful understanding by helping students to organize and connect the information they already know about a subject with the new knowledge. The student's conceptual knowledge is illustrated well through concept-mapping. It is recommended by Chabeli, M. (2010) that the nurse educators can use concept-mapping to facilitate critical thinking and encourage a deep approach to learning. Based on observations and interviews with students engaged in academic reading, Marton and Saljo (1976) have been credited with identifying two fundamental approaches to learning: deep and surface. The deep approach to learning is directed at understanding meaning that resulted in greater retention of learned material over time. The surface approach to learning is directed toward learning the text itself, with less attention on understanding the meaning of the text. Metacognitive processes, enable the learner to flexibly and selectively coordinate knowledge, lead to a deeper level of understanding by making students responsible for their own learning (Georghiadis, 2000). It is described from the study of August- Brady, M., (2005), that the increase in

deep approach to learning scores in the treatment group suggests the metacognitive intervention (concept mapping) had an effect on increasing participants' approach to learning to a deeper, more meaningful level. The goal of this method is to achieve a method of meaningful learning that occurs when the learner actively connects new concepts to existing concepts from former formation of knowledge. Accordingly, this helps complete the missing knowledge and clarify existing knowledge (Harpaz, et al., 2004).

The studies of Chabeli, M. (2010), Taylor, J. & Wros, P., (2007) and August-Brady, M. (2005), manifest that concept mapping is an effective metacognitive tool and an effective teaching strategy in nursing to evaluate both content knowledge and student thinking patterns.

Concept mapping improves critical thinking

A number of articles in the nursing literature support the use of concept mapping to promote critical thinking in nursing education. Concept maps show a flow of thought processes and require analyzing, synthesizing, and evaluating information to determine an action or nursing intervention. Abel, W., & Freeze, M. (2006) noted that concept mapping diagrams the critical thinking strategy involved in using the nursing process.

The ability to think critically and solve problems in different clinical practice settings is required for all nurses, including those who are newly registered and nursing students. Toofany, S., (2008) stated that the selection and implementation of learning activities that promote critical thinking and the use of the nursing process are essential elements of nursing education. As for Chabeli, M., (2010) concept maps are valuable tools with which to

harness the power of the learners' vision to understand complex information at a glance. Concept-mapping is a teaching method to facilitate critical thinking. The concept map is recognized as a teaching strategy that promotes critical thinking because it stimulates deep understanding. Students work through the process of organizing, analyzing, and communicating interrelationships among concepts through a visual representation of components (Hsu, L., 2004).

Vacek, J. (2009) evaluated the use of the concept map as a strategy to teach and evaluate critical thinking. For the purpose of this article, the five elements of critical thinking identified by Facione's 1990 Delphi study, which include analysis, interpretation, inference, explanation, and self-regulation, are used. Novak & Gowin (1984) infused these steps into the building of a concept map, an instructional tool used to facilitate the complex critical thinking process.

Concept mapping can promote problem-solving and critical thinking, thus helping students organize complex patient data, process complex relationships, and offer holistic care to patients (Novak & Gowin 1984).

Critical thinking is a skill that student nurses must have if they are to succeed in nursing. Many schools have reviewed their teaching methods and some have adopted systems of Problem Based Learning that help students develop critical thinking skills to understand and revolve specific problems. Hsu, L. (2004) examines the effects of adopting concept mapping in PBL scenario discussions on the improvement of the students' learning outcomes in the nursing course. As shown from the study of Hsu, L. (2004), the

students were able to integrate Roy's four concepts into nursing concept maps through the concept map construction process.

The study of Abel, W., & Freeze, M. (2006) entitled " Evaluation of Concept Mapping in an Associate Degree Nursing Program" has an aim to evaluate concept mapping as a clinical teaching learning actively that reflects critical thinking. ADN students were asked to create a concept map that depicts the physiologic and psychosocial needs of hospitalized patients. The results showed that the concept maps provide a means for the students to critically think through real clinical situations. And the nursing students were able to create concept maps reflecting the nursing needs of the patients.

Nurses are expected to recognize emerging patient problems and life-threatening situations and to have the ability to think critically and intervene appropriately. However, novice nurses have minimal clinical decision-making and critical thinking experience, and hospitals have few resources to train them (Welk, 2002). These conflicting dynamics can result in poor patient outcomes and possibly lawsuits, which are major concerns for nurse administrators. Toofany, S. (2008) describes concept mapping as a strategy to enhance and evaluate the critical thinking skills of novice graduate nurses. Based from the study of Wilgis, M., & McConnell, J. (2008), concept mapping showed substantial improvement in graduate nurse's ability to identify the main health problem of patients after a two day orientation program. Concept mapping is a valuable tool for hospital educators to use to improve critical thinking, clinical decision making, and performance in graduate nurses.

These studies (Chabeli, M., 2010, Vacek, J., 2009, Wilgis, M., & McConnell, J., 2008, Abel, W., & Freeze, M., 2006 and Hsu, L., 2004) focus on the use of concept maps to facilitate critical thinking in nursing education. The authors believed that the use of concept maps can lead to significant improvements in the ability of the students to conceptualize and think critically.

Concept mapping as a teaching- learning method

Harpaz, et al. (2004) revealed that one of the goals of nursing educators is to help students develop skills that enable them to continue acquiring knowledge independently, even after their formal education is completed. In this era of abundant information and technology that is characterized by rapidly changing data and knowledge, it is up to the students to learn how to study, and even more, how to organize the knowledge and differentiate between significant and insignificant information. There are several methods of teaching that can help the student in the process of becoming a “smart learner.” One of the strategies of teaching – learning that promotes this educational concept is called concept mapping.

Concept mapping is used broadly in nursing education (Chabeli, M., 2010, Vacek, J., 2009, Wilgis, M., & McConnell, J., 2008, Kostovich, C., et al., 2007, MacNeil, M., 2007, Taylor, J. & Wros, P., 2007, Abel, W., & Freeze, M., 2006, August- Brady, M., 2005 and Hsu, L., 2004). Nursing faculty may employ them as a teaching strategy in the classroom.

Clayton (2006) advocates concept mapping as an active teaching strategy that can help nurse educators prepare graduates to think critically.

Educators are urged to use concept-mapping as a method of individual or

group assessment and evaluation to assess the learners' conceptual understanding and handling of complex information (Chabeli, M., 2010).

Concept mapping involves the use of flow charts to organize central concepts and which facilitates understanding of the relationships between them. Research has shown that concept mapping is an advanced method for successful learning (Harpaz, et al., 2004).

The article of Kostovich, C., et al. (2007) focused on the used of concept mapping as a way to tutor students who were having difficulty in their senior adult health course. The use of concept mapping was then extended and used as a teaching tool for all students in the course and as one way to evaluate students' understanding of key concepts in the course.

The literature describes concept mapping as an effective strategy for many kinds of learners, especially for students in health related programs. From the study of MacNeil, M. (2007), pre-lecture and post-lecture concept maps describing wellness were used to measure teaching effectiveness. The pre lecture concept maps helps determine what students know about general concepts prior to instruction, and the post lecture concept maps helps determine the knowledge that has developed. The use of a pre-lecture and post-lecture concept mapping process provided an authentic and innovative evaluative technique to determine understanding of concepts.

The post-lecture concept maps showed significantly more detail than did the pre lecture concept maps, and the complexity of the post-lecture maps provided evidence that the students had a clearer understanding of the

nursing course, as a result from the studies of Wilgis, M., & McConnell, J. (2008), MacNeil, M. (2007) and Abel, W., & Freeze, M. (2006).

One advantage of clinical concept mapping is that it provides a very accessible means through which the instructor can evaluate student preparation and detect gaps in their knowledge base in their reasoning concerning clinical connections. Abel, W., & Freeze, M. (2006) stressed that with the use of concept mapping it will be easy to recognize the student's insight and understanding about the patients. Thus misunderstandings and lack of knowledge could be identified quickly.

Concept mapping was found to be a useful teaching strategy and an effective method to evaluate graduate nurses' thought processes as depicted from the study of Wilgis, M., & McConnell, J. (2008). The improvement in concept mapping scores shows that even a brief experience with using this strategy during a 2-day orientation program can be very valuable in accelerating graduate nurses' ability to synthesize and prioritize information, formulate appropriate care plans, and make judicious decisions about critical clinical situations.

Traditional care plans are effective tools for helping students learn but they have been criticised for resulting in linear thinking, whereas the concept map promotes nonlinear thinking. Several authors recommend replacing traditional care plans with concept mapped care plans to help students learn how patients' various problems are connected to one another (Chabeli, M., 2010, Kostovich, C., et al., 2007 and Abel, W., & Freeze, M. 2006). These authors further propose that, in clinical situations, concept maps should

replace traditional care plans, primarily to synthesise data such as diagnoses, signs and symptoms, health needs, nursing interventions and assessments.

The studies of Chabeli, M., 2010, Wilgis, M., & McConnell, J., 2008, Kostovich, C., et al., 2007, MacNeil, M., 2007 and Abel, W., & Freeze, M., 2006 support the literature that identifies concept maps as a tool in nursing course and as an effective teaching and learning method. Concept maps have been widely used as a teaching strategy in nursing course because it provided a hierarchical structure that allowed students to integrate their understanding in planning the care plan of the patient.

Table 4 described the overall results of concept mapping after analyzing nine studies. It is revealed that instructors and students reported satisfaction from use of concept maps in the educational process. Teaching with the aid of concept maps has been incorporated as an innovative teaching method in nursing education. Use of concept maps enable integration between the knowledge acquired in the class and its implementation in direct treatment of the patient in the clinical field, in locating specific problems, and in planning interventions appropriately. Concept maps have been widely reported in the literature as a teaching strategy in the nursing course. A concept map is a metacognitive tool that allows the student to create a visual representation of their understanding of a particular concept. The use of concept maps can lead to significant improvements in the ability of students to conceptualize and think critically. The concept map is recognized as a teaching strategy that promoted critical thinking because it stimulates deep understanding. It is equally important to understand that the use of <https://assignbuster.com/a-review-article-on-concept-mapping/>

concept mapping does not resume to replace existing teaching methods, but rather to accompany them as an additional way to promote teaching and learning.

Conclusion

Concept mapping facilitates the introduction of nursing concepts into a nursing curriculum (Chabeli, M., 2010, Vacek, J., 2009, and Kostovich, C., et al., 2007). Concept mapping strategies may be useful for analysis of individual student's thinking processes in the nursing course. The use of concept maps was shown as a metacognitive tool to enhance academic performance by enabling students to synthesize and retain complex information, thus promoting meaningful learning (MacNeil, M. 2007, Taylor, J. & Wros, P., 2007 and August- Brady, M., 2005).

It appears to foster the development of critical thinking abilities, providing a way for faculty to measure students' ability to apply critical thinking skills to client situations. The creation of concept maps requires a synthesis of past and current knowledge using the nursing process as a framework. Critical thinking is exercised in the nursing process to determine what relationships exist and why. Concept maps can be used to teach critical thinking and the nursing process (Wilgis, M., & McConnell, J., 2008, Abel, W., & Freeze, M., 2006 and Hsu, L., 2004). This is a huge challenge to nurse educators, as the nursing profession requires nurses who have well-developed critical and creative thinking skills Nurses need critical thinking skills to perform their daily functions in practice. The concept map allows both students and instructors to see the clinical situation at a glance, and the instructor can

quickly evaluate how well students are prepared to provide needed nursing care.

Implications to Nursing Research

This review article has demonstrated that early introduction to concept mapping for clinical care are advantageous as a metacognitive tool, used in increasing students' critical-thinking ability and can be used as teaching – learning method over time.

Students also used concept mapping to assist with preparation for class and clinical activities linking theory with clinical practice and clarifying key concepts. While it appears from these studies that concept mapping is an effective tool in the nursing education (Chabeli, M., 2010, Vacek, J., 2009, Wilgis, M., & McConnell, J., 2008, Kostovich, C., et al., 2007, MacNeil, M., 2007, Taylor, J. & Wros, P., 2007, Abel, W., & Freeze, M., 2006, August-Brady, M., 2005 and Hsu, L., 2004). The existing researches on concept mapping are too limited for drawing generalizations. More research is needed to assess the most effective ways to implement the concept mapping process in clinical nursing education. Such research could lend decisive support to the use of concept mapping as a primary strategy in nursing education. The findings of the studies suggest that incorporation of concept mapping facilitates deeper approaches to learning and greater flexibility in control of that learning.

Further research regarding the use of concept mapping in nursing education is needed to address the best times to introduce concept maps, identify methods for assessment and evaluation, and understand how concept maps

facilitate student learning and critical thinking abilities. Studies also need to focus on the integration of theory with clinical practice, and the role of concept maps on knowledge development in practice among experience nurses.

Implications to Nursing Practice

It seems apparent that concept mapping has the potential to be an effective teaching strategy in nursing education. It works from the perspective of the educator trying to develop and measure critical thinking skills and it works from the perspective of the student trying to master a very complex field.

Concept maps must be introduced to beginning level nursing students. If concept maps are to be used for evaluation criteria, students should be given feedback on their maps through lectures, providing examples and providing instruction. Concept maps could be useful in student preparation for clinical experiences. Concept mapping could be taught to nursing students to assist them in organizing the data obtained in pre-planning for clinical experience and then presented at clinical conferences (MacNeil, M., 2007). Additionally, concepts maps could provide advanced organization for reading assignments and classroom activities.

Another strategy to help students develop their skill with concept mapping is to incorporate concept mapping into classroom learning activities. For example, students can use concept mapping to analyze a case study (Taylor, J. & Wros, P., 2007). This approach fosters discussion about the sorting of data, relationships among nursing diagnoses, missing data in the assessment, and problem identification for the client.

From a faculty perspective, there are some concerns regarding the use of concept mapping that must be considered prior to initiating their use in the nursing course. Faculty feedback on students' clinical concept maps is essential to facilitate maximal learning. Initially, this pro