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Thinking Maps: Visual Tools for Activating Habits of Mind

David Hyerle

New theories penetrate into the world of practical affairs when they are translated into methods and tools. . . . "Tool" comes from a prehistoric Germanic word for "to make, to prepare, or to do." It still carries that meaning: Tools are what you make, prepare, or do with.

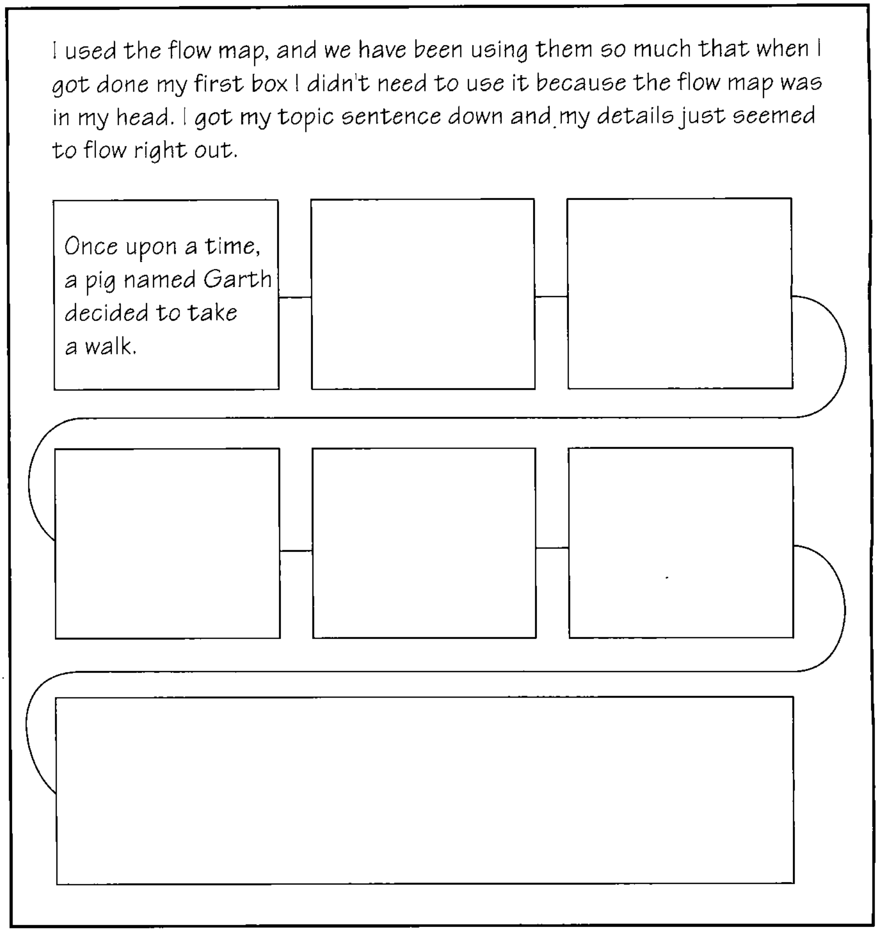
Peter Senge

In early 1995, 4th graders at Friendship Valley Elementary School in Carroll County, Maryland, responded to a narrative writing prompt on the Maryland Performance-Based Assessment. The school had been built five years before on the principles of the "School as a Home for the Mind" (Costa, 1991), and it had strengthened its program through a range of high-quality teaching and learning strategies.

If you had been standing in a certain hallway of Friendship Valley on the morning of that test—normally a stressful few hours for all involved—you would have been startled by an ecstatic teacher running out of a room exclaiming, "They're using them on the test!" Many of her students, without coaching, had used Thinking Maps® to generate and organize information to complete the prompt. After the testing documents were collected, the teacher asked students to write about strategies they used during the test. One student responded with a note and a flow map, one of the eight Thinking Maps that students had been taught (see Figure 4.1).

By the time the student and her peers sat down for the writing test, they were relatively fluent with using the flow map to direct and construct networks of knowledge on the way to final products. In addition, they had developed the disposition for creativity and flexibility. They were able to persist, and they could call on a highly developed system for reflection and metacognition. In the end, these students' test scores were second across the whole state of Maryland on the combined scoring of six performance assessments—well beyond the mark where students in the school had performed previously. Exactly how was it that the student and her classmates, in the midst of a stressful test, were able to pull up a Thinking Map in their mind's eye?

FIGURE 4.1
Student Flow Map



Source: Adapted from Hyerle, 2000a.

THE VISUAL BRAIN

The brain is capable of absorbing 36,000 images every minute. How can this incredible figure be true? It is because the sophisticated, front-loaded wiring of our brain system is well beyond our imagination. Research approximates that between 80 and 90 percent of the information received by the brain is through the eyes. Though our auditory and kinesthetic modes of sensing are complex and integrated with visual processing, the dominant mode is visual. Such dominance may seem a radical departure from the idea that we need to somehow balance instruction across multiple modalities. Yet the reality is that the human brain has evolved to become positively *imbalanced* toward visual imaging for information processing.

Even if we believe that some individuals are more kinesthetic, auditory, or visual learners—or more global or analytic—we need to consider research showing that each of us still processes far more information visually than through other modalities. We must help students use their visual strengths.

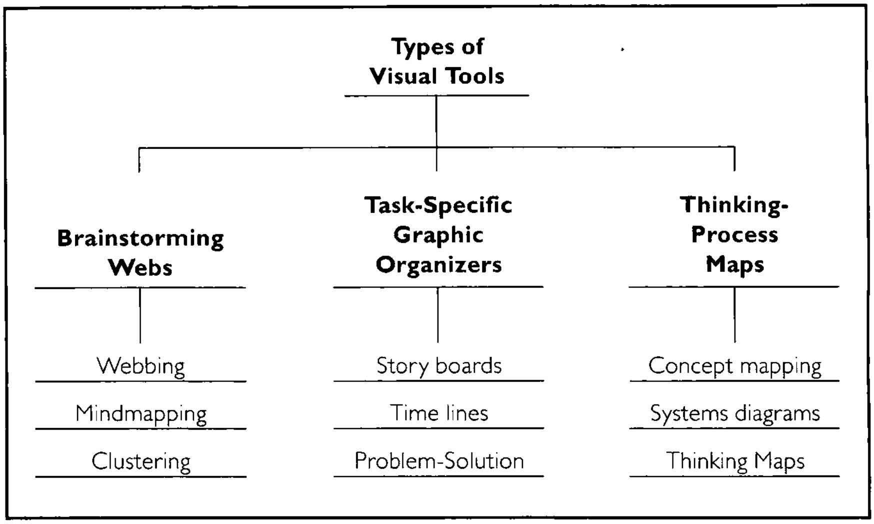
VISUAL TOOLS FOR CONSTRUCTING KNOWLEDGE

Metacognition means thinking about thinking. It means knowing what we know—and what we don't know—and how we know that. Metacognition also refers to an awareness and control of one's cognitive processes and the regulatory mechanisms used to problem solve. Metacognition anchors strategies for students so that they can apply them in life situations beyond school.

When students represent their cognitive strategies with visual tools, they practice metacognition, a principle of learning where they describe the thinking processes they use to pattern content knowledge and to solve problems (Hyerle, 1996). Three types of visual tools aid this metacognition: brainstorming webs, task-specific graphic organizers, and thinking-process maps (see Figure 4.2).

Carpenters and chefs have particular tools for different operations; so, too, thinkers turn to different visual tools to activate certain habits of mind. In the examples that follow, we see that students can develop their capacities to be creative and flexible, to persevere, to be systematic, and to be aware of and reflective about metacognitive patterns to the degree that they can fluently apply these patterns to classroom challenges.

FIGURE 4.2
Constructing Knowledge



Source: Adapted from Hyerle, 2000a.

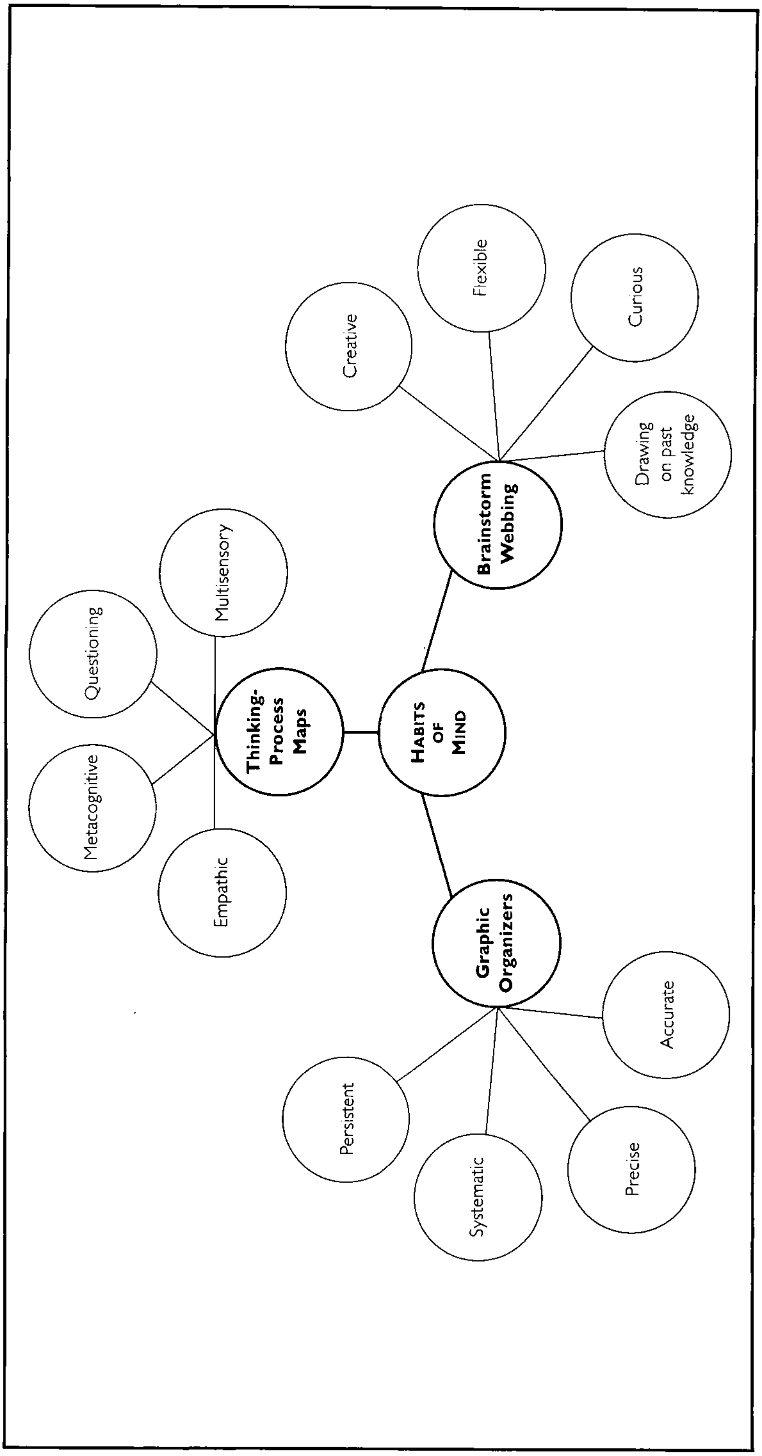
The graphic representations in Figure 4.3 (see p. 50), or "displayed metacognition" (Costa, 1991), enable students to look into their own thinking as they might look at their own reflection in a pool of water. With visual tools, students see their thinking displayed. From this public display, all students can readily share in one another's thinking and become self-reflective on the process, content, and, most importantly, evolving *form* of their thinking.

Brainstorming Webs

Although brainstorming webs appear in infinite forms, most learners start in the center of a blank page and branch out, creating idiosyncratic designs as an idea expands. The open form and purpose of brainstorming webs promote creative generation of ideas without blinders. Most brainstorming webs are used for thinking "outside the box," and they spark a high degree of open-ended networking and associative thinking.

After students become fluent with webbing, or with Tony Buzan's more specific techniques called Mindmapping™ (Buzan, 1994), it becomes clear that a cluster of intelligent behaviors, centered around creative thinking, is actively engaged and facilitated. Although educators have found it easy to identify verbal and written fluency as key objectives in school, it is more

FIGURE 4.3
Visual Tools and the Habits of Mind



Source: Adapted from Hyerle, 1999.

difficult for us to see that these two forms—speech and writing—are essentially linear representations. With brainstorming webs, students have self-generated, nonlinear tools for activating fluent thinking, which reflects the holistic networking capacity of the human brain.

Students call upon their disposition for ingenuity, originality, and insightfulness to express this form of thinking. Brainstorming webs provide the tools for venturing to the edge of our thinking—and thinking beyond the edge. Brainstorming also opens other habits of mind such as flexibility and curiosity.

Many teachers have a particular concern about brainstorming: What happens after the storm? Students need to move beyond the generation of ideas. They need to gain organizational control over ideas, and they need self-control to support more systematic and analytical thinking. To address this concern, another type of visual tool supports another cluster of habits of mind.

Task-Specific Graphic Organizers

Unlike webs, which facilitate thinking *outside* the box, most graphic organizers are structured so that students think *inside* the box. A teacher may create or take from a teacher's guide a specific visual structure that students follow and fill in as they proceed through a complex series of steps. Teachers often match these organizers with specific patterns of content or the development of content skills; thus, they are called task-specific organizers. These highly structured graphics may seem constraining at times, yet each can be fruitful for students as they systematically approach a task, organize their ideas, and stay focused (especially when the task is complex).

For example, many organizers are sequential, showing the steps for solving a word problem, organizing content information for a research report, learning a specific process for a certain kind of writing prompt, or highlighting essential skills and patterns for comprehending a story. Because these types of visual tools are highly structured, they directly facilitate several habits of mind: persisting, managing impulsivity, striving for accuracy, and thinking and communicating with clarity and precision.

The visual/spatial structure guides students through the steps, box by box or oval by oval. Teachers report that one of the main outcomes of using graphic organizers is that they provide a concrete system and model for proceeding through a problem that students would otherwise abandon because they have not developed their own organizational structures for persisting. An obvious reason for this advantage is that the visual structure reveals a whole view of the process and, importantly, an end point.

This kind of structuring also provides visual guidelines, much like a rope students can grasp. They don't impulsively jump outside the problem to what Benjamin Bloom calls "one-shot thinking." The visual modeling shows students that they can manage their impulsivity and stay in the box when they need to focus on following through to a solution. This kind of modeling also lends itself to greater accuracy and precision of language. Students usually don't have a record of their thinking, along with the steps and missteps they took along the way. They also have a hard time differentiating one idea from the next. By visually capturing their thinking, students can look back on their ideas, refine them, and share them with others to get feedback.

Both brainstorming webs and graphic organizers help students become familiar and fluent with networking and patterning information. Such work leads to a question about the relationships between thinking skills instruction and visual tools: Are there common patterns of thinking keyed to questions we ask every day in schools that could—if represented visually—deepen students' understanding and extension of their own thinking and habits of mind?

THINKING-PROCESS MAPS

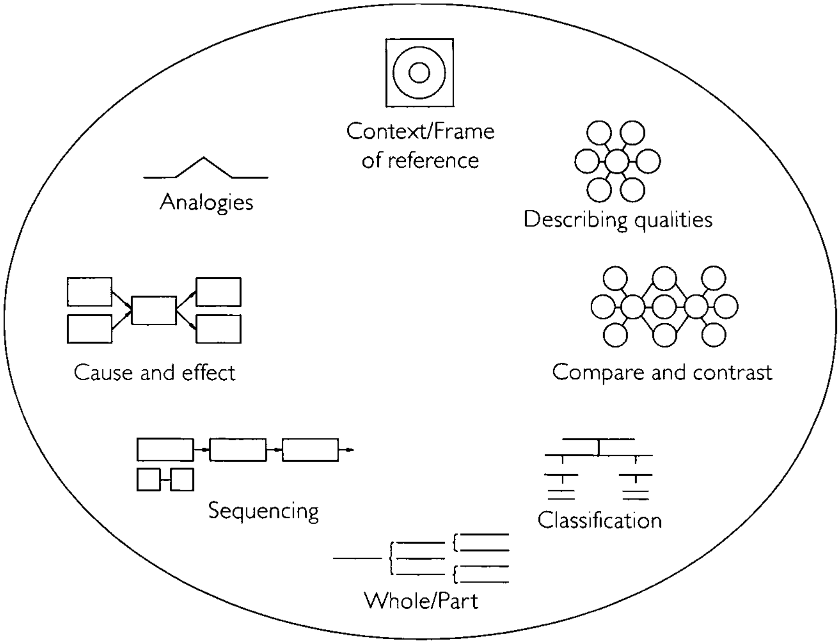
A third kind of visual tool now appearing in classrooms simultaneously supports thinking inside and outside the box. These tools—which I call thinking-process maps—are designed to reflect common patterns of thinking, from fundamental cognitive skills such as comparison, classification, and cause-effect reasoning to integrated visual languages such as Concept Mapping™ (Novak & Gowin, 1984), systems diagramming, and Thinking Maps.

Although these dynamic tools often *look* much like some static graphic organizers we see in classrooms, the differences in the purpose, introduction, application, and outcomes are significant. Thinking-process maps scaffold many habits of mind related to brainstorming webs and organizers, but these tools focus explicitly on different forms of concept development. They facilitate more explicitly four habits of mind: questioning and posing problems, gathering data through all senses, thinking about thinking (metacognition), and listening with understanding and empathy.

As one example, let's look at Thinking Maps, a synthesis model, or *language*, of eight thinking-process maps. This toolbox of visual tools combines the creative thinking facilitated by brainstorming webs, the organizational structures of graphic organizers, and the metacognitive capacities inherent in thinking-process maps, such as concept mapping and systems diagramming. As shown in the descriptions provided in Figure 4.4, each map is grounded in a specific, fundamental cognitive process. When used as connected tools—on a blank piece of paper, a chalkboard, a white board, or with Thinking Maps software (*Thinking Maps: Technology for Learning*, 1998)—these maps concretely support interactive teaching, higher-order thinking and learning, and assessing across linear and nonlinear patterns of knowledge.

FIGURE 4.4

Thinking Maps: A Common Visual Language



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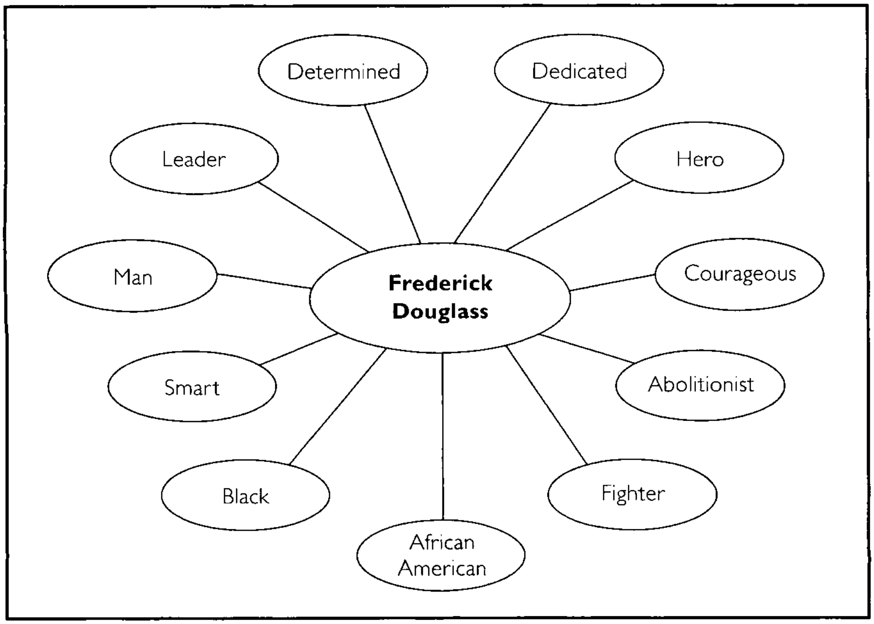
For a concrete example of Thinking Maps at work, consider this learning objective a teacher in New York City gave to her 5th grade class: "In celebration of Black History Month, research and write a report on a famous African American." This teacher knew that the cognitive complexity of this multistep process was daunting to her students. But all teachers and students in this inner-city, K–5 school had been trained for years in the use of Thinking Maps, and they had applied these tools across disciplines. By the time the 5th grade students faced this objective, they were fluent with all eight tools for patterning thinking in reading, writing, and mathematics. They also had learned how to use multiple maps together to create final products. Figures 4.5, 4.6, and 4.7 (see p. 56) show how one student independently used Thinking Maps as tools for writing an essay for her investigation of the life of Frederick Douglass.

First, the student used a bubble map to identify key attributes about Frederick Douglass (Figure 4.5). This map is based on the cognitive skill of identifying attributes of things and developing a descriptive cluster of qualities of the man: dedicated, smart, courageous, and determined. The student then used the tree map to sort the information into the paper topic, the supporting ideas, and a detailed factual record (Figure 4.6). The tree map helped her synthesize a vast quantity of ideas while deleting extraneous details. Last, she used a flow map to create a logical progression of ideas for writing (Figure 4.7). The outcome from these Thinking Maps was a highly scored 10-paragraph essay that mirrored the flow map. Additionally, the three maps also were submitted in typed form providing evidence of the thinking processes she went through on the way to the final product.

Consider now the three types of visual tools and the clusters of behaviors related to each. First, this student investigated Frederick Douglass, starting with blank pages and developing map after map of ideas drawn

FIGURE 4.5
Using a Bubble Map to Identify Attributes

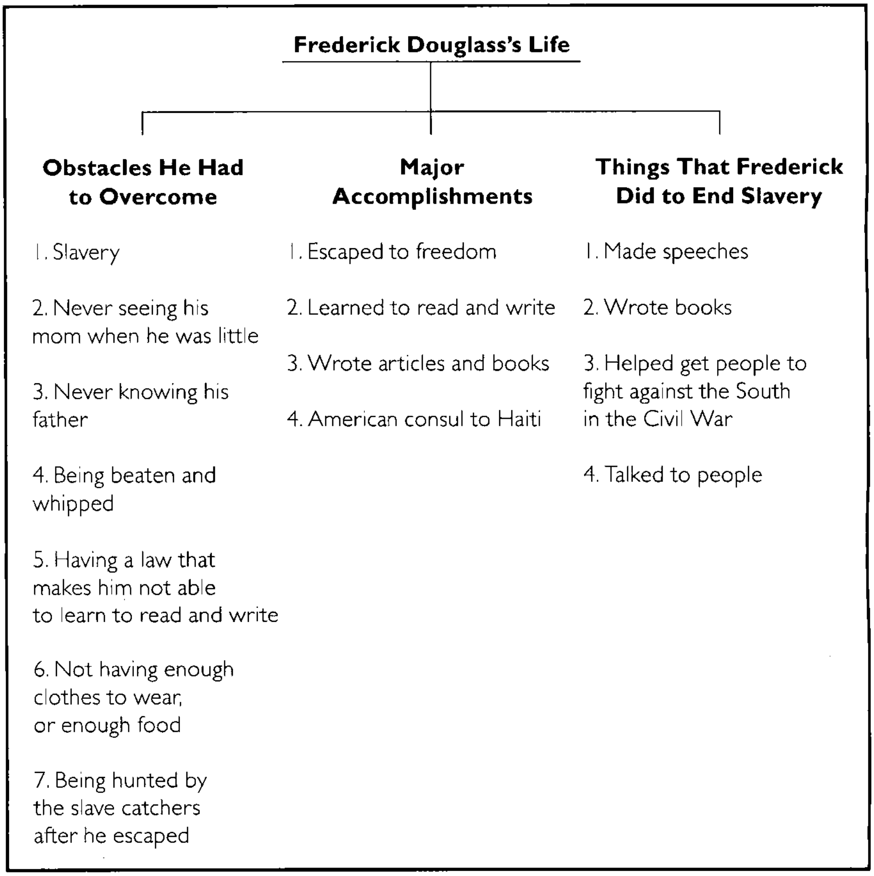


Source: Hyerle, 2000a.

from resources in the school. She linked information from map to map as well, easily transforming information into different patterns of thought. Even though the bubble map is specifically intended for identifying attributes or characteristics, it provided a way for the student to abstract Douglass's essential qualities from linear textual sources and develop a rich cluster of information.

Second, much as with graphic organizers, this student shows that the starting points—or common graphic primitives—for each Thinking Map effectively facilitate perseverance in the task. The student stayed focused on the lengthy, multistep requirements of the project: research, organization, and writing.

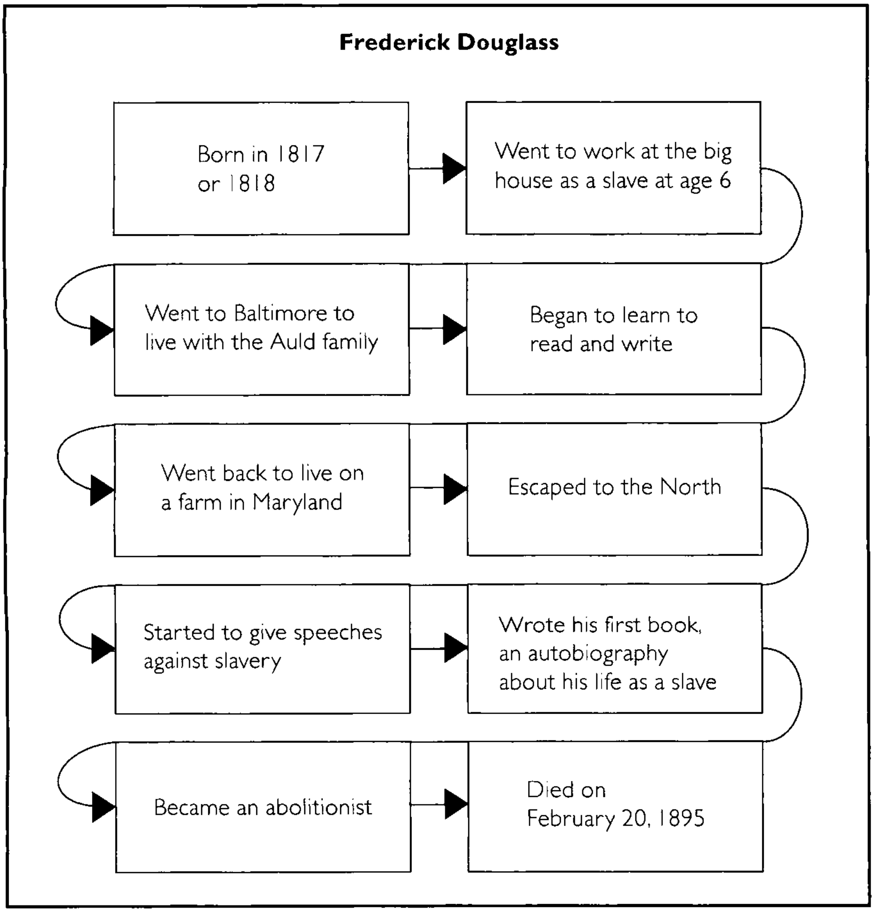
FIGURE 4.6
Using a Tree Map to Sort Information



Source: Hyerle, 2000a.

Third, as with other thinking-process maps, this student became aware of the multiple cognitive processes necessary for completing the task. She developed fluency with the tools that enabled her to configure the Thinking Maps to match her evolving understandings about Frederick Douglass. She "chunked" information and consciously formed the information into different patterns, which enabled her to write the essay. This process is atypical of what most students can do, especially when they are confronted with the otherwise daunting learning objective of researching, organizing, and then writing an essay report.

Figure 4.7
Using a Flow Map to Pull It All Together



Source: Hyerle, 2000a.

EFFECTS OF USING THINKING MAPS

Teachers, students, and administrators report some or all of these outcomes after implementing Thinking Maps:

- Increased memory of content knowledge when reading.
- Well-organized final products, particularly written work.
- Deeper conceptual understandings.
- Greater capacity to communicate abstract concepts.
- Heightened metacognition and self-assessment.
- Enhanced creativity and perspective.
- Transfer of thinking processes across disciplines and outside school.
- Test-score changes in reading, writing, and mathematics (Hyerle, 2000a).

Such learning was brought home to a teacher in North Carolina when her 10th grade students started using multiple Thinking Maps to interpret and then write a formal character analysis for a Langston Hughes short story, "Thank You, Ma'm." One student, who had struggled with writing all year, told the teacher, "The maps have helped me see what you mean when you tell us to go beyond the surface of the story and think deeply. I didn't think I could, but when I created the map I realized that I could have those kinds of ideas. The writing is much easier now." This student's experience summarizes one of the most important educational goals of all: When students combine the use of visual tools with the habits of mind to think more deeply, they *see* their own expanding ideas and thus gain a new sense of themselves as efficacious thinkers.

REFERENCES

Buzan, T. (1994). *Use both sides of your brain.* London: Dutton.

Costa, A. (1991). Foreword. In J. Clark, *Patterns of thinking.* New York: Allyn and Bacon.

Hyerle, D. (1996). *Visual tools for constructing knowledge.* Alexandria, VA: Association for Supervision and Curriculum Development.

Hyerle, D. (1999). *Visual tools and technologies* [Videotape]. Lyme, NH: Designs for Thinking.

Hyerle, D. (2000a). *A field guide to using visual tools.* Alexandria, VA: Association for Supervision and Curriculum Development.

Hyerle, D. (2000b). *Thinking Maps® training of trainers resource manual.* Raleigh, NC: Innovative Sciences.

Novak, J., & Gowin, R. (1984). *Learning how to learn.* Cambridge, MA: Cambridge University Press.

Thinking Maps®: Technology for learning [Software]. (1998). Raleigh, NC: Innovative Sciences.