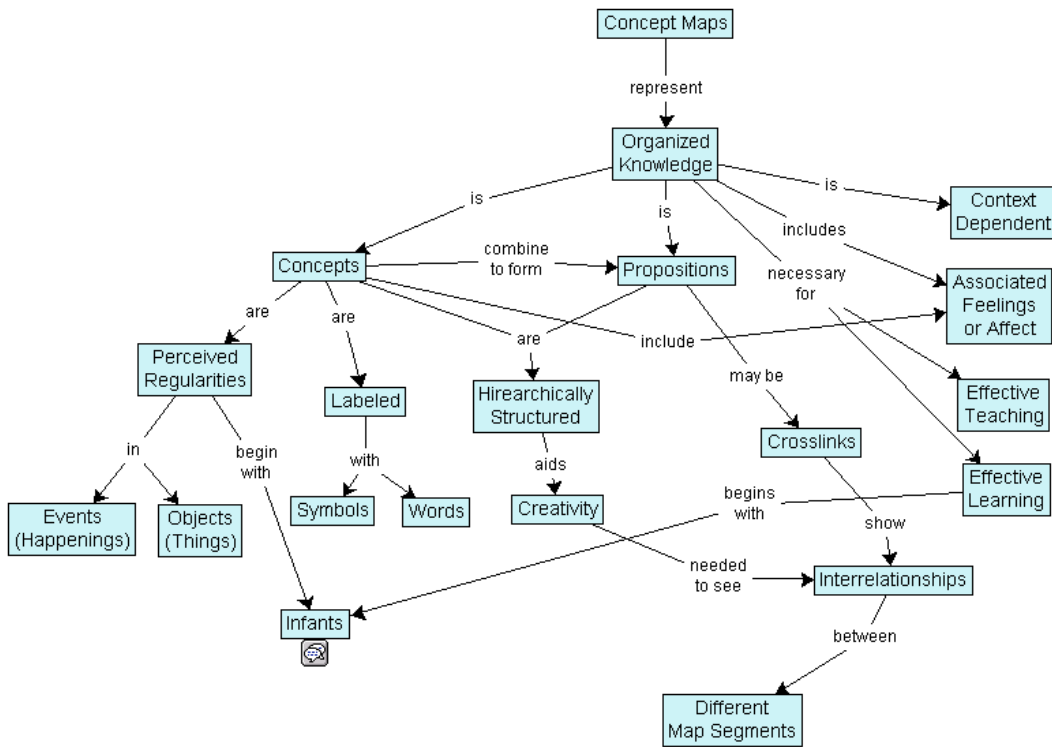


Concept Maps

(Source: Adapted from Univ. of Illinois)

A **concept map** is a diagram showing the relationships between concepts (Wikipedia, 2009). A concept map consists of cells (circles or other shape) that contain a concept or vocabulary term. Links/connecting lines are sometimes labeled and may have direction indicated with an arrow symbol. The labeled links explain the relationship between the cells. Arrows describe the direction of the relationship and can be read like a sentence by the concept map's author. *When students work together to create concept maps they engage in a good bit of dialogue, and this deepens learning and helps increase students' vocabulary learning* (K. Cooter & R. Cooter, in press).

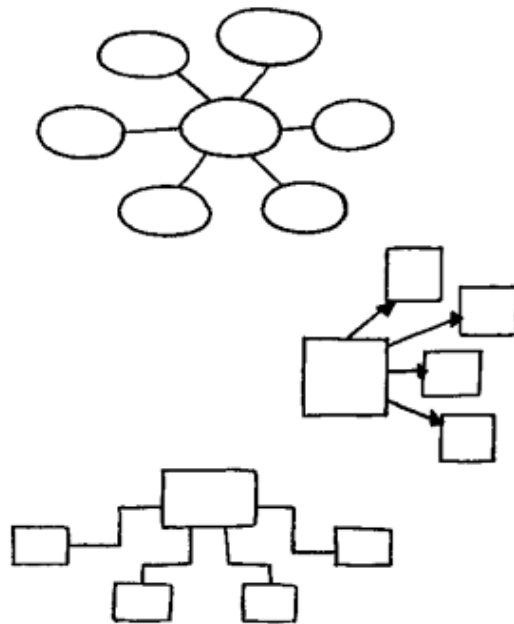


Example concept map, created using the IHMC CmapTools computer program.

There are four major categories of concept maps. These are distinguished by their different format for representing information, and include **spider** concept maps, **hierarchy** concept maps, **flowchart** concept maps, and **systems** concept maps. All of these work well with subject area studies.

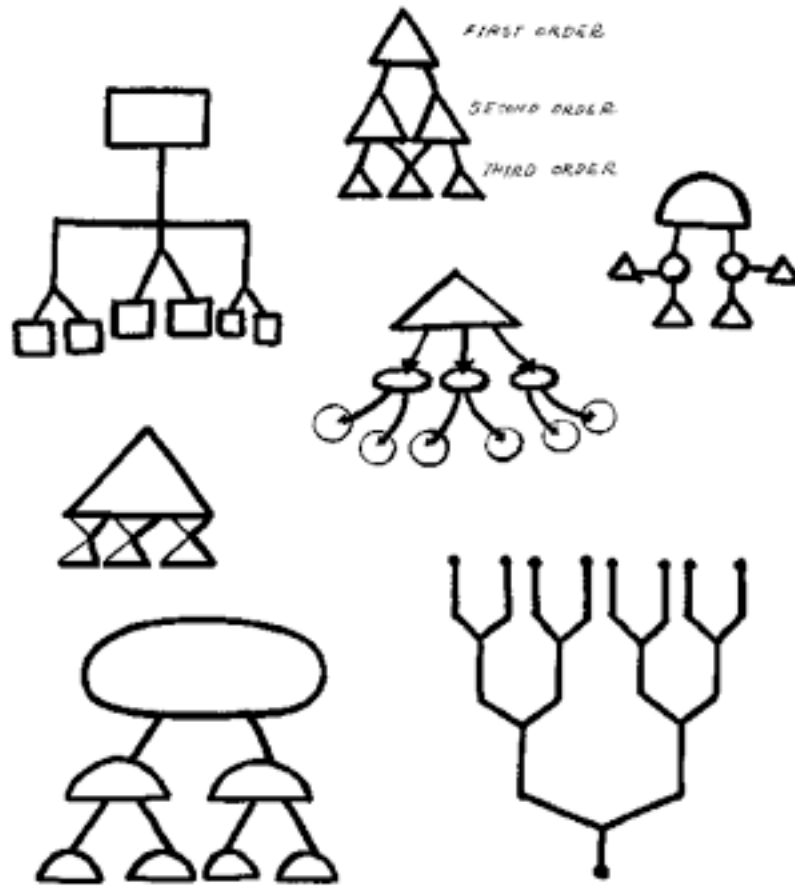
Spider concept map formats- The "spider" concept map is organized by placing the central theme or unifying factor in the center of the map. Outwardly radiating sub-themes surround the center of the map.

SPIDER Concept Maps



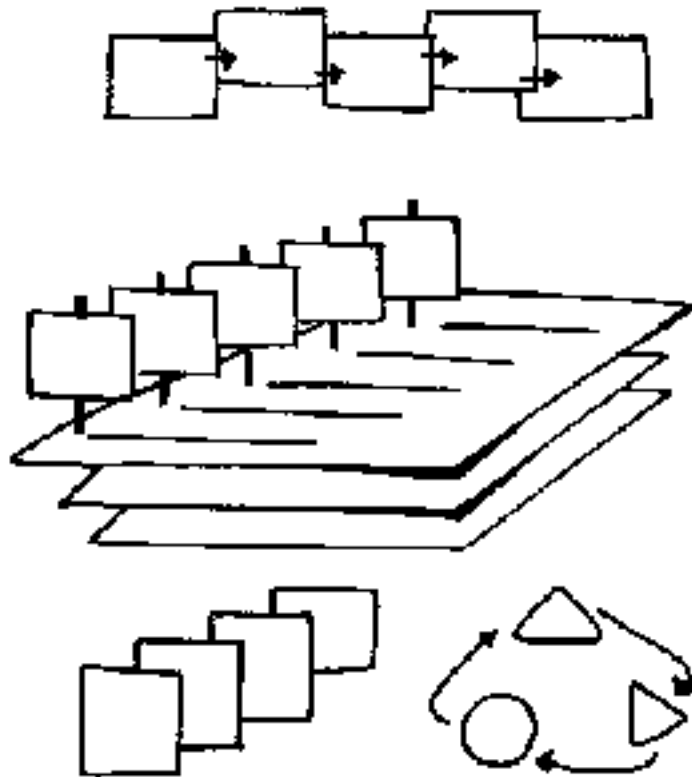
Hierarchy concept maps- The hierarchy concept map presents information in a descending order of importance. The most important information is placed on the top. Distinguishing factors determine the placement of the information.

HIERARCHY



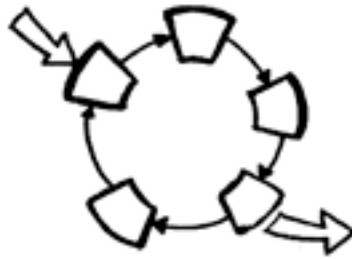
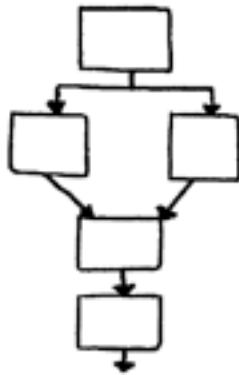
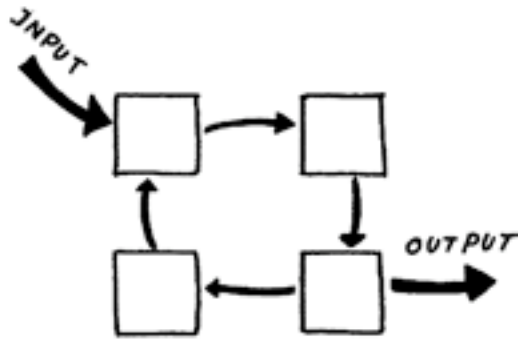
Flowchart concept maps- The flowchart concept map organizes information in a linear planned format.

FLOWCHART - ALGORITHM concept Maps



Systems concept maps- The systems concept map organizes information in a format that is similar to a flowchart with the addition of 'INPUTS' and 'OUTPUTS.'

SYSTEMS Concept Maps



Constructing a Concept Map* (Group Activity)

Brainstorming Phase: From your memory, identify words or phrases that you think are in anyway associated with the topic. Make a list of these items and print them neatly on small stick 'em notes, one per note. This is a **brain-storming** process, so write down everything that anybody in your group thinks of at this point. Your objective here is to generate the largest possible list you can. Before your group completes this step, you may have a LOT of items.

Organizing Phase: Spread out your stick 'em notes on a flat surface so that they can all be seen. Create groups and sub-groups of related words/phrases. Try to group items to emphasize hierarchies or how things are related. Feel free to rearrange items and introduce new items that you think of. Note that some concepts will fall into multiple groupings. This will become important later.

Layout Phase: On a large sheet of paper, try to come up with an arrangement (layout) that best represents your collective understanding of the interrelationships and connections among groupings. Feel free to rearrange things at any time during this phase. Use a consistent hierarchy in which the most important concepts are in the center or at the top. Within sub-grouping, place closely-related items near to each other. Do not expect your layout to be like that of other groups.

Linking Phase: Use a version of one of the **concept map formats (i.e., spider, hierarchical, flowchart, systems)** with lines and/or arrows to show the relationship between connected items.

Finalizing & Sharing Your Concept Map: After your group has agreed on an arrangement of items that shows your understanding, convert the concept map into a permanent form that others can view and discuss.

Be creative in your use of colors, shapes, border thickness, etc. to communicate your group's understanding. Give your concept map a **title**. If you want to construct your final concept map on a computer, try using PowerPoint. In reviewing your concept map, consider the following attributes:

- **Accuracy and Thoroughness.** Are the concepts and relationships correct? Are important concepts missing?
- **Organization.** Was the concept map laid out in a way that higher order relationships are apparent and easy to follow? Does your concept map have a title?
- **Appearance.** Was the assignment done with care showing attention to details such as spelling and penmanship? Is it neat and orderly or is it chaotic and messy.
- **Creativity.** Are there unusual elements that aid communication or stimulate interest without being distracting or over-the-top?

*Adapted from directions created by the Department of Chemistry and Biochemistry, University of Delaware (2002).

History of Concept Maps

The use of concept maps as a teaching strategy was first developed by J. D. Novak of Cornell University in the early 1980's. It was derived from Ausubel's learning theory that places central emphasis on the influence of students' prior knowledge on subsequent meaningful learning. According to Ausubel, "the most important single factor influencing learning is what the learner already knows. Thus meaningful learning results when a person consciously and explicitly ties new knowledge to relevant concepts they already possess. Ausubel suggests that when meaningful learning occurs, it produces a series of changes within our entire cognitive structure, modifying existing concepts and forming new linkages between concepts. This is why meaningful learning is lasting and powerful whereas rote learning is easily forgotten and not easily applied in new learning or problem solving situations.

Use of concept maps in teaching

Teaching a topic

In constructing concept maps, difficult concepts can be clarified and can be arranged in a systematic order. Using concept maps in teaching helps teachers to be more aware of the key concepts and relationship among them. This helps teachers to convey a clear general picture of the topics and their relationships to their students. In this way, it is less likely to miss or misinterpret any important concepts.

Reinforce understanding

Using concept maps can reinforce students' understanding and learning. This enables visualization of key concepts and summarizes their relationship.

Check learning and identify misconception

The use of concept maps can also assist teachers in evaluating the process of teaching. They can assess the students' achievement by identifying misconception and missing concepts.

Evaluation

Students' achievement can be tested or examined by concept mapping.