

SEE WHAT YOUR STUDENTS ARE THINKING!

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Whether they're called mind maps, semantic nets or webs, concept maps offer powerful thinking tools for teachers and learners. For teachers they offer a means to uncover naive theories and misinformation in the content areas, and provide an assessment of lesson clarity. For students they are a vehicle to integrate new information with information previously learned, a knowledge construction kit. Concept mapping encourages learners to build connected or *relational* knowledge rather than the static knowledge of unrelated facts and inert associations.

Concept mapping promotes a high degree of active learning since the learner plays a dynamic role in creating and developing the concept map. Research suggests concept maps are most effective when the students create their own maps during the learning process. Students show best results from maps that define the connections between the concepts (Anderson—Inman & Zeitz, 1993). Concept mapping enables students to see that concepts do not exist in isolation and that each concept depends on its relationships to many others for meaning (Rafferty & Fleschner, 1993). All maps that a student creates illustrate the understanding and prior knowledge that the student possesses concerning the material being mapped. The maps summarize and integrate knowledge that is already learned, and generate new knowledge from the manipulation of existing ideas (Wholeben, 1994). A student who is using concept mapping must transform knowledge from its current, linear form into a context-dependent hierarchical form. In order for a student to do this successfully, she must identify key concepts, arrange them, and relate them to each other in a meaningful way (Wandersee, 1990). This is crucial information for the teacher involved because it is concrete evidence of how well the student understands the skills and ideas being taught (Scantling, McAlesse, Tietjen, & Strand, 1992). In general then, the literature shows that the capacity to form relational knowledge is related to the degree to which students have an organized conceptual structure which they have helped to create, and which shows the connections between conceptual elements with labeled links.

The common tools for building semantic networks are pencil, paper and eraser. The mapping process requires frequent real-time revision as a student or group of students struggles to clearly define and capture a concept and its associations. Students can find the process of making and changing paper-based maps tedious and time-consuming. Enter the computer.

In much the same way that word processors facilitate working with text, and spreadsheets make mathematical manipulations quick and easy, "thought processors" remove

much of the frustration inherent in the paper and pencil approach to concept mapping. The computer and appropriate software enable learners to create, move, label and modify conceptual elements or links with relative ease. Inspiration™, available for both the Macintosh and Windows platforms, is perhaps the best known example of programs specifically designed for this purpose. Benefits of using such programs include:

- making the revision process faster and less burdensome
- multiple copies can be made of the concept map illustrating each stage of development while constructing the map
- individualized instruction of concept mapping can be accomplished with the use of a computer
- computers provide an interactive experience which raises student motivation and encourages individual expression
- students are able to revise and evaluate their concept maps in a convenient and trouble-free fashion and reorganize knowledge as it changes according to their understanding
- switching between outline and graphical views of the same information
- the addition of multimedia elements such as graphics, pictures and sounds
- the ability to easily collapse and expand portions of the map to aid in focusing discussion and enhancing attention to chosen sections

Inspiration™ and programs like it provide potent tools for actively engaging learners in constructing relational knowledge in virtually any content area. *

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