

The effectiveness of mind mapping as an active learning strategy among associate degree nursing students



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Abstract

There is a significant need for faculty to move away from the traditional teacher-centered educational approach and increase implementation of an active, student-centered, learning environment. Creating learning experiences that facilitate reflection, knowledge building, problem solving, inquiry, and critical thinking is vital. Using mind maps as an active learning strategy is an innovative technique to facilitate student learning. Students can illustrate a vision, exhibit their contextual knowledge and creativity, and make associations about a central theme during this activity. Mind mapping can be used for note taking, completing homework assignments, preparing for exams, analyzing, and reflecting about nursing practice. Mind maps can be executed in nursing curricula as an alternative learning experience.

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1. Problem Driving the Project

Engaging students in the learning process is a challenge for faculty members. Redesigning learning approaches is essential to meet the college student's demands for a worthy and satisfying classroom experience in today's educational communities (Gillies & Haynes, 2011). Mind mapping, an active learning strategy not commonly used in nursing education, facilitates the learning process and promotes the mind's natural ability to think (Buzan & Buzan, 1996). This learning strategy provides faculty members who are responsible for organizing learning activities the tools to enhance the classroom environment to facilitate student learning.

Mind mapping originated from the theory of radiant thinking, or the full brain actively thinking of associations

driven from a central concept (Buzan & Buzan, 1996). Creating new ideas and problem solving emerges when the mind is allowed to think radiantly or freely. The technique of mind mapping is a graphic illustration using words, images, colors, and branches that extend from a central idea illustrating finer details and associations in a nonlinear format. It emphasizes the use of diagrams and pictures that enhance memory and cultivate knowledge (Buzan & Buzan, 1996). This strategy is easy for the novice learner to apply and encourages self-expression and exploration of a concept by the student. There are no limits to associations and connections of the concept. Mind mapping allows the student to build upon existing knowledge when new information is presented that enables meaningful learning to take place (Buzan & Buzan, 1996; Davies, 2010; Spencer, Anderson, & Ellis, 2013).

Traditionally, educators use concept mapping as a typical learning tool for nursing students to provide a visual exemplary to organize a holistic plan of care for the patient. The purpose

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of concept mapping is to construct formal relationships and cross connections between ideas systematically in a linear or structured format (Cook, Dover, Dickson, & Colton, 2012; Eppler, 2006). While the complexity of the concept map makes it difficult to enhance recall, the chief advantage is an outline of a relational structure of the concept. Linear thinking is no longer adequate for today's nursing student who requires expanded ways of thinking and learning.

Faculty need to move away from the traditional teacher-centered educational approaches and implement an active student-centered learning environment. It is essential to create learning experiences that facilitate reflection, knowledge building, problem-solving, inquiry, and critical thinking. With the aim of promoting a student-centered learning environment, the use of mind mapping was explored in a cooperative learning (CL) environment. Cooperative learning is defined as "learning in small groups to facilitate students working together to optimize their own, as well as, each other's learning" (Alexander, Lindow, & Schock, 2008, p. 18). The purpose of this article is to evaluate the effectiveness of mind mapping as an active learning strategy among associate degree nurses using a CL environment.

2. Literature Review

Evidence supports that both mind mapping and CL are valuable active learning strategies for today's college students. Cooperative learning implemented in educational programs cultivates positive attitudes and self-directed student growth. Discussing one's ideas and having others react and respond within a group setting improves critical thinking, reasoning capabilities, intensifies learning comprehension, and academic achievement (Baumberger-Henry, 2005; Gillies & Haynes, 2011). Also, more learning occurs when individuals learn with others compared to learning alone (Michael, 2006). Collaboration, demonstration and a deeper understanding of the topic assigned are advantages of implementing mind mapping using CL groups.

Mind mapping has been found to be an effective strategy for adult learners (Davies, 2010; Noonan, 2012). Students 25 years of age or older are more likely to learn from their peers, have higher levels of motivation and cognitive involvement, all of which support the use of mind mapping in a CL environment (Alexander et al., 2008).

There is a lack of research examining the value of using mind maps among associate degree nursing students as an alternative to lecturing, creating the need to understand the usefulness of this strategy. Kern, Bush, and McClesh (2006) introduced mind mapping to move away from linear thinking associated with traditional care plans among associate degree nursing students. Using this strategy, the implementation of a mind map care plan (MMCP) was used to facilitate the operational knowledge of the nursing process in nursing curricula as an alternative to traditional care plans. During the nursing students first semester they were introduced to

the concept of the nursing process using the mind mapping technique. Results indicated that greater than 90% of the students strongly agreed that mind mapping assisted them to: (a) view their patient in a holistic manner, (b) personalize the plan of care, and (c) think critically.

In a study conducted by Rooda (1994), mind mapping was introduced as a learning strategy in a baccalaureate level introductory nursing research course. Results showed that students who used mind mapping had higher exam scores (84.4%) compared to students who did not use mind mapping (76.7%). Rooda (1994) concluded that students who used mind mapping were able to attain and recall a large volume of complex data.

D'Antoni, Pinto Zipp, and Olsen (2010) studied the use of mind mapping to assist with the retrieval of information and critical thinking among medical students. One group used mind mapping and the other used typical note taking during class sessions. Results showed the successful use of mind mapping for retrieval of short term information and retention of new information. Boley (2008) found graduate nursing students who used faculty created mind maps as study aides scored higher on quizzes than those who did not use the mind mapping. This evidence supports the value of using mind maps in nursing education.

The learning objectives of this activity were to have students:

- synthesize a mind map reflective of the components of critical thinking;
- implement self-assessment using a rubric while developing a mind map; and
- evaluate mind mapping as an effective learning strategy for the concept of critical thinking.

3. Methods

The mind mapping activity was implemented in a first semester writing intensive course focusing on nurse's ways of knowing at a state college of nursing. Students' were assigned to complete readings about critical thinking one week prior to class. The articles assigned describe mind mapping as a creative tool for critical thinking, and the application of reflective thinking in nursing practice. Additionally, students were assigned to watch a YouTube video How to Mind Map (Buzan, 2010). This tutorial explained how to create a mind map and was used to assist the students to complete this activity. The origin of mind mapping, what it is and how this strategy supports thinking, learning, and creativity was discussed at the beginning of the class.

3.1. Participants

The participants consisted of male and female students between the ages of 24 to 65 years. Approximately half of these students have had past college experiences grounded in

a traditional passive learning style. Students' self-selected their groups; each group included four to five students. The students typically chose their friends as members of their group and did not seek out classmates with comparable levels of academic achievement. This activity was approved by the university's institutional review board (IRB).

3.2. Intervention

A three step cooperative structure was used to illustrate the students' understanding of the concept of critical thinking. The students were asked to create a mind map reflective of thoughts and actions that are essential components of critical thinking used by nurses' during everyday clinical practice. The first step was thinking silently about the question posed. Next, individuals exchanged thoughts, shared responses with others within their group, and lastly shared the synthesis of their mind maps with the class.

Each group of students was provided with markers and a 36 x 48 size Post-it paper and were asked to write the words "critical thinking" in the center and work outward from the central focus to create a mind map. Students began judiciously thinking about their clinical experiences, maximizing and sharing their ideas about the components of critical thinking used in their nursing practice to begin synthesizing their mind map. The mind map was formatted from the central concept with branches or hooks that are configured thick to thinner and branch outward. The most important components associated with the central concept were located on the branches closest to the center and the least being furthest away. The minds radiation of thought is reflected by the branches of the mind map. Related thoughts are in the same color creating clarity to enhance recall. Verbosity was illustrated by having numerous key names associated with the central thought, but only one name per branch and having the name the same size as the branch (Buzan & Buzan, 2010). Approximately forty five minutes was provided to work on this activity.

The researcher rounded, listened to the groups conversations, and observed the students' working together to achieve a comfortable level of understanding of how to assimilate the concept of critical thinking using mind mapping. The students used verbal and visual techniques to assist their peers to learn simultaneously. This allows the faculty member to identify the students' ability to apply the concept, recognize, and correct any issues with implementation and understanding of the assignment (Billings & Halstead, 2005).

Three evaluation methods: (a) instructional rubric as a self-assessment tool, (b) formative assessment, and (c) the mind map questionnaire was used to determine if the learning objectives were met. The rubric had three purposes: (a) an instructional guide for the student during the creation of their mind map, (b) to give the student the opportunity to achieve a level of proficiency for this project, and (c) for the researcher to evaluate how well the students' implemented

this project (Appendix A). Prior to the activity, the rubric was reviewed by the students who were instructed to conduct a self-assessment and make revisions to their mind map throughout the activity to achieve the learning objectives. Although this project used a rubric with categories and related scores, the purpose of these scores was to assist the student with self-assessment in learning how to mind map. The development of valid and reliable criteria to assess and grade a mind map requires continued development (D'Antoni, Pinto Zipp, & Olsen, 2009), for this reason the mind map was not a graded project.

Formative assessment was implemented by the researcher using constructive verbal feedback. This occurred while the students were engaged within their groups discussing the concept and creating their mind maps. In an open forum the students shared their thoughts about the development of their mind maps.

At the completion of the project each student was asked to complete a Mind Mapping Student Evaluation Questionnaire (Appendix B). The purpose of the questionnaire was to evaluate the students' learning experience and to realize the value of mind mapping as a learning strategy. The tool consisted of nine questions rated on a Likert scale with four response categories, strongly agree to strongly disagree. One qualitative open-ended question was asked to determine if the activity enhanced the students' learning (Appendix C). The questionnaire was completed anonymously and voluntarily by the students at the end of the activity.

4. Results

The instructional rubric identified 66% of the students achieved a score of four and 33.3% received a score of three in the Content category of the rubric. This section reflects the inclusion of the major components of critical thinking in the mind maps. Based on the rubric scores the Content category continued to be unclear for some students. Radiant thinking was evident in 66% of the students (Appendix A). Radiance reflects the use of the students' natural ability to think diversely using all aspects of the right and left brain with thought beginning at the central point. Recall, creative thought, associations, brainstorming, and knowledge attainment are stimulated with radiant thinking (Buzan & Buzan, 1996).

All students received a score of four in the categories of format, color, and verbosity. Ninety percent of the students scored a four in the category of neatness, and 93% agreed mind mapping enhanced their creativity. Ninety-seven percent of all students agreed that this learning strategy was effective and useful, and provided the participants with a greater perspective about the concept of critical thinking. Ninety-seven percent of the participants related their mind map ideas to their role as a nurse. Ninety-three percent of the students indicated that they had sufficient time to complete the activity (Appendix B). Analysis by results suggests that mind mapping is an effective learning strategy in the population studied.

5. Discussion

Thirty nursing students implemented mind mapping as an active learning strategy to achieve their educational objectives (Appendix D). Some were concerned that they could not draw well enough to illustrate the meaning of critical thinking. Others were concerned that they would not have enough time to complete the activity, therefore an extra fifteen minutes was allotted for the groups to finish their mind map. All of the students utilized the Mind Map Instructional Rubric while working together. Buzan and Buzan (1996) identified that mind mapping promotes the use of radiant or central thinking to enhance the multiplicity of the brain. Mind mapping helped the students explore the concept and its key associations in an organized, colorful, vibrant, and logical manner. While developing the mind maps, students found themselves exploring the concept of critical thinking by reflecting how they make patient care decisions in the clinical setting. Similarly, Picton (2009) found that using reflection enhanced the students' ability to describe their critical thinking process and demonstrate the concept in a graphic format. Picton (2009) also noted that mind mapping can be used to illustrate pathways that encourage reflection on patient care.

Students were asked an open ended question about how mind mapping enhanced their learning experience as part of the evaluation. The students expressed that mind mapping allowed them to have hands on participation, discussion and visualization of the concept (Appendix C). In addition, it helped them to keep their ideas focused and have a clearer understanding of the concept. A study by Davies (2010) similarly identified that processing of information visually and pictorially facilitates learning.

In contrast to Sand-Jecklin (2007) who found that nursing students showed a preference for passive instruction, students found that this "hands on activity" stimulated and expanded their thinking and creativity to better understand the concept. The majority of the students indicated that this activity helped them understand and apply critical thinking to nursing practice. They communicated that mind mapping encouraged collaboration with peers, was engaging, stimulating, and promoted their learning.

According to Spencer, Anderson, and Ellis (2013) in most educational situations, students have difficulty assessing their contribution to the learning of other students without instructor feedback. Boston (2002) identified formative assessment occurs during the learning process; therefore this assessment method used during the mind mapping activity identified students were learning from each other.

At times the students found it difficult to describe critical thinking components to include in their mind map. They were surprised by the number of essential critical thinking components required to think through a problem and support clinical decisions. Formative feedback revealed that mind mapping stimulated the students to use reflective thinking, apply the nursing process, and discuss various

ways of knowing to expand their thoughts about critical thinking.

Students expressed that small group discussions enriched their learning, while class discussion was supplemental to understanding the concept. In addition, they indicated that mind mapping would be beneficial in other courses for note taking. The researcher noted that students did not lose interest while having a central discussion and were open to sharing their experiences about the mind map activity.

Some students identified the components of critical thinking in a different way when building their mind map. For example, the students' mind map reflected educational instructions for the patient who spoke a different language and nursing care being cost effective. Instead of using critical thinking mechanisms to reflect nursing care, several students used application of nursing interventions when creating their mind maps. The reason for this could be multifactorial. The reading assignments may not have been completed, although students stated they read the assignment prior to the activity. Additionally, nurses are often clinically focused and may have had a discomfort with the abstractness of the concept resulting in an unclear view of the topic. It can be difficult to elevate the conceptual level and the imprecise view of the concept as these learners are novice nursing students.

5.1. Limitations and Recommendations

From this experience it was learned that some students overlooked expanding their ideas and thoughts relative to the concept of critical thinking. Group discussion using formative assessment and a question and answer session would be helpful to identify what students perceive as the components of critical thinking to clarify the concept prior to the activity. Formative assessment improved the students' knowledge and provided an opportunity to discuss critical thinking concepts to complete the assignment. Formative assessment throughout the entire activity would be beneficial for faculty to evaluate the learning process and enhance student learning. This strategy may improve the students' ability to be more accurate answering the question posed in this assignment, achieve a higher score on their rubric, and decrease the amount of revisions needed during formative assessment. Having all groups discuss their maps on the same day to maintain momentum of the activity should be considered. This may be difficult with large groups.

The sample was not randomized; therefore this process is not without bias. The inherent bias limits the generalizability of this study which merits further investigation among the associate degree nursing population. The majority of the participants in the self-selected groups for this project were students who were friends; making these groups homogeneous. Future research using random sampling could yield different outcomes.

5.2. Future Research

Consideration should be given to evaluate the efficacy of using this learning strategy with larger populations. Future studies should focus on the amount of preparatory work required by the student to develop more comprehensive mind maps. A qualitative evaluation may be more useful to better understand how students respond to mind mapping as an active learning strategy and to further understand how this strategy fostered their learning.

The development of criteria for faculty members to assess and grade a mind map requires continued development. Currently there is no valid or reliable instrument to use for grading mind maps. However, it may be valuable to identify the outcomes of using mind mapping as a graded project compared

to a non-graded classroom exercise. Faculty members can consider developing and evaluating a rubric that is reliable and valid for grading this activity for nursing students.

Mind maps may be incorporated in nursing curricula as a study guide for exams, used as assignments, and integrated into coursework to gain maximum success for this strategy. Mind mapping may be particularly beneficial when preparing for the National Council Licensure Exam for Registered Nurses (NCLEX-RN).

This activity utilized a small sample size ($n = 30$) in a nonclinical nursing course. Consideration would have to be given to the efficacy of using this learning strategy among larger groups across different courses in nursing programs. Additional research is required to identify the generalizability of mind mapping in health sciences curricula.

Appendix A

Mind Map Instructional Rubric. Adapted from: www.docstoc.com

Category <i>n</i> = 30	Score 4 = 1 point	Score 3 = 0.75 points	Score 2 = 0.5 points	Score 1 = 0 points	Total Score
Format	Mind map follows the branch or hook format. 30/30	Mind map partially follows the branch or hook format.	Mind map follows another format, such as bubbles, circles, boxes, lines, etc.	Mind map does not consistently follow any format or is chaotic and difficult to understand.	100% = score 4/4
Color	The mind map uses a different color for each branch. The mind map is brightly colored. 30/30	The mind map uses different colors for some branches or the colors are drab.	The mind map is not completely colored.	The mind map is not colored.	100% = score 4/4
Content	The mind map includes the MAJOR components of critical thinking with the branches expanding on many thoughts/ideas from the major components. 20/30	The mind map misses some of the major components of critical thinking and misses some expansion on thoughts/ideas from the major components. 10/30	The mind map misses most major components of critical thinking including branches of thoughts and ideas.	The mind map presents no major components and lacks branches including thoughts and ideas.	66.6% = score 4/4 33.3% = score 3/4
Verbosity	The mind map presents numerous names on all or most branches or hooks. 30/30	The mind map presents some words or names on some branches or hooks.	The mind map presents few words or names on a branch or hook.	The mind map presents no words or names on one branch or hook.	100% = score 4/4
Radiance	The mind map radiates from the center of the page. Ideas branch out from other ideas in a logical and organized manner. 20/30	The mind map radiates from a central point. Some ideas branch out of other ideas; some branches are a single line extending from the center. 10/30	The mind map radiates from a central point. Few ideas branch out of other ideas; most branches are a single line extending from the center.	The mind map radiates from a central point. No ideas branch out of other ideas; all branches are a single line extending from the center. OR: The mind map does not radiate from a central point.	66.6% = score 4/4 33.3% = score 3/4
Illustration	The mind map includes at least relevant 4 illustrations. The illustrations make the mind map memorable. 27/30	The mind map includes at least 3 relevant illustrations. The illustrations make the mind map memorable. 3/30	The mind map includes at least relevant 2 illustrations. The illustrations make the mind map memorable.	The mind map includes no relevant illustrations or the illustrations do not make the mind map memorable.	90% = score 4/4 10% = score 3/4
Neatness	The mind map is very neat and orderly. The mind map is clearly readable. 27/30	The mind map is somewhat neat and orderly. The mind map is clearly readable. 3/30	The mind map is not very neat and orderly. The mind map is readable.	The mind map is not readable. (This may affect other portions of the grade).	90% = score 4/4 10% = score 3/4

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