



## Mind and Concept Mapping

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### Overview and Definition

Mind mapping and concept mapping are ways to visually represent information and ideas. Though often used interchangeably, educators define them in distinct ways. A mind map is a spontaneous way of showing the association between ideas. A concept map is a more deliberate and structured way of representing the relationship between ideas (Davies 2011, 280). Maps usually contain several ideas articulated in words and images: a mind map contains arrows drawn between associated ideas (see example from [Char Booth's Info-mational blog](#)) while a concept map typically labels arrows with descriptions of how those ideas relate to each other (see example from [IHMC CmapTools](#)). The visual, non-linear nature of both mapping techniques makes them useful tools for educators who want to help students think through complex ideas and processes in accessible ways. While mapping can be achieved with pen and paper, there are a range of mapping programs that allow teachers and students to easily create and share maps.

### Basis for Current Interest

Educators looking for new ways to make their teaching engaging, active, and student centered can use mapping tools to achieve their teaching and learning goals. Teachers can visually engage students by making maps that complement or take the place of auditory and written information. They can also have their students participate in the tactile activity of making maps. Active learning occurs when "students are doing things and thinking about what they are doing" and meaningful learning happens when students integrate new information into what they already know (Stalheim-Smith 1998, 1; Novak 2007). Mapping, which requires students to express their understanding of concepts in words and images and then draw and label links between those ideas,

facilitates both learning processes. Further, the prevalence of online mapping tools allows students and teachers to share and create maps together, and supports higher education's increasing emphasis on collaborative learning.

### Current Applications in Academic Libraries and Higher Education

Instructors in many disciplines have used maps as visual aids in classroom and online teaching. Maps have been used to illustrate the relationships between disciplinary concepts, the developments of theories over time, and steps in the academic research process (Novak 1991; Kandiko, Hay, and Weller 2012). Maps have also been included in syllabi to show how topics covered during the term relate to one another (Clark 2007). This [concept map at McGill University](#), for example, maps learning outcomes to assignments in a political science course.

Maps help students visualize their learning. Concept maps, in particular are recognized as constructivist tools that facilitate active, reflective and meaningful learning (Hay 2008, 309). Students have been taught to utilize mapping for note taking, project planning, and exam review. Some instructors use digital mapping tools to facilitate group brainstorming and discussion (Novak and Canas 2007). Maps have also been used to assess student learning. Students can be asked to make maps at strategic times in a course, "at the start to establish what students know about a topic before instruction begins, during instruction to demonstrate learning progress, and at the end of instruction as an indication of what the student has learned" (Daugherty, Custer, and Dixon 2012, 12).

Maps are also used in administrative work. Char Booth, for example, has documented the organizational usefulness of maps as communication and collaboration tools, "applicable to presentations, outreach, and teaching as well as small-group or solo brainstorming, planning, strategic thinking, and non-linear documentation" (Booth 2011). Curriculum mapping is widely practiced but, because maps can compactly capture

the key points of lengthy documents and discussions, they are useful in completing many other administrative tasks (Colosimo and Fitzgibbons 2012, 8).

Free and low cost software programs for digital mapping and information visualization include [CmapTools](#), [Mindomo](#), [FreeMind](#), [Visual Understanding Environment \(VUE\)](#), [Visual Thesaurus](#), [XMind](#), [Popplet](#), [Bubbl.us](#), [Inspiration](#), [MindMeister](#), and [Prezi](#). All are available on the Web; some can be downloaded to desktops; many allow the creation of images that can be copied into lecture slides and/or included in online course modules; and several allow sharing and collaboration among groups of users.

## Applications in Academic Library Instruction

Academic librarians commonly use maps as visual aids to teach library research processes and information literacy skills. Maps that show the steps in the library research process or the stages of academic publishing can make those complex processes more understandable to students. [Rutgers University Libraries' Developing a Research Strategy](#) map, for example, captures the many stages of the non-linear process in one clear image, and the [University of Washington, "Scientific Publication Cycle"](#) map situates scientific publishing in layers of concepts that, when understood, will help students choose information sources appropriate for their topics.

Mapping has also been employed as an active learning exercise in instruction sessions. Librarians have used mind mapping and concept mapping to facilitate students' hands-on work in different stages of library research including: brainstorming for topic ideas, thinking up keyword search terms, and creating research strategies (Burkhardt and MacDonald 2010, 27-30; Tysick 2004). Though many articles describe students taking pen to paper, digital mapping tools have been used to facilitate collaborative thinking, group brainstorming, and project planning (Whicker, Shields, and Chadwell 2012, 14-15).

Digital tools strengthen the curriculum mapping processes that have long been a staple of library information literacy planning. [The Claremont Colleges Library curriculum mapping template](#), for

example, uses the Mindomo platform to provide a vehicle for librarians to visualize how a multitude of classes, course sequences, and degree programs relate to library resources and services.

Sophisticated mapping software (rather than pen, paper, sticky notes, and whiteboards) enables librarians to clearly illustrate and organize the many inputs to be considered in planning library programs and creating instruction tools. For example, mapping the information architecture of instructional websites can help librarians visualize the different paths students might take to get to instructional content. Digital maps also have the advantage of being more easily created, shared, and revised with groups of people, thus fostering collaboration among librarians and faculty across different spaces and times.

## Potential Value

Many examples in the library literature attest to the value of having students visualize their research and brainstorm keywords and topic ideas with mapping tools (Colosimo and Fitzgibbons 2012, 3). A mapping exercise designed by Cynthia Tysick is notable because it combines the commonly used free association techniques of mind mapping with the more structured process of concept mapping. She describes a two step library instruction process in which she has students begin by brainstorming a map of their research topic and then revisit that map to "arrange their brainstorming work into a concept map" which identifies particular keywords and relationships to focus on in their library research work (Tysick 2004, 2.2).

Mapping can be used in a number of research and information seeking activities and thus could become more central to library instruction. For example, maps could be used more fully in online teaching and learning. In addition to using maps to illustrate specific information literacy concepts, librarians could use conceptual maps to structure student navigation through information literacy tutorials and student quizzes could be constructed around having students correctly fill in labels that represent accurate relationships among concepts (Edwards and Cooper 2010; Eppler 2006; Pinto, Doucet, and Fernandez-Ramos 2010).

Maps are powerful assessment tools. Students can be asked to make concept maps in different stages

of an information literacy course to capture how well they are integrating class concepts into their pre-existing research and information seeking knowledge. Concept mapping exercises can be challenging to assess because students will produce a range of maps that are very particular to the way they think. However, some librarians have proposed questions and rubrics to guide systematic evaluation (Radcliff 2007, 107; Colosimo and Fitzgibbons 2012).

Finally, librarians could support student and faculty success on campuses by teaching them how to use mapping software to organize personal projects and group work. Online mapping programs are excellent tools for graphically displaying information and organizing files and documents. For example, the [Rhode Island School of Design's Fleet Library, Concept Mapping Tutorial](#) teaches students how to use maps at all stages of the research process, including topic exploration, search strategy design, and resource management. Similarly, librarians at McGill Library have taught students to use concept mapping for note taking and organizing lecture slides, course readings, and assignments (Colosimo and Fitzgibbons 2012).

## Potential Hurdles

Mapping is an effective learning tool because it enables teachers and students to represent their current understanding of a topic using a form that mirrors the mind's own relational construction of knowledge. The complexity involved in making maps effective representations, however, means that they can take a lot of time to teach and to learn. Mapping processes that ask students to describe and label relationships among concepts can be particularly time consuming; students often need to practice mapping several times before being able to make meaningful maps (Bifuh-Ambe and Reid-Griffin, 2010). Instructors who want students to use digital mapping tools will need to take even more time to teach students how to use particular software. Consequently, online mapping may be more appropriate for longer workshops and classes with multiple meetings.

Digital mapping tools allow for easy revision and sharing of maps; however, some users find that these tools impede their thinking and collaboration processes. The limits of what can be seen clearly on a computer screen, combined with the time and

labor involved with typing text and uploading images can inhibit the free flowing creativity that is unleashed by using more informal, low-tech processes like pen, paper, and/or sticky notes (Anderson-Inman and Horney 1996; Tucker, Armstrong, and Massad 2010).

Finally, while there are plenty of free and low-cost mapping technologies available, most don't interact with one another. Some software allows users to export and print images of maps, however the ability to collaborate and revise maps with others is limited to users who subscribe to the same software platforms.

## Conclusion

Librarians, faculty, and students who wish to learn and use mapping technology may find that doing so requires a significant investment of their time (and sometimes money). Nonetheless, the use of this technology may ultimately enhance the teaching, learning, and planning processes that are required in academic work. The brainstorming techniques that have always been a staple of library instruction can be more easily practiced collaboratively with mapping software. Although the practice and revision important to developing knowledge through mapping takes time away from other research techniques, their ability to engage students in active and meaningful learning and their application to a range of academic work including, note taking, studying, and project planning makes them worth adopting, and even making central, to instruction.

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