The New Hampshire Journal of Education

Volume II

Plymouth State College
Center for Professional Educational Partnerships

The Metacognitive School: Creating a Community Where Children and Adults Reflect on Their Work

Jeffrey M. Spiegel, Ed.D.
Principal, Hanover Street School
Lebanon, New Hampshire

What happens when an entire school makes a fundamental shift in its thinking? At Hanover Street School (HSS), an elementary school in Lebanon, New Hampshire, children and adults are talking about thinking and integrating their ideas to change how teachers teach and students learn. This article describes the developmental experiences characterizing the school's evolution as a metacognitive school.

Current learning theorists are focusing on the social nature of learning. They are proposing that through participation with others in common activities, knowledge is distributed among members in any group and work is organized to draw upon their collective expertise (Demarest, 1998). This article suggests that when students and teachers reflect on their work, become more adept at describing the skills and strategies they use to solve complex problems, and apply those same strategies in a variety of contexts, they consequently discover their metacognitive process for both teaching and learning. More importantly, they transform their roles as a learning community by joining as partners in the instructional process.

Like most contemporary schools, HSS is improving instructional competencies by mapping curriculum for planning, exploring new formats for assessment, and aligning teaching objectives with local, state, and national standards. Teachers are considering approaches that address the full intellectual development of their students. Provocative and dynamic relationships are slowly emerging with greater classroom consciousness about how children think. The result is a greater demand to create school climate conditions that are intellectually growth-producing (Costa, 1991).

At first blush HSS looks like an ordinary public school. Students gather on the playground prior to the school day to converse, play on the new climbing structure, and see who can reach the greatest heights on the swings. Like most schools, the hallways offer a glimpse of the past and present. A fifty-year-old photograph of the school's first principal overlooks a showcase of ceramic pots embellished with humorous shapes and fanciful glazes by fourth graders. In the third-grade wing, a large colorful map displays how students traced the progress of the Alaskan Ididarod racers, while the hallway beside two sixth-grade classes is adorned with huge three-dimensional replicas of whales swimming in their natural habitat. What distinguishes this school from others only becomes apparent when closely examining some unusual representations of student work that are also prominently displayed in classrooms and corridors.

Students are representing their cognitive strategies with visual tools called Thinking Maps. It is the school's way of practicing metacognition, a principle of learning

Abstract

This article advances a metacognitive theory emerging from one school's emphasis on instructional thinking maps and community-based learning. Hanover Street School students and teachers learned to reflect on the mental strategies they accessed for academic planning and complex problem solving. Their experiences generated provocative insights about the dynamic relationship characterizing their teaching and learning behaviors.

Emanating from this metacognitive praxis was the implementation of a systematic reflection process and the formation of a new theory about instructional development. The result was the creation of an intellectual community model composed by and for teachers as learners and learners as teachers.

that exists when children are able to describe the thinking processes they use to solve problems. Eric Jensen, in *Teaching with the Brain in Mind* (1998), suggests that explicit learning models should include rich graphic organizers because they can provide an informational context for greater understanding and meaning.

HSS was the first school in New Hampshire trained by David Hyerle, the developer of Thinking Maps and author of *Visual Tools for Constructing Knowledge* (1996). During Thinking Maps implementation teachers were surprised that their discussions with students often resulted in thinking about thinking. This dialogue represents the school's initial step to a new level of understanding about the learning and teaching process. Unbeknownst to many teachers, when students began describing strategies they used with the Thinking Maps, they were embarking on a journey toward metacognitive development.

Metacognition

Metacognition has been defined as knowing and controlling one's own thinking and learning (Yinger, 1977; Jansson, 1983). Other researchers characterize metacognition as thinking about thinking, knowing what we know and what we don't know (Garmston, et al. 1993). Metacognition refers to an awareness of one's own cognitive processes and the regulatory mechanism learners and teachers use to problem solve (Costa, 1994). At HSS, metacognition also reflects the ability of students to apply their identified thinking strategies to other contexts, particularly real-life situations.

Thinking Maps at HSS appear in many forms. Fifth graders use various color markers on blue construction paper measuring six feet in length to create a giant Tree Map, entitled "War." Underneath are such categories as Causes, Results, Types of Warfare, Locations and Weapons. Some subtopics are Transportation, Shelters, and Groups of People. As many as 39 examples appear under each category.

In a third-grade classroom there's a depiction of bubbles emanating from a central circle with the words "My Community." In the outer circles of the Bubble Map students identify the local hospital, library, recreation center, and a host of other neighborhood resources and establishments.

These Thinking Maps demonstrate some of the many ways in which children in different grades, and responding to various subject matter, are able to organize information and visually represent it to others. Thinking Maps are not only a useful tool for classifying information and identifying problem-solving strategies. Additionally, they
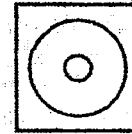
are effective for communication and assessment by depicting how children think and make sense about what they are learning.
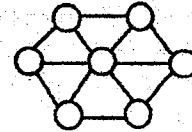
Thinking Maps as Metacognitive Tools

Entering each classroom in the school, visitors notice eight maps prominently displayed on the walls (see Figure 1).
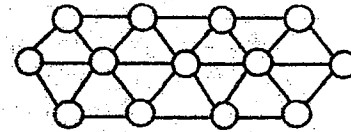
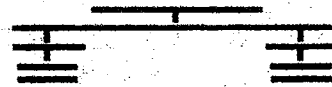## Figure 1. Thinking Maps

Defining in context
Circle map

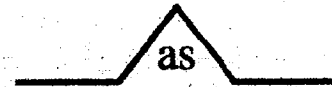*Describing qualities*
Bubble map
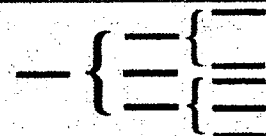
Comparing and contrasting
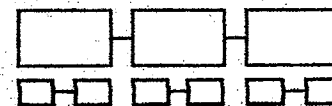Double bubble map

Classifying
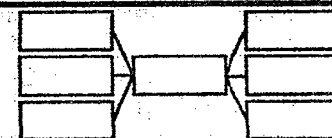Tree map

Seeing analogies
Bridge map

Part-whole
Brace map

Sequencing
Flow map

Cause and effect
Multi-flow map

Thinking Maps represent the common visual language teachers and students use to generate and organize ideas, to reflect on sequences of events, to characterize and contrast story elements, as well as to identify causes and effects of such varied topics as science reactions, pollution, slavery, or even discipline infractions. Students create maps describing physical attributes of Aztec Shields and develop Bridge Maps demonstrating the relationship between book authors' styles and artists' techniques by way of analogies. This higher order thinking by students represents a deeper understanding of curricula content that has surprised many teachers and parents.

As a result of this work, the faculty at HSS is now more adept at bridging local curriculum with the New Hampshire Frameworks. As in most states, the Frameworks identify curricula standards and proficiencies for all subjects specific to each grade level. With Thinking Maps, students at HSS display the thought processes they rely on to prepare writing prompts, solve multi-operational math problems, or describe relationships ranging from competing story protagonists to contrasting historical events that appear on the state Frameworks tests.

More impressively, Thinking Maps are providing new pathways for children to think at higher levels. Some students are so adept with the maps, they no longer draw them. As one sixth grader remarked in a class meeting. "Instead of putting the map on paper to organize my thoughts, I can picture the map in my head and come up with the information right away."

Thinking Maps provide opportunities for students and teachers to talk about thinking and to work together to integrate their discoveries within the context of varied topics. Often, during the initial year of implementation, students were able to create and apply innovative uses of the maps. This phenomenon was exciting and dynamic. It meant that students were taking charge of their leaning. Moreover, in some classrooms, they were driving the instructional practice.

The implementation of Thinking Maps represents the cognitive side of metacognition. Students are now better able to describe their thinking strategies and apply them to traditional academic tasks. Consider Melissa's experience as best dramatizing this first-stage metacognitive process. While studying her spelling words with a learning specialist, Melissa was asked how she taught herself to remember the correct spelling of her words. "Well, first I close my eyes and picture the word in my head," she replies. "Each letter points with an arrow to the next letter. I say the letters out loud to myself, then I open my eyes and write the word down."

This description represents Melissa's emerging awareness of a metacognitive principle for herself. Intuitively, she pictures a flow map with arrows to help her remember the sequence of letters that characterize the correct spelling of a word. Melissa's mental strategy demonstrates the way she accesses and organize visual, auditory, and kinesthetic operations to accomplish the task of spelling. She begins by creating a visual image in her mind, moves to auditory process by saying the letters in her head, and concludes kinesthetically with her writing the letters. When asked the metacognitive question, could she recall a time when she used that same strategy in her personal life, Melissa smiles confidently and proudly acknowledges, "Sure, that's what I do to remember my dad's phone number at work."

Although identified as a special needs student, Melissa shows us she is proficient at describing her learning process and competent in applying her cognitive strategy to a non-academic setting. By shifting modalities to establish an integrated mental process, this so-called handicapped student displays cognitive flexibility. Melissa demonstrates that the difference between the excellent speller and the poor speller is the mental strategy used to encode accurate spellings into long-term memory (Fontanel & Saltier, 1993).

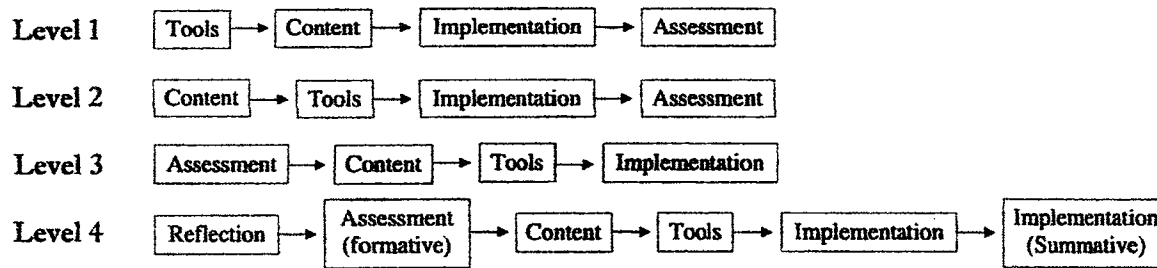## Metacognitive Teaching as a Developmental Process

Although Thinking Maps are integrated into the curriculum at HSS, they are only the first step to creating a metacognitive school. Currently, the faculty is engaged in redefining the school's mission as a place for learning. It is what some in the literature have characterized as school development; namely "the process by which members of an institution develop the capacity to reflect on the nature and purpose of their work together" (Stewart, Prebble, & Duncan, 1997).

The initial experiences with Thinking maps demonstrate that a developmental process describes teachers' integration of new and provocative instructional practices. Based upon their experiences, teachers reconsidered the implications of the instructional planning process. In particular, they focused on the role assessment plays in unit study development.

Teachers begin their discussions by considering their Thinking Maps experiences. Introduction and implementation of a new approach to teaching represented a developmental process of integration.

Assessment was defined by teachers as the formative collection(s) of evidence(s) of learning. Assessment requires a conscious plan to develop

Figure 2. Four Stages of Instructional Planning Development

Level 1   Tools → Content → Implementation → Assessment

Level 2   Content → Tools → Implementation → Assessment

Level 3   Assessment → Content → Tools → Implementation

Level 4   Reflection → Assessment (formative) → Content → Tools → Implementation → Implementation (Summative)

essential questions to guide the unit study and to determine what kind of student work would be assessed and with what formats (e.g., rubrics, formal tests, reports, projects, etc.). Assessment is distinguished from evaluation, which is defined as the analysis of the assessment evidence. Evaluation drives instructional reflection and subsequent planning with students for future unit development.

Figure 2 identifies four stages of teacher development identified by the faculty.

Level 1, which might take one to two years to achieve depending on the instructional competencies of the educator, is characterized by a focus on the actual tool or approach as the primary focus of lessons. Subsequently, content areas are identifies for curriculum application purposes. The parentheses around Assessment connote that Level 1 teachers may or may not consider assessment as part of this process. Those who do often include an assessment component at the conclusion of the instructional unit by collecting samples of student work or through more standardized formats, such as end-of-the-unit tests or reports that determine levels of student understanding and accomplishment.

Level 2 teachers recognize that a tool or innovation is really just a vehicle for helping students understand a curriculum context. Level 2 teachers begin with an area of study already in mind and decide which maps will appropriately help students organize their planning of, thinking about, and representation of the content information. As with Level 1 teachers, assessment tends to be considered last in this process and is relegated to a collection of student work at the conclusion of the study. Parenthetically, with regard to the Thinking Maps implementation, Level 2 teachers moved from using maps in isolation or one per lesson to introducing a variety for students to select on their own for problem solving.

Level 3 teachers dramatize something very different. Here, teachers consider assessment first. They begin to develop essential and guiding questions and determine initially what skills they want students to

achieve and what methods of assessment to use. Level 3 teachers empower students by consulting with them about what they wish to learn about the unit prior to the instructional implementation. The experience with Thinking Maps at HSS demonstrates that Level 3 teachers do not pre-select maps for students but rather allow them to choose the ones they feel are appropriate when addressing academic tasks. In this fashion, Level 3 teachers initiate an outcome-based approach that is more student-centered.
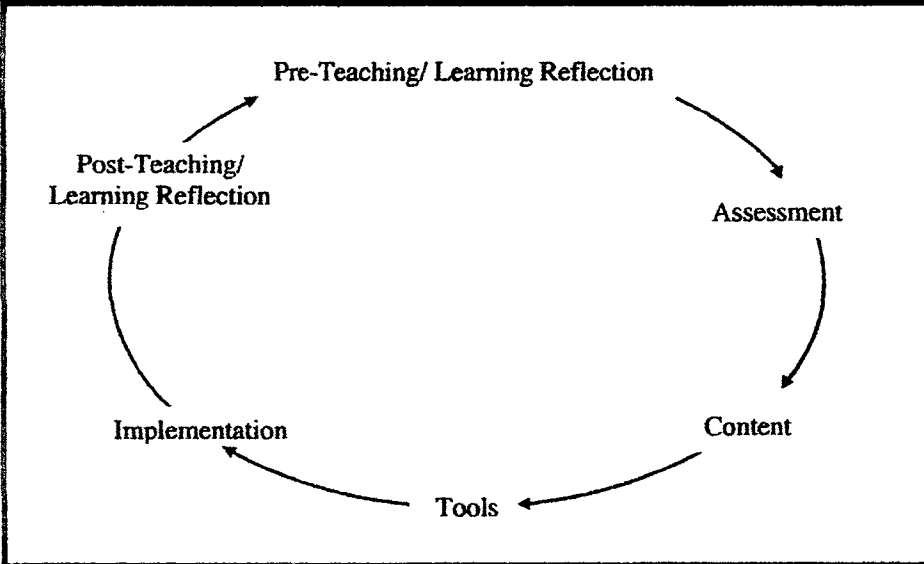
Finally, there are the Level 4 teachers. They proceed one stop further in instructional planning and arrive at a metacognitive stage by introducing a reflection process for students. For HSS teachers, reflection means becoming conscious about the instructional planning process first, then being intentional in developing outcomes (formative assessment), mediating learning in fundamentally new ways, evaluating growth (summative assessment), and subsequently recognizing student accomplishment.

Metacognitive Teaching and Learning

When teachers begin reflecting on their instructional process a number of provocative discoveries emerge. One of the most obvious and yet fascinating is acknowledging that no matter how differently teachers at the school teach and approach their subject matter, they all tend to share one instructional technique: namely, to require students sometime during the year to investigate a particular topic and subsequently either as a group member or as individuals present their findings to their classmates. Essentially, the students are expected to teach what they have learned.

When initially asked why they as a faculty almost unilaterally employed this practice, teachers were unable to provide an explanation. They were unaware that on some level of cognitive consciousness they all believed in the concept of teaching as vital to the learning process.

Figure 3. Level 5 Teachers

Pre-Teaching/ Learning Reflection

Post-Teaching/
Learning Reflection

Assessment

Implementation

Content

Tools

enhance the presentation of their learnings. In the Pre-Assessment Stage, students describe what thinking strategies they might use to solve problems and which methods would best organize their ideas and present information to their class. This level of instruction characterizes metacognitive teaching and learning and acknowledges a mutual and interactive relationship that represents the formation of a new kind of learning community in the classroom.

Prior to this faculty reflection, teachers never made the connection nor acknowledged the significance of this aspect of their instructional work. It was only subsequent to this discussion that teachers began to understand how they empowered students in the learning process by having them teach! As a result, a new teacher level emerged.

The circular flow map that describes Level 5 teachers (see Figure 3) resembles the recursive model offered by literacy advocates. It demonstrates how the reflection process connects the initial assessment identification with feedback from students on what they discovered when they actually thought about what they learned and what strategies were successful in their problem solving. For students, the reflection process consists of demonstrating either in written narrative or through a project how they applied their thinking strategies to other contexts.

In level 5, the focus of the lesson or unit of study is on teaching. Teachers and students reflect on ways in which students develop instructional skills to

Community Based Learning and Metacognition

This past year the faculty and administration at HSS asked themselves, if Thinking Maps represent the cognitive side of metacognition, what then, constitutes the meta or

Figure 4. Causes and Effects of Community Based Learning on Academic and Metacognitive Development

Academic Achievement
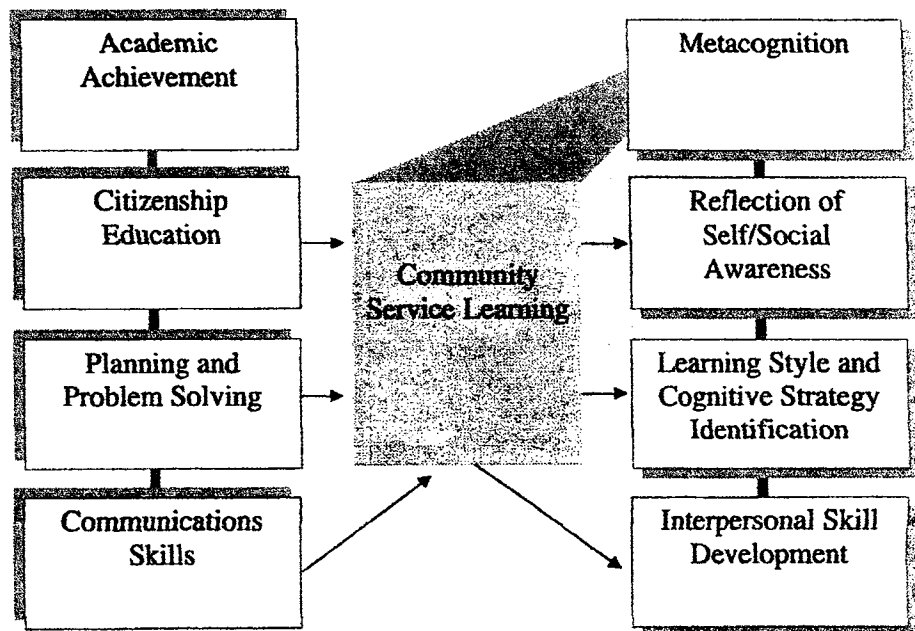
Citizenship Education

Planning and Problem Solving

Communications Skills

Community Service Learning

Metacognition

Reflection of Self/Social Awareness

Learning Style and Cognitive Strategy Identification

Interpersonal Skill Development

Figure 5. Instructional Design of CBL

| Planning | → | Preparation | → | Action | → | Reflection | → | Recognition |

experiential side? The answer: Community Based Learning (CBL).

CBL is comprised of five primary organizational components: planning (assessment/essential question); preparation (resonance with curriculum); action (implementation); reflection (evaluation); and recognition (social development). Figure 4, a Multi-Flow map, describes four essential academic goals. When applied in a CBL context, the metacognitive behaviors of self-reflection, cognitive style inventory, and social skill development often result. The map also provide a visual explanation of the relationships and interactive components that characterize a metacognitive school.

The subcategories under Academic Achievement refer to most state-mandated curriculum Framework outcomes for students. Citizenship education, the ability to plan and problem solve, and the development of appropriate communication skills span a variety of subject matter goals. CBL acknowledges that citizenship education is not learned in a vacuum, but rather is enhanced through social action, responsibility, and recognition. Experiential application of academic skills acquired from classroom instruction is fostered through school and local community partnerships. The metacognitive process of linking CBL and academic development is achieved as students learn to consciously reflect on their experiences in organized and intentional ways through journal notation, record keeping, self-assessment rubrics, and project presentations.

Proponents of CBL view their instructional design in linear fashion. In Figure 5, a Flow Map, each step evolves sequentially from one stage to the next.

Literacy advocates perceive the process of reflection as critical to the evaluation and subsequent planning stage of instruction. They propose a circular or recursive model, as in Figure 6.

With CBL and the literacy model, reflection is considered instrumental to the planning and teaching process. In both, the function of reflective thought is intentional and transformative. It is an attempt to consider a variety of experiences and interactions with instructional materials and activities to arrive at academic, intellectual, social, and emotional learning that is clear, coherent, settled, and harmonious (Dewey, 1933).

Interestingly, when the faculty began exploring CBL, Thinking Maps were used to help them better understand its essential features. Having considered a number of

articles regarding the standards of quality that describe school-based CBL programs, teachers generated this Bubble Map (see Figure 7).

Inherent in this rich description of quality standards for CBL are emerging ideas about morality, ethics, and social values. While the staff was sensitive to national, state, and local academic standards, a metacognitive process was also evident with statements about reflection, critical thinking, systemic and summative evaluation, and youth involvement in planning. In a sense, this map offers a view of the faculty's reflection about quality standards. This map represents an emerging perspective by the faculty, characterized by higher order thinking about the connection between the teaching and learning process.

Figure 6. Literacy Model of Instructional Planning

The Teaching and Learning Cycle

Assessment

Learning

Evaluation

Teaching

Planning
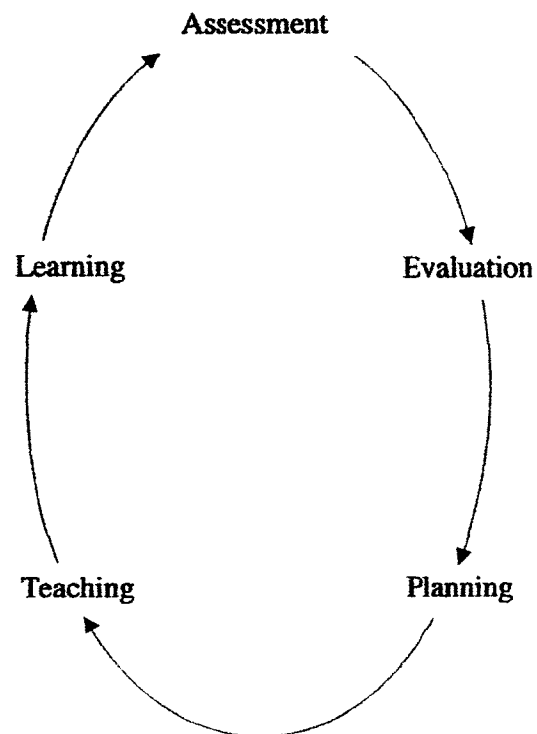
References

Costa, A. L. (1991), *The school as a home for the mind.* Palatine, IL: Skylight Publishing.

Costa, A. L. (1994). *Cognitive coaching: A foundation for renaissance schools.* Norwood, MA: Christopher-Gordon Publishers, Inc.

Demarest, E. (1998, April). High performance learning communities: A new vision for American schools. *The Policy Forum.*

Dewey, J. (1933). *Experience and education.* New York, NY: Collier Books.

Fontenault, D. & Salter, N. (1993). *Cast-a-spell manual.* E. Hampton, CT: Edu-Care.

Garmston, R., Linder, C., & Whitaker, J. (1993). Reflections on cognitive coaching. *Educational Leadership. 52* (2).

Hyerle, D. (1996). *Visual tools for constructing knowledge.* Alexandria, VA: ASCD.

Jansson, L. (1983). Mental training: Thinking rehearsal and its use. In Maxwell, W. (Ed.). *Thinking: The expanding frontier.* Philadelphia, PA: The Franklin Institute.

Jensen, E. (1998). *Teaching with the brain in mind.* Alexandria, VA: ASCD.

Stewart, D., Prebble, T., & Duncan, P., (1997). *The reflective Principal.* Katonah, NY: Richard C. Owen Publishers, Inc.

Yinger, R. J. (1977). A study of teacher planning: Description and theory development using ethnographic and information processing methods. Unpublished doctoral dissertation. East Lansing, MI: Michigan State University.