



What are the differences you note in Novak’s mapping of concept maps versus the usual student-generated concept maps? You will notice the inclusion of “cross-links.” These links represent relationships between concepts in different domains of the concept map. The cross-links show how concepts within the domain are related to each other. In the creation of new knowledge, cross-links may represent creative leaps on the part of the creator (student). In order to create meaningful learning, it is best to construct maps with reference to a specific question we are seeking to answer or a situation or event we are trying to understand through the organization of certain knowledge. Some examples follow on the next page.

<b>Science</b>	<p>What is the process and result when cells divide?            Why did the United States want to go to the moon?            What is an ecosystem?</p>
<b>Math</b>	<p>How can word problems be solved?            What is the relationship between fractions and percentages?            How would you measure a room for a rug?</p>
<b>Social Studies</b>	<p>What was the purpose of the Berlin Wall?            What is a terrorist?            How does the process of democracy work?</p>
<b>Language Arts</b>	<p>Show the relationships among the characters in <i>Charlotte’s Web</i>.            What are the characteristics of a narrative poem?            What is the process for writing a résumé?</p>

Some teachers find they can help their students move to more meaningful learning just by the way they initially frame the domain (Power 1) to be considered.

## How to Construct Concept Maps to Foster Meaningful Learning



- 1) **Begin with a familiar domain.** Examples: a segment of a familiar text, a recent laboratory activity, a problem or question under consideration.
- 2) **Limit the domain.** The domain should include ideas that relate to each other for ease of modeling the process. Example: Not the Civil War, but 3 issues that led to the Civil War.
- 3) **Identify key concepts.** Perhaps this could be a joint effort with students. Read a selection relating to the domain; together pull out the key ideas and list in any order. Another plan would be to organize students in cooperative groups or pairs and have them read a textbook selection then pull out the key concepts.
- 4) **Rank key concepts.** This may be preliminary, much like a first draft. Students could attach Power numbers to the concepts.
- 5) **Construct a preliminary map.** Student groups could do this. The process should include the struggle to achieve the best possible map in both hierarchy and relationships or cross-links. There is NO expectation of a perfect map, rather a beginning map.
- 6) **Use a computer software program or use sticky notes** on chart or butcher paper so groups of concepts and links may be moved around and various meanings considered relating to the domain or quest.
- 7) **Seek cross-links.** This is the area that may be the most difficult for students. This step requires students to deal in depth with a concept in order to establish meaningful relationships. Students must look for relationships among the concepts represented on their map. (It may be helpful to re-examine Novak’s concept map.)
- 8) **Expect to undergo three to five revisions.** Through presentation of each major and minor concept and their relationship(s), students attain the desired outcome—clarity of understanding. The best maps show reciprocal relationships through choice of language. The final revision should be much like the final draft of a well-written paper, clear and concise. Once a map is done, students can readily provide elaboration and summarize the information in writing.

**Remember: A concept map is never finished!**

As of 3/1/06, the following websites, and references provide additional information on concept mapping. They also include several sample concept maps.

### Internet Sites of Interest & Reference

Assessment Tools for Mathematics and Science and Technology with Concept Maps  
Easily adapted for high schools.

[http://www.flaguide.org/tools/tools\\_technique.php](http://www.flaguide.org/tools/tools_technique.php)

Building on New Constructivist Ideas and Cmap Tools to Create a New Model of Education

<http://www.ihmc.us/users/acanas/Publications/NewModelEducation/NewModelforEducation.pdf>

Bruce's Guide to Student Evaluation of Web Sites

<http://www.wiu.edu/users/mfbhl/websource.htm>

Embedded Interactive Concept Maps in Web Documents

<http://www.cpsc.ucalgary.ca/~kremer/webnet96/we>

Institute for Human and Machine Cognition (Cmap Tools)

<http://www.ihmc.us/index.php>

LTScotland 5-14 Online (National Educational Guidelines for Scottish Schools)

Site provides access to works of J. Dunbier, St. Bede's College, New Zealand

<http://www.ltscotland.org.uk/5to14/specialfocus/mathematics>

Click on "Mind Mapping", then click "Mathematical Concept Maps"

Using Concepts Maps via the Web to Enhance Learning in Latin America

<http://www.ihmc.us/users/acanas/Publications/QuorumSoupST/SoupsST.htm>

### References

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