Mind Maps: Useful Schematic Tool for Organizing and Integrating Concepts of Complex Patient Care in the Clinic and Classroom

But what are student perceptions?

Dr. Genevieve Pinto Zipp
Dr. Catherine Maher
Dr. Anthony D’Antoni
Background

• In recent years, many health care professions have advanced the entry-level degree required to practice (Cottrell, 2000; Glicken, 2002; Rothstein, 1998; Threlkeld et al., 1999).

• This phenomenon has resulted in more contact hours devoted to the curriculum, with a concomitant increase in the number, diversity, and complexity of courses (Threlkeld et al., 1999).

• More time is now available to develop critical thinking; however, how this can and should be done remains unclear (Taconis, Ferguson-Hessler, & Broekkamp, 2001; Willingham, 2007).
Operational Definition: Critical Thinking

Critical thinking is a metacognitive, nonlinear process of purposeful judgment that includes self-directed learning and self-assessment (Bodner, 1986; Daley et al., 1999).
A learning strategy is a thinking tool that a student can use to actively acquire information and some examples include mnemonics, charts, or maps (Gage & Berliner, 1998).
Conceptual Framework for Adult Learning

Figure 1. Theoretical assumptions that underlie constructivist theory using a bottom-up approach. Adapted from Ausubel (1978).
Willingham (2007) stated that critical thinking occurs when a student possesses both domain knowledge and the capacity to penetrate beyond the surface structure of a problem to recognize how the problem can be solved.
Different Learning Strategies

- Mnemonics
- Traditional hierarchical note taking
- Flow charts
- Scientograms (Moya-Anegón et al., 2007)
- Concept maps (Novak & Gowin, 1984)
- Mind maps (Buzan & Buzan, 1993)
# Two Types of Maps

<table>
<thead>
<tr>
<th>Concept Map</th>
<th>Mind Map</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td><strong>Design</strong></td>
</tr>
<tr>
<td>Top to bottom</td>
<td>Central to peripheral</td>
</tr>
<tr>
<td>Unicolor</td>
<td>Multicolor</td>
</tr>
<tr>
<td>No pictures</td>
<td>Multiple pictures</td>
</tr>
<tr>
<td>Many propositions&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Few or no propositions</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td>Promotes critical thinking by establishing nonlinear relationships between concepts</td>
<td>Promotes critical thinking by establishing nonlinear relationships between concepts and enhances recall of information through the use of dynamic colors and pictures&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Proposals are linking words that accompany lines connecting concepts.

<sup>b</sup> The use of color and pictures have been shown to facilitate the conversion of information from short- to long-term memory (Bellezza, 1983; Day & Bellezza, 1983).
A map showing structure/function relationships

A town

<table>
<thead>
<tr>
<th>Animate objects</th>
<th>Inanimate objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants</td>
<td>Movable objects</td>
</tr>
<tr>
<td>Animals</td>
<td>Cars</td>
</tr>
<tr>
<td>Humans</td>
<td>Buses</td>
</tr>
</tbody>
</table>

- Plants eat
- Animals eat
- Humans drive
- Movable objects drive on
- Immovable objects live in

Irvine (1995) discussed how CMs can be used to promote meaningful learning in nursing students and how CMs can be integrated in nursing curricula.

- She defined meaningful learning as a process whereby a student links new information with old information, and argued that concept maps facilitate this linking.
- CMs are metacognitive tools that can be applied to all domains of knowledge and can help students develop meaningful learning and help teachers become more effective.
Daley et al. (1999) evaluated the usefulness of CMs in developing critical thinking skills in nursing students (n=54). They concluded that CMs improved critical thinking.

- Students in 6 senior clinical groups (n=54) constructed 3 CMs over the course of a semester. The work of 3 students from each of the 6 groups (n=18) were randomly selected for data analysis and scoring.

- Scoring criteria were based upon the development of propositions, hierarchy, and cross-links within the maps. A t-test was used to compare mean scores of the first and final concept maps (p=.001).
Hill (2006) described how nursing students integrated their daily clinical experiences using CMs.

- Students were given a CM template.
- They first constructed preconference maps from the data obtained when patients were admitted, and then modified the maps as they obtained more information throughout the day. At the end of the day, they met with nursing instructors to discuss their cases and then created post conference maps.
- She concluded that CMs enhanced the nursing process by allowing students to visualize changes to their maps over time.
Mind Maps and Critical Thinking

• Farrand et al. (2002) investigated whether MMs are superior to traditional note taking in the recall of both short- and long-term factual information.

  ❖ 50 medical students (n=50) exposed to a 600-word sample of text from *Scientific American* and then administered 3 short tests based upon the text.
  ❖ Recall was only slightly higher but significant in the mind map group after the second test (p=.016).
  ❖ Comparison of mean scores on the third test (administered 1 week later) revealed that the mind map group had significantly higher factual recall compared to the self-study group (p=.013).
Figure 1  Mean unadjusted correct recall (maximum score = 15), using mind map and self-selected study techniques.

Currently, one of our doctoral students is engaging in research that we hope will provide data to support the hypothesis that mind maps promote critical thinking.

But an important question that will influence the utilization of mind maps by students centers around their perception of usefulness of the mind map learning strategy.
Research Question

Do students perceive that the mind mapping learning technique enabled them to better organize, prioritize and integrate material presented in a course.
Hypothesis

PT students perceive that **Mind mapping (MM)** helped them better organize, prioritize and integrate material presented in the course when compared to standard note taking.
Methods
Subjects

Doctor of Physical Therapy (DPT) students (n= 21 ) enrolled in a neurorehabilitation course (Management of Neuromuscular Problems) were required to create mind maps based upon assigned readings for six diagnoses.
Procedures

Students were asked to complete two surveys,

• demographic survey requesting the following data:
  □ Age
  □ Gender
  □ Ethnicity
  □ Overall GPA score
  □ Course grade

• post-course survey to assess their perceptions of the usefulness of the mind map learning technique in improving organization, prioritizing and integration of course material.
Study Design

- Survey post-test exploratory design
- Quantitative
## Variables

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Independent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey response</td>
<td>MM group</td>
</tr>
</tbody>
</table>
Data Analyses

Percent Agreement
Student Demographics Data  
(n 21)

- **Age**  
  - Range; 24 – 35 years old
- **Gender**  
  - Males 9  
  - Female 12
- **Ethnicity**  
  - African American 2  
  - African 1  
  - Asian American 4  
  - Caucasian/Non Hispanic 14
- **Overall GPA**  
  - Range  3.093 – 3.876 (mean 3.639)
- **Course GPA**  
  - Range 81.7 (2.9) – 98.89 (3.98) (mean 91.53/3.1)
Table 1. Students’ Perception of Mind Mapping in Areas of Organizing, Prioritizing and Integrating (Percent Agreement)

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Unsure</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organize</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 5</td>
<td>4.8 (n 1)</td>
<td>33.3 (n 7)</td>
<td>23.8 (n 5)</td>
<td>19 (n 4)</td>
<td>19 (n 4)</td>
</tr>
<tr>
<td><strong>Prioritize</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 13</td>
<td>0</td>
<td>9.5 (n 2)</td>
<td>33.3 (n 7)</td>
<td>38.1 (n 8)</td>
<td>19 (n 4)</td>
</tr>
<tr>
<td><strong>Integrate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 6</td>
<td>0</td>
<td>33.3 (n 7)</td>
<td>28.6 (n 6)</td>
<td>33.3 (n 7)</td>
<td>4.8 (n 1)</td>
</tr>
<tr>
<td>Question 11</td>
<td>0</td>
<td>0</td>
<td>42.9 (n 9)</td>
<td>42.9 (n 9)</td>
<td>14.3 (n 3)</td>
</tr>
<tr>
<td>Communication</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Unsure</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------</td>
<td>---------</td>
<td>--------</td>
<td>----------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Item 4 Improved oral</td>
<td>0</td>
<td>4.8 (n 1)</td>
<td>9.5 (n 2)</td>
<td>61.9 (n 13)</td>
<td>23.8 (n 5)</td>
</tr>
<tr>
<td>communication skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 7 Communicate with</td>
<td>0</td>
<td>9.5 (n 2)</td>
<td>19 (n 4)</td>
<td>57.1 (n 12)</td>
<td>14.3 (n 3)</td>
</tr>
<tr>
<td>patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 8 Communicate with</td>
<td>4.8 (n 1)</td>
<td>0</td>
<td>33.3 (n 7)</td>
<td>47.6 (n 10)</td>
<td>14.3 (n 3)</td>
</tr>
<tr>
<td>rehabilitation specialist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 12 Sharing information</td>
<td>0</td>
<td>4.8 (n 1)</td>
<td>33.3 (n 7)</td>
<td>47.6 (n 10)</td>
<td>14.3 (n 3)</td>
</tr>
<tr>
<td>with classmates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Students’ Perception of Mind Mapping in Areas of Knowledge (Percent Agreement)

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Unsure</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 2</td>
<td>0</td>
<td>9.5 (n 2)</td>
<td>38.1 (n 8)</td>
<td>33.3 (n 7)</td>
<td>19 (n 4)</td>
</tr>
<tr>
<td><em>Valuable when learning concepts</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 9</td>
<td>0</td>
<td>28.6 (n 6)</td>
<td>33.3 (n 7)</td>
<td>33.3 (n 7)</td>
<td>4.8 (n 1)</td>
</tr>
<tr>
<td><em>Improved understanding of topic</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 10</td>
<td>0</td>
<td>23.8 (n 5)</td>
<td>33.3 (n 7)</td>
<td>19.0 (n 4)</td>
<td>23.8 (n 5)</td>
</tr>
<tr>
<td><em>Improved retention of material</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Open Ended Comments- Pros

- Encouraged us to read and outline the chapters, good self study
- Forced me to read the chapter thoroughly, sit down and basically study long before exams
- It helped organized information and good to outline
- Made me actually go through the chapters and keep up on my reading
- I liked the fact that it made me open up the neuro book and truly examine the chapter in a timely efficient manner
Open Ended Comments - Con

- Not my learning style
- I don’t think it helped with retention of material
- Not my type of learning, but I’m sure it would help if I spent more time on them
- Not really utilized it during studying since it is not my way of learning
- They were unorganized for my style of learning and after doing them I never looked back at them
Results

- The data from this pilot project suggests that DPT students did not perceive that the mind map learning technique enabled them to better organize, prioritize and integrate material presented in the course.
Conclusion

- The data obtained from students’ perceptions does not offer support for the use of the mind mapping learning technique in promoting organization, prioritization and integration of course material in DPT education.

- However, this finding does not negate the usefulness of mind mapping as a learning tool as the data represents only students’ perceptions.
Conclusion

• In order to fully address if mind mapping is effective in organizing, prioritizing and integrating material which fosters the development of critical thinking skills, further work is needed to explore pre/post changes in overall GPA and course GPA as these are objective markers of the development of critical thinking skills.

• An additional marker of the strategies’ usefulness in the development of critical thinking in students may include the use of standardized critical thinking assessment tools.
Future Directions

- Pre/post knowledge based testing
- Score Mind Maps depths for evidence of learning
- Measure critical thinking using the Health Sciences Reasoning Test (HSRT).
- Measure learning styles of the learners using the Gregorc Style Delineator