Nurse Educator

Developing Scholarly Thinking Using Mind Maps in Graduate Nursing Education

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Two broad issues that beginning graduate nursing students face are identifying a research focus and learning how to organize complex information. Developing a mind map is 1 strategy to help students clarify their thinking and lay the foundation for in-depth expertise related to their research focus, review of the literature, and conceptual framework. The authors discuss their use of mind mapping combined with feedback using a fishbowl technique.

Graduate nursing education extends the knowledge of the discipline through research and practice. From the initial stages of graduate education, well-designed course environments are needed in conjunction with necessary tools, software, and hardware resources. One problem students struggle with early in their graduate program is clarifying and developing a research focus of interest. Before deciding on a research topic, students need to be fully engaged in the exploration and development process.[1] They also need to be open to changing their mindset and challenging preconceptions, beliefs, or assumptions they have about a particular topic. Furthermore, Luse et al[1] proposed several techniques to foster creative thinking that are necessary for identifying a research topic. Some examples are brainstorming, reflecting on research topics, thinking about the research topic focus in logical ways, and questioning the how, what, why, where, and who in a focus area. A graphic representation of ideas fosters creative thinking and helps students to narrow complex ideas into simpler ones.

Another issue in today's digital age is that information and technology are increasing at an exponential rate. Web search engines allow instantaneous access to an abundant amount of knowledge from a plethora of sources. However, critically analyzing and synthesizing new and complex information from diverse sources can be overwhelming for students. Exercising critical thinking skills to gain new ways of understanding is also challenging to students. How students assimilate knowledge and use thought processes impacts their learning and development of research skills.

The method of taking active control over one's thinking and knowledge about thought processes is known as metacognition. This term is used to describe thinking and managing learning strategically based on awareness and control of one's cognitive system.[2] Cognitive monitoring can occur through 4 classes of phenomena, including metacognitive knowledge, metacognitive experiences, goals (tasks), and actions (strategies).[3] One dimension of metacognitive knowledge is procedural knowledge that refers to developing cognitive strategies in a step-by-step manner. These cognitive strategies help to overcome the challenges of organizing knowledge. For example, taking notes, using imagery, summarizing main ideas, and mapping learning are strategies that encourage the organization of information in graphical or visual form and contribute to deep thinking and learning.[4]

The first course of the PhD program at a Midwestern university, Socialization to the Scholarly Role, is designed to provide a foundation for students in developing their research focus area. Faculty teaching this course design activities to help students gain higher levels of scholarly thinking and receive support for their learning needs. Faculty promote the use of critical thinking, which has been defined by Facione[5] to be "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based." Faculty members use a technology tool, mind mapping software, as a teaching strategy. This tool was chosen because mind mapping is a strategy that assists students to use critical thinking skills in organizing and presenting their research concepts of interest, thus to make cognitive progress.[3] The mind mapping teaching strategy is combined with the fishbowl technique that is based on the Socratic method of discussion. It provides a powerful learning environment for class discussion and for faculty and peer feedback that triggers

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the student's metacognitive knowledge and experiences to formulate goals and actions.

Mind Mapping and Learning

Mind maps are useful for note taking, visually representing ideas, planning, brainstorming, summarizing, organizing, and recording information. They facilitate critical thinking, information retrieval and retention, problem solving, and analysis.[6] Mind maps consist of frameworks of concepts connected either in a radial, hierarchical, linear, or nonlinear manner. A typical mind map is a visual representation of a central main topic from which nodes, subnodes, groupings, branches or areas are classified with the goal of representing semantic information. This learning technique promotes greater creativity for all learners. Besides using plain text and words, use of colors, images, symbols, codes, lines, and other dimensions throughout the map aid in conceptualization.

Buzan, the inventor of mind maps, claimed that mind mapping is vastly superior to traditional note-taking methods. Mind mapping uses the full range of left and right human cortical skills, balances the brain, and taps into the alleged "99% of your unused mental potential," as well as intuition.[6] Studies have described mind mapping as an innovative educational tool to teach nursing students how to think critically when planning patient care.[7,8] Noonan[9] reviewed the integration of mind mapping as an assessment strategy in nurse midwifery education. Benefits of mind maps noted by Noonan include the potential for students to adopt a strategy that enhances retention of information, critical thinking, and problem solving skills.

Mind mapping assists students to conduct a constructive exercise of their thought processes and also teaches them to think reflectively about their nursing practice.[10] D'Antoni et al[11] found that medical students who used mind mapping were successful at retrieving information in the short-term but did not increase significantly in critical thinking or information retrieval compared with a standard note-taking group in the long-term. Van Gog et al[12] suggested that a learning strategy that combines a verbal report with mind mapping helps learners make inferences about why they group or relate concepts together.

A recent review by Pudelko et al[13] on mapping as a learning strategy in health professional education suggested that learning improves when mapping is used in combination with other strategies such as feedback and scaffolding. Similarly, Ziyan[14] emphasized that feedback from peers and faculty members promotes the learner's self-monitoring with mind mapping. This process helps learners to further evaluate and identify deficiencies and to take remedial measures. Likewise, Farrand et al[15] concluded that mind maps work best as an effective study technique when learners are motivated.

Software Used for Mind Mapping

Xmind (www.xmind.net) is the free mind mapping application software that we chose for our course. The application has an intuitive, simple polished interface and can be downloaded onto a computer for a class activity. Mind maps can be created quickly with easy-to-use features and designs. Although there are other mind mapping software, such as IMindMap and FreeMind, our choice was based on the benefit of saving time and resources when modifying, updating, and sharing mind maps created in the same application.

Our students select and conceptualize their concepts based on an extensive review of the literature. They use the mind mapping strategy to organize concepts and illustrate critical thinking about their research concepts. Table, Supplemental Digital Content 1, http://links.lww.com/NE/A112, shows how the Xmind software uses color and lines to depict the concepts and the relations among concepts in mind mapping.

Using Mind Mapping and Feedback in Courses in a PhD program

Students in the course Socialization to the Scholarly Role connect and engage as a group in interactive activities that build personal and professional relationships. This course provides an orientation to the classroom and learning activities (synchronous and asynchronous). Students are required to attend an intensive week of face-to-face classes on campus during 1 of the first few weeks of this course. This is when students are introduced to mind mapping (Xmind software) and begin to identify and structure their concepts. They learn the basics of using the software from an in-class demonstration of the software and video and text tutorials provided in the lesson module.

The rationale behind the mind mapping exercise is to guide students to view the whole big picture before selecting priority areas of a concept. Students are encouraged to use the resources of a medical librarian to perform thorough database searches. The mind map provides an opportunity to organize and synthesize available knowledge in their focus area. Students begin the initial version of their mind map by placing their primary research concepts in a map form. The color-coded visual record of impressions encourages higher order thinking. When students review the first draft of their mind map, they become aware of the complexity and of the essential/nonessential components of their research focus. Students are asked to reflect on the complexity, interrelatedness, as well as essential/nonessential components of their research focus. Students next attend a face-to-face class to receive feedback from faculty and peers using a Socratic dialogic approach.

The Socratic method of teaching is a student-centered approach that challenges learners to develop their critical thinking skills and engage in analytic discussion.[16] A Socratic circle, or fishbowl, discussion is a pedagogical approach based on the Socratic method. The fishbowl activity is an effective pedagogical strategy to facilitate and enhance discussions in graduate nursing courses.[17] This approach helps students to process information and gain a deeper understanding in the area of focus.

For the fishbowl activity in the Socialization course, a student, a faculty member, and a peer sit in the inner circle. The student presents his/her mind map. Then, a faculty member and a peer ask the student challenging questions and make suggestions for revisions. Others outside the circle take notes during the fishbowl activity and give written feedback to the student in the inner circle. If students in the outside circle wish to ask a question, they seek permission to enter the inner circle and a member of the inner circle moves to the outside circle. This interactive format allows everyone to have a role and be involved in the activity. This helps students update or modify their mind map based on the feedback. At the end of the semester, students submit their mind map along with their final paper and share the mind map with their PhD advisor. The advisor's involvement throughout the process is essential.

It is expected that the outcome of this process will be that students continually synthesize information to modify their research focus, concepts in the mind map, and conceptual framework as they progress through the graduate program.

Later in the intensive week, students attend a second face-to-face class to repeat the fishbowl discussion process. Students engage in an in-depth discussion regarding a peer's mind map. This process allows them to listen, learn, and provide feedback. For example, a fishbowl activity typically allows one to initiate a discussion issue and to present a problem while being observed by others. The intention is to provide a safe environment where mistakes can be made and performance critiqued in a professional and supportive way. Observers engage in watching students in the fishbowl discuss their research focus and present their mind maps. Students receive feedback on their revised mind map from faculty and peers, and this feedback is used to make regular revisions.

In a subsequent course, Theory Development in Nursing and Health Sciences, students revise their mind maps at midterm and at the end of the semester. Gaining in-depth knowledge of theories related to their concepts assists students to continue developing their research ideas and depicting these ideas on their mind map.[18] Literature reviews and review matrices are additional metacognitive strategies that support conceptual linkages on their mind map.[19] This method of demonstrating each student's knowledge through a critical thinking process is evaluated by faculty who critique the revised map for increasing depth and transparency. These strategies result in clarity of the student's research focus as they proceed toward their dissertation study.

Faculty Observations and Perceptions

Faculty members indicate that use of the mind map throughout the program has many advantages. See Table 1 for an overview of advantages of using mind maps and fishbowl discussion as a teaching strategy for faculty and students. Table, Supplemental Digital Content 1, http://links.lww.com/NE/A112 and Figure, Supplemental Digital Content 2, http://links.lww.com/NE/A113, depict how faculty can observe changes from the initial to later versions of mind maps and include their assessment of depth and complexity in course grading. Faculty members have witnessed students gaining an ability to think critically as individuals and as a group from the mind map experi-

ence. Students move from a superficial interest to a greater depth of knowledge regarding concepts that are relevant to nursing science.[20] Faculty members monitor the student's development of cognitive thinking and identify knowledge gaps over time.[21] Faculty members perceive that the fishbowl discussion activity helps students receive constructive feedback. Another positive outcome identified by faculty is that students develop an understanding of each other's areas of research interests. They frequently share resources that they perceive may be of interest to their peers.

Student's Perception and Feedback

After acquiring experience using mind mapping, 13 PhD students have completed the Socialization to the Scholarly Role course evaluation. Students evaluated the mind mapping and fishbowl strategies as very positive. They gave feedback on 4 activities: (a) preparing mind maps, (b) sharing initial mind map ideas and discussion with the group, (c) participating in the fishbowl experience as a presenter, and (d) participating in the fishbowl experience as a participant. All students reported either "very beneficial" or "beneficial" responses for each of the 4 items.

In review of the open-ended comments by students, several shared the perception that a mind map and fishbowl teaching strategies expanded their thinking. One student shared that helping other students assisted her to think of her own focus area in a different way. A common theme of students' comments was that they felt that sharing the initial mind maps and receiving feedback from peers and faculty were extremely helpful.

Summary

In addition to traditional teaching strategies such as literature reviews and review matrices, faculty members have found that innovative strategies such as mind mapping, combined with the fishbowl technique, are valuable experiences to assist students in developing their area of research focus and organizing complex information. The fishbowl activity teaches students to give and receive constructive feedback with their peers. Faculty will continue to explore innovative teaching and learning strategies that enrich graduate nursing education programs. Faculty expect that integrating new teaching strategies will enhance students' critical thinking thought processes.

Table 1. Advantages of Using Mind Maps and Fishbowl Discussion as a Teaching Strategy for Faculty and Students

Advantages of Mind Map	For Faculty	For Students
Interactive format	Peers enhance student learning	Peers support student learning
Encourages higher order thinking	Each version demonstrates increased depth of knowledge in research focus area	Each version clearly illustrates level of thinking at that time
Encourages use of medical librarian resource	Expert assistance in searching multiple databases ensures that all available information is found in research focus	Interaction with an expert reinforces maximum use of library resource.
Color-coded visual record of impressions at a particular time	Opportunity for synthesis regarding highest priority subconcepts for discovery of new knowledge	Opportunity for synthesis and to prioritize important subconcepts
Present, revise, and discuss in fishbowl activity	Opportunity to encourage mental plasticity and adaptability	Challenges personal beliefs, ideas, and perceptions in a nonthreatening way
Notes taken during fishbowl discussion activity	Promotes observation, listening, and reflection to coach students to discern interests	Promotes observation, listening skills, reflection, and revision of mind map

References

1. Luse A, Mennecke B, Townsend A. Selecting a research topic: a framework for doctoral students. *Int J Doctoral Stud*. 2012; 7:143-152.
2. Bruning RH. *Cognitive Psychology and Instruction*. Upper Saddle River, NJ: Pearson/Merrill/Prentice Hall; 2004.
3. Flavell JH. Metacognition and cognitive monitoring: a new area of cognitive-developmental inquiry. *Am Psychol*. 1979;34(10): 906-911.
4. Efklides A. The role of metacognitive experiences in the learning process. *Psicothema*. 2009;21(1):76-82.
5. Facione PA. *Critical Thinking: What It Is and Why It Counts*. San Jose, CA: Insight Assessment; 2013:28.
6. Buzan T, Buzan B. *The Mind Map Book: How to Use Radiant Thinking to Maximize Your Brain's Untapped Potential*. New York, NY: Dutton; 1994.
7. Kern CS, Bush KL, McCleish JM. Mind-mapped care plans: integrating an innovative educational tool as an alternative to traditional care plans. *J Nurs Educ*. 2006;45(4):112-119.
8. Mueller A, Johnston M, Bligh D. Viewpoint. Joining mind mapping and care planning to enhance student critical thinking and achieve holistic nursing care. *Nurs Diagn*. 2002;13(1):24-27.
9. Noonan M. Mind maps: enhancing midwifery education. *Nurse Educ Today*. 2013;33(8):847-852. doi:10.1016/j.nedt.2012.02.003.
10. Jenkins A. Mind mapping. *Nurs Stand*. 2005;20(7):85.
11. D'Antoni AV, Zipp GP, Olson VG, Cahill TF. Does the mind map learning strategy facilitate information retrieval and critical thinking in medical students? *BMC Med Educ*. 2010;10:61.
12. van Gog T, Kester L, Nievelstein F, Giesbers B, Paas F. Uncovering cognitive processes: different techniques that can contribute to cognitive load research and instruction. *Comput Hum Behav*. 2009;25(2):325-331.
13. Pudelko B, Young M, Vincent-Lamarre P, Charlin B. Mapping as a learning strategy in health professions education: a critical analysis. *Med Educ*. 2012;46(12):1215-1225.
14. Ziyan P. Promoting E-learner's self-monitoring with mind map. *Proc Int Symp Comput Sci*. 2010:2(1):109-111.
15. Farrand P, Hussain F, Hennessy E. The efficacy of the 'mind map' study technique. *Med Educ*. 2002;36(5):426-431.
16. Coffey H. Socratic method. Available at http://www.learnnc .org/lp/pages/4994?style=print. Updated 2010. Accessed June 10, 2013.
17. Daroszewski EB, Kinser AG, Lloyd SL. Socratic method and the internet: using tiered discussion to facilitate understanding in a graduate nursing theory course. *Nurse Educ*. 2004;29(5):189-191.
18. Hunter Revell SM. Concept maps and nursing theory: a pedagogical approach. *Nurse Educ*. 2012;37(3):131-135.
19. Garrard J. *Health Sciences Literature Review Made Easy: The Matrix Method*. Sudbury, MA: Jones and Bartlett Publisher; 2011.
20. Davies M. Concept mapping, mind mapping and argument mapping: what are the differences and do they matter? *High Educ*. 2011;62(3):279-301.
21. Ifenthaler D, Masduki I, Seel N. The mystery of cognitive structure and how we can detect it: tracking the development of cognitive structures over time. *Instr Sci*. 2011;39(1):41-61.

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