

Session 9

Thinking About Thinking: Metacognition

Developed by Linda Darling-Hammond, Kim Austin, Melissa Cheung, and Daisy Martin
With Contributions From Brigid Barron, Annmarie Palincsar, and Lee Shulman
Stanford University School of Education

I. Key Questions and Learning Objectives

Key Questions

- How can people learn by reflecting on what they know and do?
- How can teachers help students think about their own thinking?

Learning Objectives

- **Defining metacognition**—Teachers will understand what metacognition is and how it improves learning. They will become familiar with two aspects of metacognition: reflection and self-regulation.
- **Developing metacognitive skills**—Teachers will understand what it means to develop a culture of metacognition in the classroom. Teachers will become familiar with strategies for helping students regulate, monitor, and guide their learning.

II. Session Overview

Often we hear that one of the most important tasks of education is to teach students how to learn on their own throughout their lifetimes. But how do we learn how to learn? How do we know what we've learned and how to direct our own future learning? These are all questions addressed by the concept of metacognition. Simply put, metacognition means "thinking about one's own thinking." There are two aspects of metacognition: 1) reflection—thinking about *what* we know; and 2) self-regulation—managing *how* we go about learning. Taken together, these processes make up an important aspect of learning and development. Developing these metacognitive abilities is not simply about becoming reflective learners, but about acquiring specific learning strategies as well.

Research has shown that one of the key traits good problem-solvers possess is highly developed metacognitive skills. They know how to recognize flaws or gaps in their own thinking, articulate their thought processes, and revise their efforts (Brown, Bransford, Ferrara, & Campione, 1983). As adults, we actively engage in these skills in our everyday thinking. We decide what method to use to solve a problem or when to ask for help. We use metacognitive skills to help us decide which elements we understand and which we do not understand. In short, we direct our own learning. Students and novices often lack these skills or fail to recognize when to use them (Flavell & Wellman, 1977). As educators, it is important for us to help foster the development of metacognitive skills in students. These are skills that will help students learn how to learn.

Sometimes people use the phrase "going meta" when talking about metacognition, referring to the process of stepping back to see what you are doing, as if you were someone else observing it. "Going meta" means becoming an audience for your own performance—in this case, your own intellectual performance. When a person is learning to play golf, for example, seeing a videotape of her own swing can help her to understand what she is doing well and what she is doing poorly. Typically, we do not know what we are doing when we do it, but it is very hard to improve a process that we are engaged in if we do not have a sense of what we are doing in the moment. Even a skilled professional ballet dancer relies on mirrors to help him understand what he looks like and what he is doing as he dances. He has to be able to see his performance as others might see it before he can begin to improve it. The ability to view our own performance is particularly useful when we learn physical skills. However, cognitive work is often invisible and cannot be directly observed.

How do we help students become thoughtful about their own performance as they are learning to reason about mathematics and history? The challenge is helping students learn how to "go meta" in regard to thought processes that are not directly visible in order to improve their cognitive performances. Teachers must create the classroom equivalent of the mirror on the dance studio wall or the videotape of the golf swing.

If one aim of schooling is to prepare children to be lifelong learners, then it is important to help students become aware of themselves as learners and to take control of their own activities. Metacognition and self-regulation play a number of roles in all of the theories discussed in this course. [See, in particular, Session 7, Learning in a Social Context, Session 8, Cognitive Apprenticeship, Session 10, The Structure of the Disciplines, and Session 11, Learning and Transfer.] In this session, we first provide background on metacognitive research and then explain how reflection and self-regulation influence learning. We define metacognition and its significance in teaching students and then explore how teachers can develop a culture of metacognition in the classroom.

Early Ideas About Metacognition

Although the word *metacognition* did not come into common use until the 1970s when it was introduced by psychologist John Flavell, the notion of reflecting about one's thinking can be found in writings dating back to Plato, who emphasized the importance of reflecting through dialogue. John Dewey, often considered the father of progressive education, viewed reflection as a central part of active learning. Dewey observed:

As long as our activity glides smoothly along from one thing to another ... there is no call for reflection. Difficulty or obstruction in the way of reaching a belief brings us, however, to a pause. In the suspense of uncertainty, we metaphorically climb a tree; we try to find some standpoint from which we may survey additional facts and, getting a more commanding view of the situation, decide how the facts stand related to one another (Dewey, 1933, p. 14).

II. Session Overview, cont'd.

Both Jean Piaget and Lev Vygotsky described the role of metacognition in cognitive development. In his research with seven- to eleven-year-olds, Piaget demonstrated children's ability to verbalize the processes they used in completing a task and the ways in which they were aware of their thinking. He called this awareness "consciousness of cognizance," which maps closely to our notion of metacognition. Vygotsky further explored these ideas in his research about the child's "inner voice," or the process of verbalizing internal thoughts as a way to make sense of something. Articulating internal thoughts out loud not only helps a student learn, but can demonstrate an awareness of the learning process—both important aspects of metacognition as we define it today.

Development of Metacognitive Strategies in Children

Part of developing cognitively is learning how to be aware of one's thinking and direct it consciously and strategically toward desired ends. Metacognitive strategies help us become more efficient and powerful in our learning because they help us to find information, evaluate when we need additional resources, and understand when to apply different approaches to problems. When children begin to master these strategies—and learn when, how, and why to use them—they are able to learn more effectively and intentionally (Brown, 1997). These strategies grow increasingly flexible and useful the more they are used and understood. How and when do these strategies develop?

Research suggests that metacognitive capabilities develop over time and depend upon a knowledge base (Brown & DeLoache, 1978). Without knowledge of the domain of mathematics, for instance, young children would have difficulty directing their thinking about how to solve a mathematical word problem. Young children build their knowledge base through concrete experiences with physical materials that they manipulate. When language is used to describe their experiences ("Oh look, you have *two* stones. Now you have *three!*") children develop concepts that, with feedback and instruction, aggregate into more systematic knowledge. In areas in which children do have a knowledge base, they are quite capable of regulating their thinking in a variety of ways.

Before they learn metacognitive strategies, children do not use tactics like planning their work or monitoring their own problem solving. They do not realize that they can use strategies and short-cuts to help them solve problems. This is not to say that young children do not have metacognitive capabilities. A classic research example involves three-year-olds who were asked to remember which cup a toy was placed under. Children were able to spontaneously use a number of strategies, like placing a hand on the cup, or moving the cups around to help them remember the location. They were able to use strategies to help them think and remember, evidence that even very young children can be purposeful in their activity (Wellman, Ritter, & Flavell, 1975).

The more children learn about general strategies for learning in specific contexts, the better they become at using them across domains. As John Bransford and colleagues observe, "The broader the range of strategies that children know and can appreciate where they apply, the more precisely they can shape their approaches to the demands of a particular circumstance" (Bransford, Brown, & Cocking, 2000, p. 100). [See Session 11, Learning and Transfer.]

Thinking About Thinking

Metacognition is most commonly broken down into two distinct but interrelated areas. John Flavell, one of the first researchers in metacognition and memory, defined these two areas as *metacognitive knowledge*—awareness of one's thinking—and *metacognitive regulation*—the ability to manage one's own thinking processes. These two components are used together to inform learning theory.

II. Session Overview, cont'd.

Metacognitive Knowledge—Reflecting on What We Know

Students have thoughts, notions, and intuitions about their own knowledge and thinking. Flavell (1979) describes three kinds of metacognitive knowledge:

- Awareness of knowledge—understanding what one knows, what one does not know, and what one wants to know. (“I know that I understand that plants need sunlight but I do not know why.”) This category may also include an awareness of others’ knowledge. (“I know that Sarah understands long division, so I’ll ask her to explain this problem to me.”)
- Awareness of thinking—understanding cognitive tasks and the nature of what is required to complete them. (“I know that reading this newspaper article will be easier for me than reading my textbook.”)
- Awareness of thinking strategies—understanding approaches to directing learning. (“I am having difficulty reading this article. I should summarize what I just read before going on.”)

We know that children are not initially very accurate or efficient at describing what they know, but as they get older their skills improve, especially if they have been taught and have had practice in how to think about and discuss their own thinking (Brown et al., 1983). Children can be guided to develop an understanding of what they know and do not know. Teachers can also help students develop an appreciation for what learning tasks might demand, as well as an awareness of the particular knowledge and strategies they can bring to these tasks. In Kendra Hearn’s 12th-grade writing class in this session’s video, for example, students use mind maps to organize their thinking before writing an essay. Ms. Hearn’s students also articulate their ideas and peer review each other’s writing before revising their essays.

Students can be encouraged to develop a sense of their own knowledge by asking questions such as, “What do I know? What don’t I know? What do I need to know?” Teachers can help students to reflect on what they know and what they want to know as they embark on the study of a new topic. Students can reflect again on what they know as they conclude a lesson or unit. During the course of their work, teachers can encourage a reflective stance toward learning that helps students assess and direct their own emerging understandings. It is not only the teacher’s job, but also the students’ responsibility to assess and direct their own learning. By asking students to consider what they might do to learn something they want to know—and then providing a range of resources for them to pursue it (materials, peers, and information)—teachers can help students learn how to learn with greater independence. Students can play an increasingly active role in monitoring what they know and don’t know—and how they can find out what they need to know—to further their own learning (Mayer & Wittrock, 1996; Schoenfeld, 1987).

Students can also be prompted to ask more general questions about a task or problem that help them become aware of their existing resources and needs. Reflective questions can help students become aware of what they can do and make connections to the tasks at hand. A student might reflect on her work and conclude, “I understand what I want to say in my essay, but I’m having trouble figuring out how to get into it,” or “I have lots of ideas about ways to test my hypothesis, but I don’t know how I’ll know if I’ve proved or disproved it.” Identifying the challenging aspects of complex cognitive tasks can help students narrow down what they need as they seek assistance. Similarly, identifying their own knowledge can help students become a source of assistance for others. This process of being aware of one’s own knowledge state is called self-monitoring.

Teachers can help their students learn how to ask self-monitoring questions as they are learning. These questions might differ depending on the developmental level of the learner. For very young children, the focus of the question might serve to self-test. For instance, while they are reading a story, young students might be encouraged to ask, “Do I know who this character is, what problem he is trying to solve, or the sequence of events in this story?” As students enter the middle grades, the nature of the questions increasingly shifts to “What inferences can I draw?” “What is the meaning of this symbol in the story?” or “What is the relevance of this information to a problem that I’m trying to solve?” High school teachers might encourage their students to evaluate the stand an author is taking: “What is the author’s perspective?” “Is the author’s evidence sufficient to support the stand that he has taken?”

II. Session Overview, cont'd.

One common approach to developing metacognitive skills involves teaching study strategies that ask students to think about the way they learn best. Students must learn to become aware of their capabilities, strengths, and weakness as learners in order to develop as learners. Questions that explicitly help students think about, “How do I study best?” or “What kinds of tools help me learn?” all engage metacognitive knowledge. This can range from information that helps students assess their own abilities and intelligences [see Session 4, Multiple Intelligences] to reflections on specific learning processes students tend to use in different situations. With such an awareness, a student might say, “I am having trouble understanding what this textbook is saying, but I know I understand things better when I make flow charts. Let me see if I can chart the process of photosynthesis for myself.” This awareness involves metacognitive skills.

Metacognitive Regulation—Directing Our Learning

When a student has information about her thinking (metacognitive knowledge), she is able to use this information to direct or regulate her learning. This kind of metacognition is also referred to as “executive control.” Just as a business executive manages and oversees activities in a company, executive control can be thought of as managing and overseeing one’s own thinking. Metacognitive regulation involves the ability to think strategically and to problem-solve, plan, set goals, organize ideas, and evaluate what is known and not known. It also involves the ability to teach to others and make the thinking process visible.

Ann Brown and her colleagues (1983) describe three ways we direct our own learning:

- Planning approaches to tasks—identifying the problem, choosing strategies, organizing our thoughts, and predicting outcomes;
- Monitoring activities during learning—testing, revising, and evaluating the effectiveness of our strategies; and
- Checking outcomes—evaluating the outcomes against specific criteria of efficiency and effectiveness.

Learning how to be mindful of one’s process and how to think strategically about a task can make problem-solving more efficient. The strategic essay writer knows how to plan his central thesis and supporting points, rather than simply writing thoughts in a stream-of-consciousness, just as the strategic mathematics student is able to step back and consider different approaches to a problem, rather than trying all the possible numbers that might give a correct answer. Such learners are accustomed to monitoring their work as they are working, “Am I making my points clear and understandable?” “Am I getting closer to a solution or farther away?” They also look back on their work to evaluate their own success, “Have I convinced my reader?” “Does this solution make sense?” Learning how to monitor one’s own thinking process can enable the learner to self-correct, rather than always relying on others to be the audience and sounding board for one’s work.

Teachers can also help students become better at selecting strategies. They can help students ask and answer questions such as “How can I keep track of what I know?” or “How do I decide which paths to go down?” and “How long should I try this approach?” “When should I switch to another strategy?” or “What should I try next?” All of these questions help students explore new subject areas, and assist them in transferring what they know from one problem to the next (Bransford et al., 2000).

Good metacognitive thinkers are also good intentional learners. That is, they are able to direct their learning in the proper ways to build understanding. They know when to use strategies and how to use them (Bereiter & Scardamalia, 1989). They are able to redirect the normal frustration that occurs when things are confusing or are not initially productive into further learning and research strategies. Teachers can help students become intentional learners by helping them manage uncertainty, redirect their efforts productively, and persevere when they get frustrated. Teachers can do this by modeling and discussing aloud their thinking process when they themselves approach uncertain tasks (“I am thinking I could try this approach or that approach. Let’s see what happens if I try this one”), as well as what they do when they hit a snag or dead end. They can also monitor students as they work to catch them at points when they need encouragement or are becoming frustrated and need a new strategy. The ability to work strategically can be taught and must be learned if students are to succeed at being self-directed learners throughout their lives.

II. Session Overview, cont'd.

A Culture of Metacognition in the Classroom

A number of conditions support a metacognitive classroom environment. Learning environments that are knowledge-centered and learner-centered, and that take into account the role of assessment in learning, lay the foundation for a reflective classroom (Bransford et al., 2000). “Knowledge-centered” classrooms focus on meaningful, powerful, nontrivial activities. When students are asked to engage in activities that build on their previous knowledge, challenge them with complex tasks, and require active sense-making, they are more likely to see the utility of being reflective and strategic learners. In such classrooms, students need access to procedural knowledge—*How* are you going to do this and be successful?—as well as conditional knowledge—*When* is this going to be useful to you?

“Learner-centered” classrooms take into account students’ current knowledge, skills, attitudes, and beliefs:

If teaching is conceived as constructing a bridge between the subject matter and the student, learner-centered teachers keep a constant eye on both ends of the bridge. The teachers attempt to get a sense of what students know and can do as well as their interests and passions—what each student knows, cares about, is able to do, and wants to do (Bransford et al., 2000, p. 136).

Metacognitive activities that ask students to reflect on what they know, care about, and are able to do not only help learners develop an awareness of themselves, but also give learner-centered teachers valuable information for their instruction.

It is important for teachers to give students opportunities to reflect on their learning because it is often difficult for them realize what they are doing both when they succeed and when they fail. If a person hits a golf ball and he sees the ball has landed two feet to the left of the tee, he has good evidence that there was something wrong with his swing. But he still needs some way of analyzing and looking at his swing, or he will not learn how to hit the ball so that it goes 200 yards and straight down the middle. Similarly, if a student writes two essays and gets an “A” on one of them and a “C” on the other, he might not understand what he did on the “A” essay that was different from the “C” essay. Thus, it is important for the teacher to assist the student in reflecting on his own performance. Without this assistance, he will not know how to improve. Metacognition involves taking what we learn in one situation and transforming it into a level of understanding that is much more likely to transfer to another situation.

Developing a culture of metacognition in the classroom—where students are encouraged to develop this kind of awareness—begins with making the purpose of learning activities and the goals for performance clear to students. Most of us would not leave for a trip without having some sense of our destination. Our destination affects how we prepare, what we pack, and the kind of experience we want to have. However, in schools, it is often more apparent to the teacher than to her students why they are learning something. A teacher can encourage students to “go meta” in their learning by informing her students what the journey is about, why they are taking this journey, what she expects of them, and what tools they will need to help them get there successfully and enjoy the experience.

Assessment based on clear standards and criteria is critical to this process. Formative assessment—opportunities for immediate feedback in the midst of an activity—is one way to help students learn from their learning. Students as well as teachers can provide such feedback. As students engage in activities and projects that require metacognitive thinking, they need frequent feedback about whether or not their thinking is effective and useful to their learning. Self assessment, peer assessment, and teacher assessment using rubrics that describe the essential elements of a strong performance can give students concrete and specific information about their work, which helps them further direct their own learning and deepen their understanding (Brown et al., 1983).

II. Session Overview, cont'd.

Self-assessments serve multiple purposes. Not only do they give students practice in reflecting on their own work, they also help teachers learn about how to help their students. As a teacher listens to his students' thinking about how they are learning and where they are struggling, the teacher has the opportunity to think critically about how to improve his own teaching so as to support the students' immediate needs. Brigid Barron and her colleagues observe:

An emphasis on self-assessment helps students to develop the ability to monitor their own understanding and to find resources to deepen it when necessary Learners get opportunities to test their mettle, to see how they are doing and to revise their learning process as necessary. Without these assessment opportunities, the quality of learning can be disappointing—yet, [too often] this is not discovered until the end of the project when it is too late to change and revise the process (Barron, Schwartz, Vye, Moore, Petrosino, Zech, & Bransford, 1998, p. 284).

Metacognitive learning is supported by a culture that encourages and recognizes the importance of revision. When students are given feedback with the purpose of redirecting and revising their work—rather than simply to assign a grade—they have the opportunity to revisit their work with a greater understanding. When a teacher provides clear expectations in terms of how she evaluates student work and provides models and examples that give students a sense of the goals they are striving for, students are empowered to take on more responsibility and ownership in their learning. The key to high-quality work is no longer a mystery; expectations and goals are clear. Students are also more motivated to succeed when they can see concrete pathways to improvement. [See Session 12, Motivation and Learning.]

Many of the metacognitive skills described here are used when working with others. When students collaborate and interact with one another, they must regulate the ways they explain what they know and also be aware of their classmates' knowledge. Students must ask such questions as, "What do you know that I don't know?" or "How can I explain what I know to you so you will understand?" Classroom activities that encourage such exchanges, like group discussions, group problem-solving, or reciprocal teaching, can provide opportunities for making internal thoughts external and building metacognitive awareness. [See Session 7, Learning in a Social Context.]

Strategies for Learning

Teachers who are developing metacognitive skills in the classroom help students incorporate active reflection in their learning. They model and scaffold the processes of reflection, questioning, evaluating, and other thinking strategies that may not come naturally. The strategies below include opportunities to reflect on learning and to learn to *regulate* or direct one's work:

- *Predicting outcomes*—Most often seen in mathematics or science classes, predicting helps students understand what kinds of information they might need to successfully solve a problem. Prediction also helps students compare their initial thoughts with the final outcomes of a problem or experiment.
- *Evaluating work*—Students review their work and determine where the strengths and weaknesses are in their work and their thinking.
- *Questioning by the teacher*—The teacher asks students as they work. "What are you doing now? Why are you doing it? How does it help you?" (Schoenfeld, 1987).
- *Self-assessing*—Students reflect on their learning and determine how well they have learned something or how their skills have developed.
- *Self-questioning*—Commonly taught for use in reading tasks, but also useful in writing and problem-solving of all kinds, students use questions to check their own knowledge as they are learning. When students learn to ask questions (of themselves or of others) while they work, they intentionally direct their thinking and clarify the areas where they need assistance.

II. Session Overview, cont'd.

- *Selecting strategies*—Students decide which strategies are useful for a given task. Strategy selection may depend on understanding one's own learning style and strengths as well as understanding the features of a problem.
- *Using directed or selective thinking*—Students choose consciously to follow a specific line of thinking or structured approach in order to find an answer.
- *Using discourse*—Students discuss ideas with each other and their teacher. This process makes thinking more concrete and helps students learn to ask questions, identify gaps in their own knowledge, and learn from others' thoughts and ideas.
- *Critiquing*—Students provide feedback to other students about their work in a constructive way. This process allows students giving feedback to practice verbalizing their own thinking and students receiving feedback to improve their own thinking process and performance.
- *Revising*—Students return to their work after receiving feedback. This opportunity allows students to update their thinking and check their use of learning strategies.

Classroom activities that call on these metacognitive strategies take many forms and vary depending on the topic. Generally, however, activities like journaling (where students keep a journal in which they reflect on what they understand, what they are learning, and what they do not understand); process reflection (where students reflect on their process of learning, including what worked and what did not work for them); or self-assessment (where students assess their own work against standards or criteria for quality) are all ways of activating metacognitive skills. They all require that students consider their own thinking and how they acquired their knowledge. In Kathleen Hayes-Parvin's sixth-grade language arts class in this session's video, for example, students engage in reciprocal teaching. They teach preservice teachers at the University of Michigan how to create a reading and writing workshop, which uses a number of these strategies. Teaching others helps Ms. Hayes-Parvin's students reflect on their own learning process.

Teachers can model thinking strategies by reflecting on their own processes as learners. They can make transparent for students the processes they themselves use and can ask students to display and discuss their own learning strategies for the class. For example, by demonstrating on a screen how to examine a microbe under a microscope and by talking aloud about his process, a biology teacher can make visible processes that would not be obvious from observation alone. Similarly, by asking lab teams to brief the class on their processes and findings, students can get access to many different approaches, which can provide different "hooks" into the material. [See Session 8, Cognitive Apprenticeship.]

It is also important for teachers to reflect on their own teaching with their students and with other teachers. Modeling reflective processes such as thinking aloud about strategic decisions ("Should we move on to the next topic, or have we not yet fully explored this one?"); evaluating one's own work ("How well did I structure those groups?"); and making underlying thoughts visible ("Here's how I thought about grading these papers.") contributes to a climate of "going meta" on everyday tasks.

Conclusion

Activities that encourage a reflective and strategic stance toward learning should be embedded in the regular activities of a classroom. Too often, such reflective activities are an add-on or afterthought, which takes away from the power of ongoing reflection, evaluation, and revision, and being strategic about our work. When teachers make aspects of learning and problem-solving visible, and help students identify their own strengths and strategies, they can have a lasting impact on how their students learn once they leave their classrooms.

III. Additional Session Reading

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). Learning: From speculation to science, Learning and transfer, and How children learn (Chapter 1, see selected pages 18-19; Chapter 3, see selected pages 67-68; and Chapter 4, see selected pages 95-101). In *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press. [Online]. Available: <http://books.nap.edu/html/howpeople1>.

IV. Session Activities

Getting Started

Answer the following question in a free-write, pair-share, or small-group discussion.

1. Think of a time when you asked your students to assess their own learning or reflect on their work.
 - How did you structure this activity?
 - What difficulties and challenges did you face in trying to make this happen in your classroom?
 - What benefits did you experience by using this activity?
 - How successful was this activity?
 - How do you know?

To the Facilitator: These activities can be used as session warm-ups or as activities that occur after video viewing.

Discussion of Session Readings

To the Facilitator: You may want to select questions from the Other Learning Activities and Assessments section to launch a discussion of the session readings. The questions used for the Checking for Understanding activities may be a particularly helpful resource.

Session Video

Metacognition is thinking about your own thinking. It is what we do when we manage and monitor our work by asking ourselves questions like, "How well am I doing? What do I need to do next? What else do I need to learn in order to achieve my goal?" This session's video features teachers helping their students to learn and practice metacognitive strategies.

IV. Session Activities, cont'd.

Background on Teachers

Kendra Hearn was teaching 12th-grade English at West Bloomfield High School, Michigan at the time this program was taped. She has seven years of teaching experience. She holds a master's degree in education administration from the University of Detroit, Mercy. Ms. Hearn holds a bachelor's degree in English from the University of Michigan, Ann Arbor and is studying metacognitive theory and applications as part of her doctoral studies in curriculum and instruction at Wayne State University. She is certified by the National Board for Professional Teaching Standards in English language arts. Ms. Hearn is now a professional development consultant with the Macomb Intermediate School District.

The first video segment features Ms. Hearn teaching English composition to seniors. She helps her students develop their thinking through writing. To help them become conscious writers, Ms. Hearn teaches them strategies for observing their own thoughts using journals, reading reflections, and mind maps, among her many tools. She also encourages them to assess their own work and their peers' work using standards and rubrics that allow them to analyze their writing. Ms. Hearn serves as both a model and a coach for her students as they learn to think metacognitively.

Kathleen Hayes-Parvin teaches sixth-grade language arts and social studies at Birney Middle School in Southfield, Michigan. She has been teaching for 12 years. She received her master's degree in special education, with an emphasis in learning disabilities, and her bachelor's degree in English, both from Marygrove College. Ms. Hayes-Parvin is contributing author of *Trends and Issues in Elementary Language Arts* (2000) published by the National Council of Teachers of English. She is also a writing project teacher consultant for the National Writing Project Network.

In the second video segment, Ms. Hayes-Parvin helps her students reflect on their learning by having them teach their strategies to someone else. In this segment, her students are helping a class of student teachers learn how to teach middle school English. The video shows students preparing and presenting their thoughts to the student teachers and their instructor.

Discussion of Session Video

To the Facilitator: You may want to pause the tape at the following points to discuss these questions. If you are watching a real-time broadcast on the Annenberg/CPB Channel, you may want to consider the questions as you watch and discuss some of them afterward.

1. Choosing Strategies (Kendra Hearn)

Video Cue: *The Learning Classroom* icon fades out at approximately 7:00 into the program.

Audio Cue: Ms. Hearn says, "And then use what you got in terms of the thinking about this essay to decide where you would think it would fall on the rubric, okay? So have a debate; come to a consensus; use what you wrote on your notes."

- What are some of the strategies you noticed Ms. Hearn using to teach about thinking strategies in her classroom?
- What kinds of metacognitive strategies are most important in your subject matter?
- What kinds of questions do students need to ask themselves as they are doing the work of your subject matter?
- How could you teach students about these strategies and when to use them in your curriculum?

IV. Session Activities, cont'd.

2. Using a Rubric (Kendra Hearn)

Video Cue: *The Learning Classroom* icon fades out at approximately 11:00 into the program.

Audio Cue: Ms. Hearn says, "There are no secrets about the standard. So when they get their grades back, they fully understand and they're able to often again through self-assessment articulate where their writing falls along the guidelines of that particular rubric. So, the rubric becomes a cornerstone for that thinking about their thinking on those particular writing exercises."

- What do you think may be useful about the way Ms. Hearn uses rubrics in her classroom?
 - How might these uses of a rubric encourage metacognition?
- What benefits and challenges do you perceive in using rubrics in the classroom?

3. Creating Mind Maps (Kendra Hearn)

Video Cue: *The Learning Classroom* icon fades out at approximately 16:00 into the program.

Audio Cue: Ms. Hearn says, "Sara's one who, when I introduced mind mapping to the class was extremely resistant. And the spectacular thing about her is that she's gone beyond, and she's accomplished a whole lot more than she expected. And I think she's a fabulous example of how these strategies have worked."

- How do you think mind maps might help students think about their thinking?
- Have you ever seen or used other strategies that also do this?
- Are there other purposes such strategies might serve?
- For your subject, what are some similar strategies for laying out one's thinking?

4. Going Meta (Kathleen Hayes-Parvin)

Video Cue: *The Learning Classroom* icon fades out at approximately 21:45 into the program.

Audio Cue: Lee Shulman, President of the Carnegie Foundation for the Advancement of Teaching, says, "And I think the heart of it is creating opportunities to step back, and analyze and reflect on your own practice. I mean it's no accident, that when we prepare people to do very complex and important kinds of skills, we create opportunities for reflection."

- What are some of the ways the students in Ms. Hayes-Parvin's classroom are reflecting on their own practice?
- How might reflection help us to use our learning "again and again," as Shulman suggests?

5. Reciprocal Teaching (Kathleen Hayes-Parvin)

Video Cue: *The Learning Classroom* icon fades out at approximately 25:00 into the program.

Audio Cue: Ms. Hayes-Parvin says, "In this environment, they're teaching every day. They're teaching each other and the teaching and learning is a two-way street."

- In what ways does teaching others require reflecting on your own thinking process?
- How do you think these students are benefiting from teaching teachers about their language arts classroom?
- How do you think these teachers are benefiting?
- Can you imagine an authentic purpose you could use to motivate learning and reflection in your classroom?

V. Other Learning Activities and Assessments

To the Facilitator: These activities and assessments are for you to choose from according to your group's needs and interests. Many of the activities offered here would work equally well as assignments both inside and outside of class. You may want to use class time to prepare for and/or reflect on any activities assigned as homework.

Applications

1. Journal

Why do you think revision and self- and peer assessment encourage student metacognition? Consider when you might use revision and self- and peer assessment in your current teaching context. How might you incorporate them into an upcoming unit?

If you already use them, discuss how, and the disadvantages and advantages.

2. Field Assignments

Describe and analyze a learning environment using a concept central to learning theory. Observe a classroom in which students are being taught to use metacognitive strategies. Describe and analyze how students are learning to be metacognitive within that environment.

Use the following questions as guides, but feel free to write about other things that you see as relevant and important to this description.

- How do teachers and/or students make the purposes of learning explicit?
- What kinds of teacher and student questions support the development of student metacognition?
- How is the *process* of learning valued in the classroom as well as the products of learning?
- What strategies does the teacher use to encourage and support students to think about their own thinking?
 - What kinds of opportunities do participants have to exchange and think about ideas?
- What kinds of feedback happen in the classroom?
 - What kinds of opportunities do students have to incorporate feedback into their work and revise it accordingly?

Use specific evidence from your observations to support your description and analysis.

3. Create an Action Plan

Pick two strategies you will use in your classroom to develop your students' thinking about their thinking. Pick one of these and write about it, answering the following questions:

- What is your goal in using this strategy?
- When and how will you use this strategy in an upcoming unit?
- How will you know when students are internalizing the ways of thinking you wish them to master?
- What might be some next steps after you use this strategy?

V. Other Learning Activities and Assessments, cont'd.

4. Thinking About Your Thinking

How does metacognition fit together with other learning theories and principles? Consider connections to ideas in the units on learning in a social context, cognitive apprenticeship, multiple intelligences, and emotion and learning. Represent the connection metacognition has to other learning principles in some fashion (e.g., an essay, concept or mind map, diagram, or a combination of formats). “Go meta” about your own learning in this course and make a representation of how you see the different theories and ideas interacting and connecting.

- What do you know about how to teach to encourage student learning?
- What do you still want to know?
- What have you learned?

Checking for Understanding

1. Short-Answer Questions

- a. Explain the two aspects of metacognition: metacognitive knowledge and metacognitive regulation. Why is each important for learners?
- b. List three teaching strategies that encourage metacognition. Briefly explain why these strategies affect metacognition.

2. Essay Questions

- a. How do the metacognitive skills of expert thinkers in a field differ from those of novices in the same field? Pick a topic/subject with which you are familiar to illustrate how an expert thinker might use metacognitive strategies in ways that a novice learner might not.
- b. How can you use your metacognitive skills to monitor and develop your own thinking as teacher? What strategies for reflection and self-regulation might you use to problem-solve and manage dilemmas in your classroom? How will you know if these strategies work?
- c. What do you now understand about metacognition? What don't you understand? What would you like to know? How might you learn what you'd like to know?

V. Other Learning Activities and Assessments, cont'd.

Long-Term Assignments

Curriculum Case Study

Consider your case study learning problem from a metacognitive perspective. (Note: If your curriculum case is on a unit you plan to teach in the future, answer in the form of what you project for that unit. You may have to anticipate some of your students' reactions.)

- What kinds of thinking did your curriculum unit require?
- How did you encourage your students' thinking about their thinking?
- Did you include ways for students to regulate and monitor their own learning in your plans? For example, were students asked to articulate their learning process and what they had learned?
- Did students share strategies and solutions with each other?
- Did students have opportunities for revision and for self- or peer assessment?
- What aspects of the unfolding events increased or decreased the opportunity for students to reflect on and regulate their learning in this learning event?
 - How do you think this may have influenced what occurred?

To the Facilitator: You will find other learning activities on the course Web site at www.learner.org/channel/courses/learning-classroom. You will want to look ahead to assign learners the reading and any homework for the next session.

VI. Web Sites and Organizations

Learning To Learn: Metacognition: <http://snow.utoronto.ca/Learn2/mod2/index.html>

This module about metacognition is part of a course about learning developed in collaboration with the Center for Academic and Adaptive Technology at the University of Toronto. This course is designed for educators, particularly those working with learning-disabled students.

Metacognition/H.O.T.S.: <http://www.nvo.com/ecnewsletter/metacognitionhots/>

This Web site is a collection of links about metacognition and higher-order thinking skills gathered by the Education & Computer Connection.

Project BETTER: Building Effective Teaching Through Educational Research:

http://www.mdk12.org/practices/good_instruction/projectbetter/

The Project BETTER series, developed by the Maryland State Department of Education, summarizes current research on effective instruction to assist teachers in expanding and refining their repertoire of teaching strategies and to guide instructional planning and decision-making. [See entries about metacognition under Science, English, Information Literacy, and Thinking & Learning.]

VII. References and Recommended Readings

Note that recommended readings are marked with an asterisk ().*

- Barron, B., Schwartz, D. L., Vye, N., Moore, A., Petrosino, A., Zech, L., & Bransford, J. (1998). Doing with understanding: Lessons from research on problem- and project-based learning. *The Journal of the Learning Sciences*, 7(3-4), 271-311.
- Bereiter, C., & Scardamalia, M. (1989) Intentional learning as a goal of instruction. In L. B. Resnick (Ed.), *Knowing and learning and instruction* (pp. 361-392). Cambridge, Eng. & New York: Cambridge University Press.
- *Biemiller, A., & Meichenbaum, D. (1992, October). The nature and nurture of the self-directed learner. *Educational Leadership*, 50(2) 75-80.
- Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.
- *Brown, A. L. (1997, April). Transforming schools into communities of thinking and learning about serious matters. *American Psychologist*, 52(4), 399-413.
- Brown, A. L., Bransford, J. D., Ferrara, R. A., & Campione, J. C. (1983). Learning, remembering, and understanding. In J. H. Flavell & E. M. Markman (Eds.), *Handbook of child psychology, Vol. 3 Cognitive development (4th ed.)* (pp. 78-166). New York: Wiley.
- *Brown, A. L., & Campione, J. (1997). Guided discovery in a community of learners. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practices* (pp. 229-270). Cambridge, MA: MIT Press.
- *Brown, A. L., & Campione, J. (1998). Designing a community of young learners: Theoretical and practical lessons. In N. M. Lambert & B. L. McCombs (Eds.), *How students learn: Reforming schools through learner-centered education* (pp. 153-186). Washington, DC: American Psychological Association.
- Brown, A. L., & DeLoache, J. S. (1978). Skills, plans, and self-regulation (pp. 3-36). In R. S. Siegler (Ed.), *Children's thinking: What develops?* Hillsdale, NJ: Lawrence Erlbaum.
- Dewey, J. (1933) *How we think*. Boston: Heath.
- Flavell, J. H. (1979) Metacognition and cognitive monitoring: A new area of cognitive-development inquiry. *American Psychologist*, 34, 906-911.
- Flavell, J. H., & Wellman, H. M. (1977). Metamemory. In V. Kail & J. W. Hagen (Eds.), *Perspectives on the development of memory and cognition* (pp. 3-33). Hillsdale, NJ: Lawrence Erlbaum.
- Mayer, R. E. & Wittrock, M. C. 1996). Problem solving transfer. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 47-62). New York: Macmillan.
- Schoenfeld, A. H. (1987). What's all the fuss about metacognition?. In A. H. Schoenfeld (Ed.), *Cognitive science and mathematics education* (pp. 189-215). Hillsdale, NJ: Lawrence Erlbaum.
- Wellman, H. M., Ritter, K., & Flavell, J. H. (1975). Deliberate memory behavior in the delayed reactions of very young children. *Developmental Psychology*, 43, 377-375.

Notes
