Using E-Maps to Organize and Navigate Online Content

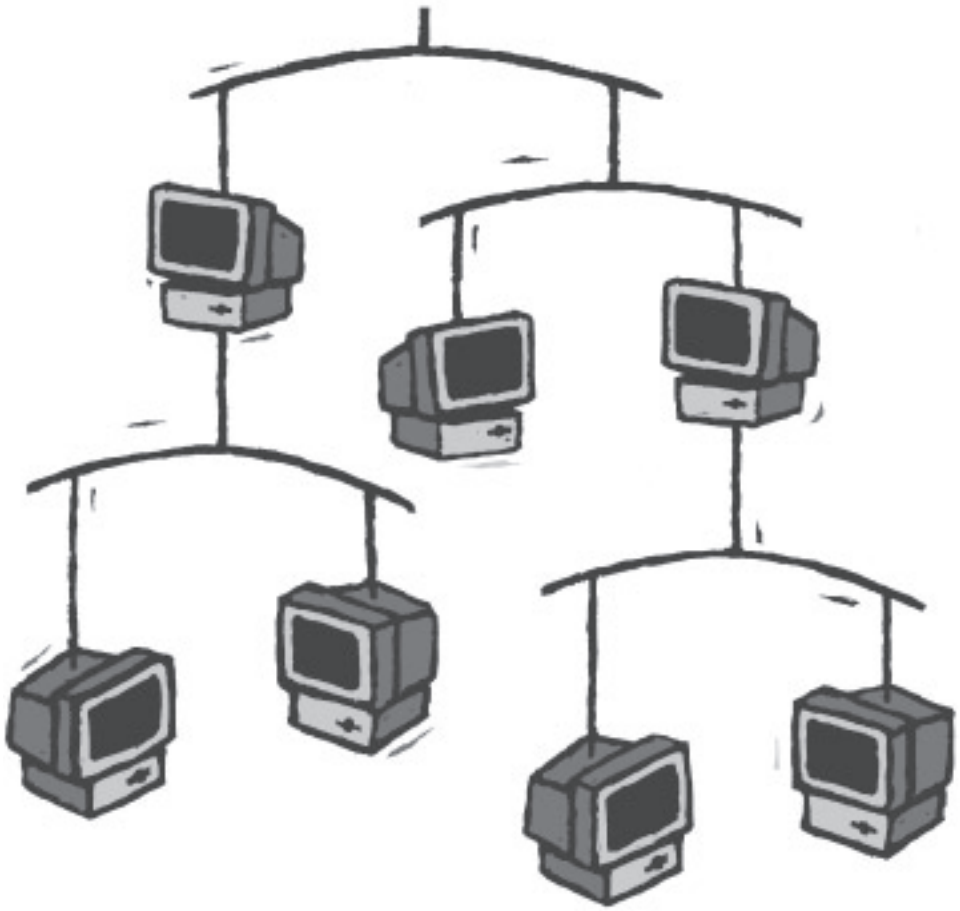
Computer-generated mind maps, or e-maps, serve as a graphical interface for presenting, organizing, and navigating web-based course content and files

By **Michael F. Ruffini**

Many university faculty design and upload course materials to the web using either their own website or a course management system. They typically present content in a linear or sequential structure, using hyperlinks to access course files, websites, and folders. Sequential ordering of content employs chronological or alphabetical order, or arranges content from general to specific. This approach ignores the adage that "a picture is worth a thousand words." If a picture is worth a thousand words, it is because a visual image can generate more cognitive associations that enhance critical thinking and memory than can words by themselves.

E-maps visually represent complex information in an easy-to-understand format that shows the overall structure of subject content. I use the term *e-maps* for computer-generated mind maps, which were created by Tony Buzan in the late 1960s to help students take better notes using key words and images.[1]

The mind forms associations almost instantaneously, and the mind map approach helps students quickly relate a central word or concept to other pieces of information. A mind map makes information more meaningful than if it were just memorized because, like concept maps, it places the information in the context of existing knowledge. Furthermore, a mind map allows instructors to organize information into chunks, enabling students to remember more information for a longer time. (See http://heuristixx.wordpress.com/ for examples of hand- and computer-drawn mind maps.)



An e-map can organize and sequence content nonlinearly on one web page by placing the main topic in an image-centered diagram with interrelated main and subtopic connections or branches in a radial format. E-mapping thus offers a powerful e-learning and organizational technique that visually displays main topics, subtopics, concepts, and images and the relationships between them.

E-Maps and Meaningful Learning

Mind maps and concept maps provide a powerful visual image that can depict complex relationships and information and relate new information to prior knowledge. Many learning theories and research studies support the effectiveness of using graphic organizers such as mind maps and e-maps to facilitate learning. An e-map can be used on the web to quickly create concise represen-

tations of ideas, complex relationships, knowledge, and information.

Graphic organizers are particularly suited to:

- Aiding learning by explicitly integrating new and old knowledge
- Generating ideas through brainstorming
- Assessing understanding or diagnosing misunderstanding
- Increasing recall
- Designing a complex structure (long texts, large websites)
- Communicating and understanding complex relationships

Grounded in learning theory and research, concept maps and mind maps are based primarily on the learning theories of cognitive psychologists, specifically David Ausubel's assimilation theory[2] and James Deese's associationist theory.[3]

The primary concept in Ausubel's assimilation theory is meaningful learning. According to Ausubel, "The most important single factor influencing learning is what the learner already knows." Thus, meaningful learning results when a student relates new knowledge or information to what he or she already knows (existing knowledge). Ausubel contrasted meaningful learning to rote learning, which occurs when a student simply memorizes information with no attempt to relate that information to prior learned knowledge. The new information is easily forgotten and not easily applied to problem-solving situations because it was not linked to concepts already learned.

Meaningful learning anchors new ideas or concepts with previously acquired knowledge in a nonarbitrary way.[4] The associationist theory states that memory consists of a network of concepts that is not hierarchical despite being supportive of hierarchies. Relationships between concepts form naturally when two concepts overlap on some dimension. As learning occurs, this network of concepts and relationships becomes more and more complex. Regardless of the theory behind it, a concept map helps represent ideas in a way that models an individual's cognitive structure.[5]

Other Research

Much research has investigated how using graphic organizers such as concept maps and mind maps can facilitate learning by using a pictorial way of constructing knowledge and organizing information. The following list summarizes notable theories and studies that support graphic organizers in the teaching and learning process:

- Use of graphic organizers aids students in retention and recall of information.[6]
- Semantic networking tools enhance comprehension and retention of the ideas being studied by helping learners construct structural knowledge. In addition to improving comprehension, structural knowledge improves retention of content being studied.[7]
- Concept maps help preservice teachers map their subject-matter knowledge as a precursor to lesson planning.[8]
- Students demonstrate some of their best thinking when they try to represent something graphically, and thinking is a necessary condition for learning.[9]
- The effects of graphic organizers are greatest when students have in-depth instruction and training in their use and when students construct graphic organizers themselves.[10]
- Graphic organizers help students transfer retention and recall skills to new situations.[11]
- Creating graphic organizers to illustrate the organization of ideas and information aids comprehension and learning.[12]
- When important information is isolated, we can see how concepts are connected, and this makes it more easily understood.[13]
- The mind arranges and stores information in an orderly fashion, so when new information is added, the framework is already there on which to attach new knowledge.[14]
- A visual graphic containing key ideas and information is easier to remember than extended text, whether the text is visual or verbal. The use of both visual and verbal language to create graphic organizers results in active learning.[15]

E-Mapping Software

In 1993, Mindjet released MindManager, one of the first professional mind mapping or e-mapping software programs developed for business, education, and corporate training. A MindManager map can be exported as a clickable image map, an image, PDF file, PowerPoint presentation, Word document, or web page. Today many e-mapping software companies offer products on both PC and Mac platforms (see Table 1).

Table 1

Commercial E-Mapping Software

Company	Program	Platform	Web Address
Mindjet	MindManager (Pro, Lite, and Mac)	PC, Mac	http://www.mindjet.com
Buzan Online Limited	iMindMap	PC, Mac	http://www.imindmap.com
INSPIRATION	Inspiration	PC, Mac	http://www.inspiration.com
SMART Technologies	SMART Ideas	PC, Mac	http://smarttech.com
Mind Technologies	Visual Mind	PC	http://www.visual-mind.com
IHMC	CmapTools	PC, Mac	http://cmap.ihmc.us
ConceptDraw	MINDMAP	PC, Mac	http://www.conceptdraw.com
CoCo Systems Ltd.	VisiMap	PC	http://www.visimap.com

Creating an E-Map

One advantage of working with e-mapping software is its ease of use. You do not need advanced computer skills to learn how to use the software—if you can create a PowerPoint presentation, you can easily learn to create e-maps for instructional modules.

Constructing an e-map involves seven basic components:

1. A central or module topic is automatically added to every new map.
2. Main topics branch off the module topic. These should be the main content related to the topic.
3. Subtopics provide details about the main topic.
4. A relationship exists between two (or more) topics.
5. Link to an existing file (including another map), Web page, or folder.
6. Callout topics can be used for comments or to provide additional information for a specific topic.
7. Floating topics can be used for comments or to label the map.

Figure 1 shows a sample e-map using all seven components.[16]

Color and graphics are important attributes in designing e-maps. Color can be used to reinforce associations, differentiate categories or topics, depict themes, and make relationships stand out. Graphic images and other visual aids such as arrows and icons serve an organizing function by illustrating the relationships between similar and different topics (see Figure 2). To see use of color and graphics in an e-map, see http://www.mapacourse.com/flash_planet_movie/virtual_field_flash_trips_MM/index.html.

Instructional Applications

E-maps can be created for a whole

Figure 1

E-Map Components

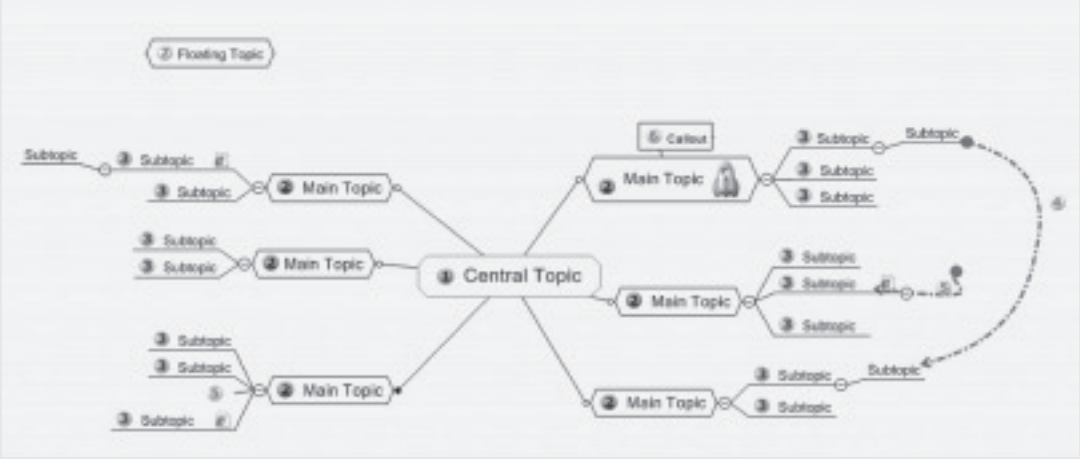


Figure 2

Graphic Elements in an E-Map

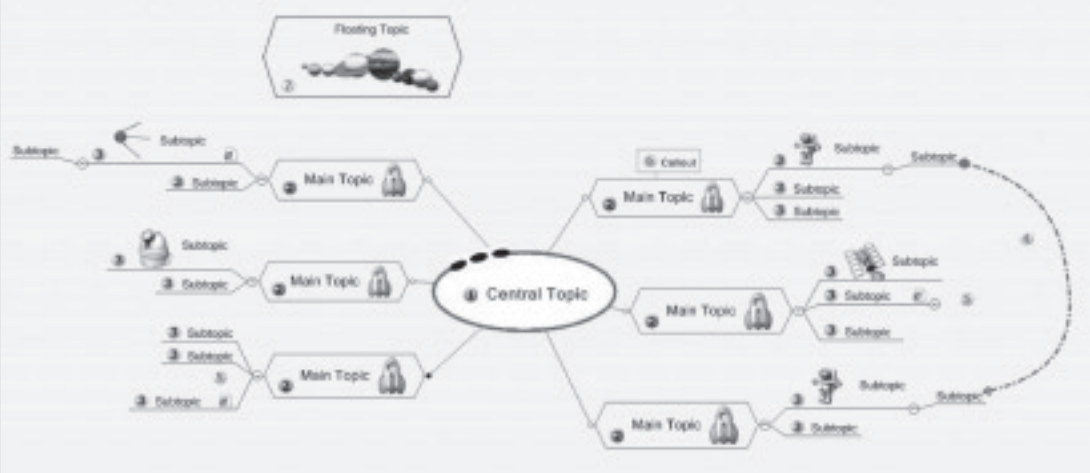
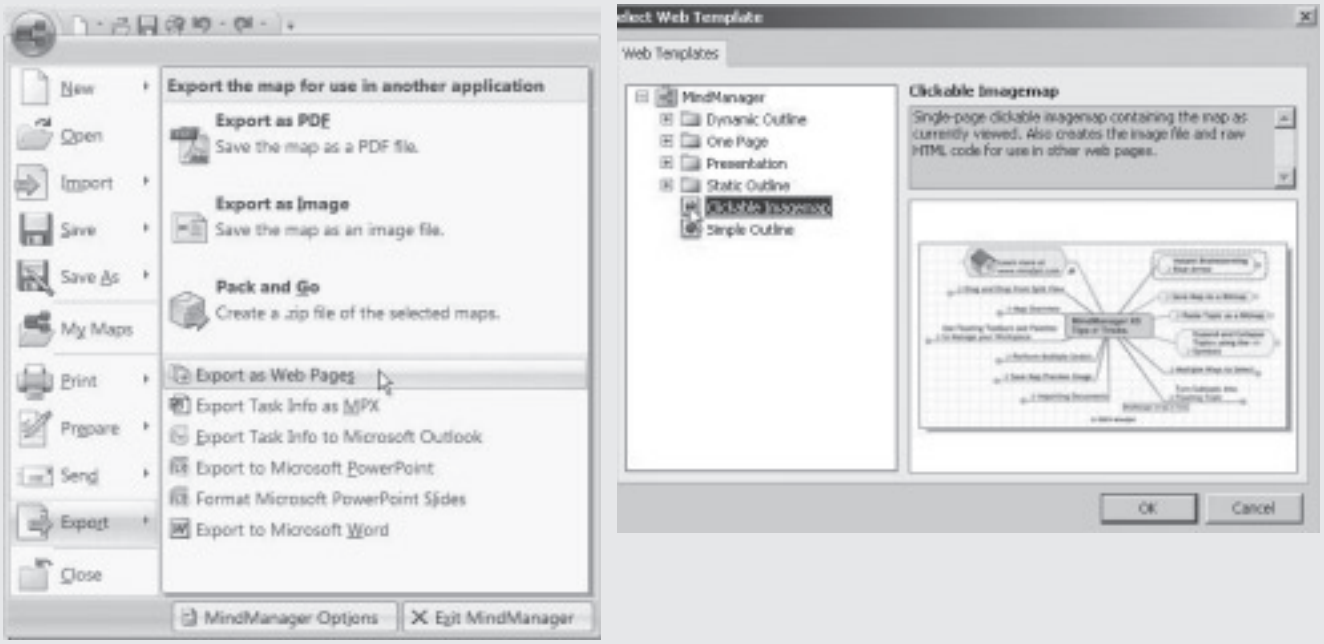


Figure 3

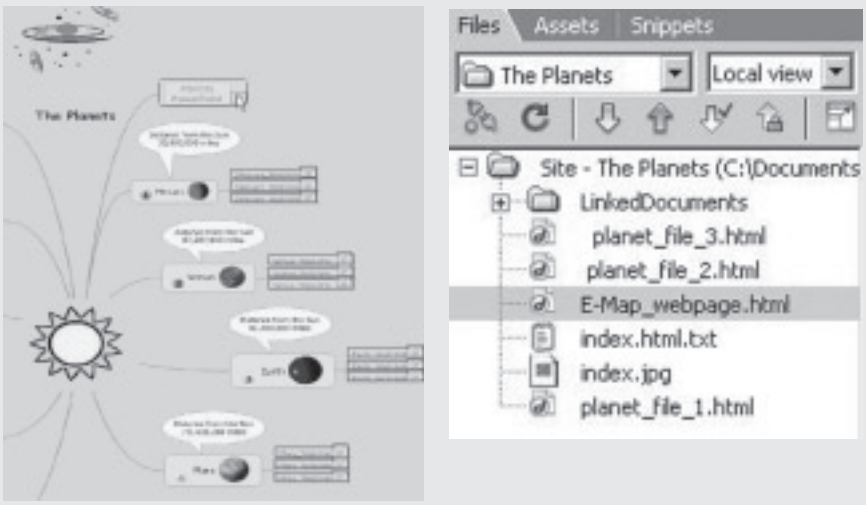
Exporting an E-Map as a Clickable Image Map



course, a course module, or a special topic within a module. Using an e-map enables the instructor to design instruction showing the interrelationships of content and complex concepts by linking websites, word processing and PDF files, PowerPoint Point presentations, video clips, Flash movies, and many other files. The instructor can use an e-map during a classroom presentation or as a study guide on a particular topic.

Figure 4

Exported E-Map Saved in Website Root Folder



E-Maps for the Web

To use an e-map as a graphical interface for web pages and files, you first need to create a website for all your web pages. You can keep all web pages and files in one location, readily available for quick editing and uploading to a server. Using a web authoring program such as Adobe Dreamweaver can aid this process. A completed e-map can be exported as a clickable image map web page (see Figure 3). The exported image map is saved in the website's root folder (see Figure 4). The relevant web pages and files can then be linked to the e-map.

E-Map Planning and Examples

Before creating an e-map, the instructor should formulate objectives for the module or topic. The objectives then serve as a guide for creating e-map topics and subtopics. Figure 5 shows an example e-map created for a module on the planets (also shown in Figure 4). Each planet branch extends out from the sun and includes a numerical position from the sun, a picture of the planet, a callout indicating the

Figure 5

E-Map of the Planets

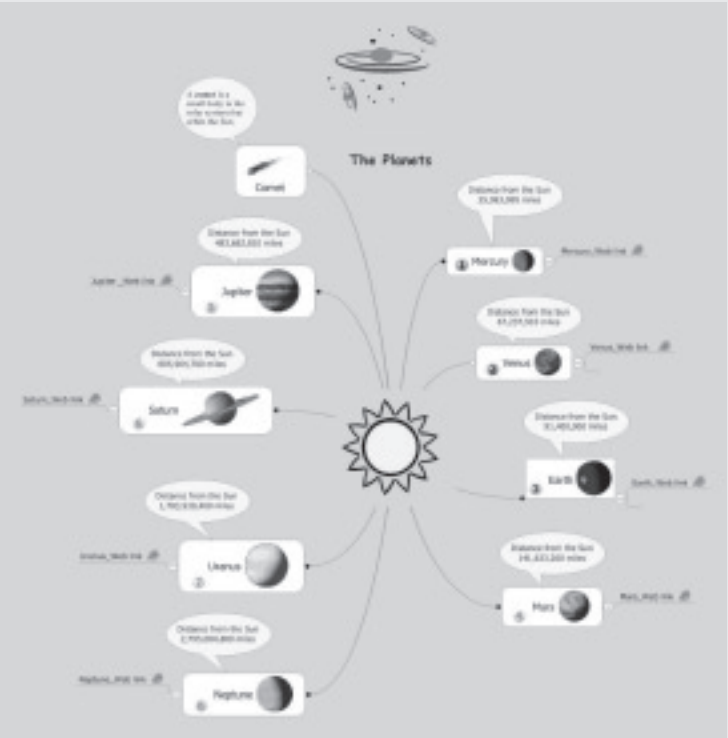
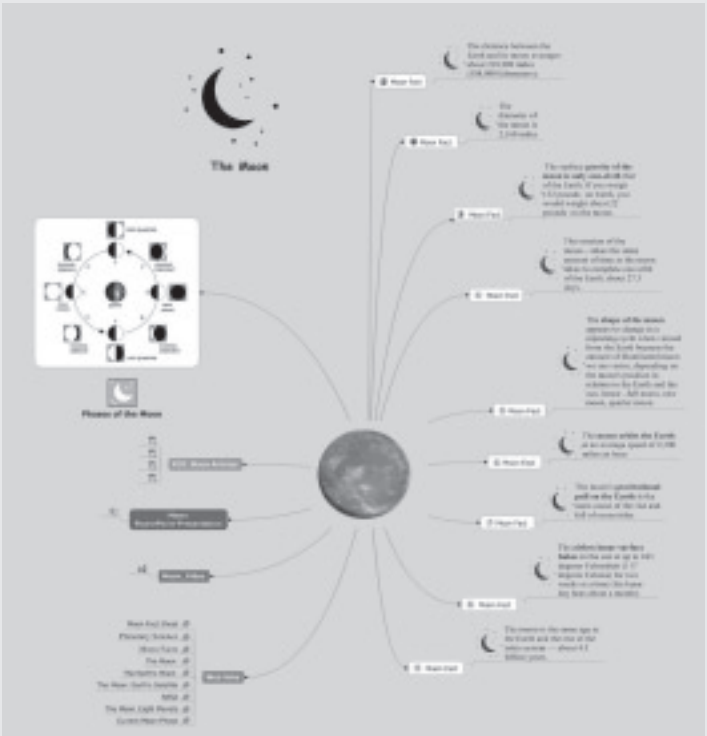


Figure 6

E-Map of the Moon



distance from the sun, a PowerPoint presentation on the planet, and hyperlinks to websites that correspond to each planet.

Figure 6 shows an e-map created to teach students about the moon. Each branch extends out from the moon image, including nine branches with an interesting fact about the moon, a branch with web links to information on the moon, a branch that attaches to a picture of the moon's phases, and branches hyperlinked to a video clip on the moon, PDF articles about the moon, and a PowerPoint presentation on the moon.

Conclusion

An e-map provides an outstanding e-learning tool for organizing and navigating web-based content and files. Considerable research indicates the effectiveness of using graphic organizers such as mind maps to facilitate meaningful learning. Buzan and Buzan[17] argue that mind maps better harness the way the brain works than traditional linear constructions of knowledge presented to students. The radiant structure of an e-map is consistent with the radial nature of the brain's functioning, and the colors, graphics, and nonlinear branches used in an e-map stimulate the entire brain, resulting in more engaged and effective learning. Using the e-map technique gives instructors the freedom to express ideas and show interrelationships between concepts and content in a very visual and nonlinear structure that benefits their students. *e*

Endnotes

1. Tony Buzan, *Mind Maps* (London: Thorsons/HarperCollins, 2002).
2. Very active in his field during the 1950s to 1970s, Ausubel was influenced by Piaget's cognitive development theory. See David P. Ausubel, *The Psychology of Meaningful Verbal Learning* (New York: Grune and Stratton, 1963).
3. James Deese, *The Structure of Associations in Language and Thought* (Baltimore: The Johns Hopkins Press, 1965).
4. Joseph D. Novak and D. Bob Gowin, *Learning How to Learn* (New York: Cambridge University Press, 1984).

5. Lee A. Freeman and Leonard M. Jessup, "The Power and Benefits of Concept Mapping: Measuring Use, Usefulness, Ease of Use, and Satisfaction," *International Journal of Science Education*, vol. 26, no. 2 (February 6, 2004), pp. 151–169.
6. Inspiration Software, "Scientifically-Based Research on Graphic Organizers," 2007, http://www.inspiration.com/vlearning/research/index.cfm.
7. David H. Jonassen, *Computers as Mindtools for Schools: Engaging Critical Thinking* (2nd ed.) (Upper Saddle River, NJ: Merrill, 2000).
8. Brian Ferry, "Probing Personal Knowledge: The Use of a Computer-Based Tool to Help Preservice Teachers Map Subject Matter Knowledge," *Research in Science Education*, vol. 26, no. 2 (1996), pp. 233–245.
9. David H. Jonassen, *Computers in the Classroom: Mindtools for Critical Thinking* (Englewood Cliffs, NJ: Merrill, 1996).
10. Pamela J. Dunston, "A Critique of Graphic Organizer Research," *Reading Research and Instruction*, vol. 31, no. 2 (1992), pp. 57–65.
11. Cynthia C. Griffin, Deborah C. Simmons, and Edward J. Kame'enui, "Investigating the Effectiveness of Graphic Organizer Instruction on the Comprehension and Recall of Science Content by Students with Learning Disabilities," *Journal of Reading, Writing and Learning Disabilities International*, vol. 7, no. 4 (October–December 1991), pp. 355–376.
12. James L. Flood and Diane Lapp, "Conceptual Mapping Strategies for Understanding Information Texts," *The Reading Teacher*, vol. 41 (April 1988), pp. 780–783.
13. Novak and Gowin, *Learning How to Learn*.
14. David E. Rumelhart, "Schemata: The Building Blocks of Cognition," in *Theoretical Issues in Reading Comprehension*, Rand J. Spiro, Bertram C. Bruce, and William F. Brewer, eds. (Hillsdale, NJ: Lawrence Erlbaum, 1980), pp. 38–55.
15. Lev S. Vygotsky, *Thought and Language* (Cambridge, MA: MIT Press, 1962).
16. I created all the figures in this article using Mindjet's MindManager Pro 7.
17. Tony Buzan and Barry Buzan, *The Mind Map Book: How to Use Radiant Thinking to Maximize Your Brain's Untapped Potential* (New York: Plume, 1993).

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