

Metacognitive Processes

Metacognition is one's ability to use prior knowledge to plan a strategy for approaching a learning task, take necessary steps to problem solve, reflect on and evaluate results, and modify one's approach as needed. It helps learners choose the right cognitive tool for the task and plays a critical role in successful learning.

What Is Metacognition?

Metacognition refers to awareness of one's own knowledge—what one does and doesn't know—and one's ability to understand, control, and manipulate one's cognitive processes (Meichenbaum, 1985). It includes knowing when and where to use particular strategies for learning and problem solving as well as how and why to use specific strategies. Metacognition is the ability to use prior knowledge to plan a strategy for approaching a learning task, take necessary steps to problem solve, reflect on and evaluate results, and modify one's approach as needed. Flavell (1976), who first used the term, offers the following example: *I am engaging in metacognition if I notice that I am having more trouble learning A than B; if it strikes me that I should double check C before accepting it as fact* (1976, p. 232).

Cognitive strategies are the basic mental abilities we use to think, study, and learn (e.g., recalling information from memory, analyzing sounds and images, making associations between or comparing/ contrasting different pieces of information, and making inferences or interpreting text). They help an individual achieve a particular goal, such as comprehending text or solving a math problem, and they can be individually identified and measured. In contrast, *metacognitive* strategies are used to ensure that an overarching learning goal is being or has been reached. Examples of metacognitive activities include planning how to approach a learning task, using appropriate skills and strategies to solve a problem, monitoring one's own comprehension of text, self-assessing and self-correcting in response to the self-assessment, evaluating progress toward the completion of a task, and becoming aware of distracting stimuli.

Elements of Metacognition

Researchers distinguish between metacognitive knowledge and metacognitive regulation (Flavell, 1979, 1987; Schraw & Dennison, 1994). Metacognitive knowledge refers to what individuals know about themselves as cognitive processors, about different approaches that can be used for learning and problem solving, and about the demands of a particular learning task. Metacognitive regulation refers to adjustments individuals make to their processes to help control their learning, such as planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation of progress and goals. Flavell (1979) further divides metacognitive knowledge into three categories:

- (1) *Person variables*: What one recognizes about his or her strengths and weaknesses in learning and processing information;
- (2) *Task variables*: What one knows or can figure out about the nature of a task and the processing demands required to complete the task—for example, knowledge that it will take more time to read, comprehend, and remember a technical article than it will a similar-length passage from a novel; and
- (3) *Strategy variables*: The strategies a person has “at the ready” to apply in a flexible way to successfully accomplish a task; for example, knowing how to activate prior knowledge before reading a technical article, using a glossary to look up unfamiliar words, or recognizing that sometimes one has to re-read a paragraph several times before it makes sense.

Livingston (1997) provides an example of all three variables: “I know that I (*person variable*) have difficulty with word problems (*task variable*), so I will answer the computational problems first and save the word problems for last (*strategy variable*).”

Why Teach Metacognitive Skills?

Research shows that metacognitive skills can be taught to students to improve their learning (Nietfeld & Shraw, 2002; Thiede, Anderson, & Therriault, 2003).

Constructing understanding requires both cognitive and metacognitive elements. Learners “construct knowledge” using cognitive strategies, and they guide, regulate, and evaluate their learning using metacognitive strategies. It is through this “thinking about thinking,” this use of metacognitive strategies, that real learning occurs. As students become more skilled at using metacognitive strategies, they gain confidence and become more independent as learners.

Individuals with well-developed metacognitive skills can think through a problem or approach a learning task, select appropriate strategies, and make decisions about a course of action to resolve the problem or successfully perform the task. They often think about their own thinking processes, taking time to think about and learn from mistakes or inaccuracies (NCREL, 1995). Some instructional programs that encourage students to learn metacognitive strategies encourage students to engage in “metacognitive conversations” with themselves so that they can “talk” with themselves about their learning, the challenges they encounter, and the ways in which they can self-correct and continue learning.

Moreover, individuals who demonstrate a wide variety of metacognitive skills perform better on exams and complete work more efficiently—they use the right tool for the job, and they modify learning strategies as needed, identifying blocks to learning and changing tools or strategies to ensure goal attainment. Because metacognition plays a critical role in successful learning, it is critical that instructors help learners develop metacognitively.

What’s the Research?

Metacognitive strategies can be taught (Halpern, 1996) and they are associated with successful learning (Borkowski, Carr, & Pressley, 1987). Successful learners have a repertoire of strategies to select from and can transfer them to new settings (Pressley, Borkowski, & Schneider, 1987). Instructors need to set tasks at an appropriate level of difficulty, i.e., challenging enough so that students need to apply metacognitive strategies to monitor success but not so challenging that students become overwhelmed or frustrated, and instructors need to prompt learners to think about what they are doing as they complete these tasks (Bi-

emiller & Meichenbaum, 1992). Instructors should take care not to do the thinking for learners or tell them what to do, because this runs the risk of making students experts at seeking help rather than experts at thinking about and directing their own learning. Instead, effective instructors continually prompt learners, asking “*What should you do next?*”

McKeachie (1988) found that few college instructors explicitly teach strategies for monitoring learning. They assume that students have already learned these strategies in high school. But many have not and are unaware of the metacognitive process and its importance to learning. Rote memorization is the usual—and often the only—learning strategy employed by high school students when they enter college (Nist, 1993). Simpson and Nist (2000), in a review of the literature on strategic learning, emphasize that instructors need to provide explicit instruction on the use of study strategies. The implication for ABE programs is that it is likely that ABE learners need explicit instruction in **both** cognitive and metacognitive strategies. They need to know that they have choices about the strategies they can employ in different contexts, and they need to monitor their use of and success with these strategies.

Recommended Instructional Strategies

Instructors can encourage ABE learners to become more strategic thinkers by helping them focus on the ways they process information. *Self-questioning*, *reflective journal writing*, and *discussing their thought processes with other learners* are among the ways that teachers can encourage learners to examine and develop their metacognitive processes.

Fogarty (1994) suggests that metacognition is a process that spans three distinct phases, and that, to be successful thinkers, students must do the following:

1. Develop a **plan** before approaching a learning task, such as reading for comprehension or solving a math problem.
2. **Monitor** their understanding; use “fix-up” strategies when meaning breaks down.
3. **Evaluate** their thinking after completing the task.

Instructors can model the application of questions, and they can prompt learners to ask themselves questions during each phase. They can incorporate into lesson plans opportunities for learners to practice using these questions during learning tasks. The following are examples.

- **During the planning phase**, learners can ask, *What am I supposed to learn? What prior knowledge will help me with this task? What should I do first? What should I look for in this reading? How much time do I have to complete this? In what direction do I want my thinking to take me?*
- **During the monitoring phase**, learners can ask, *How am I doing? Am I on the right track? How should I proceed? What information is important to remember? Should I move in a different direction? Should I adjust the pace because of the difficulty? What can I do if I do not understand?*
- **During the evaluation phase**, learners can ask, *How well did I do? What did I learn? Did I get the results I expected? What could I have done differently? Can I apply this way of thinking to other problems or situations? Is there anything I don't understand—any gaps in my knowledge? Do I need to go back through the task to fill in any gaps in understanding? How might I apply this line of thinking to other problems?*

Rather than viewing reading, writing, science, social studies, and math only as subjects or content to be taught, instructors can see them as opportunities for learners to reflect on their learning processes. Examples follow for each content area.

- **Reading:** Teach learners how to ask questions during reading and model “think-alouds.” Ask learners questions during read-alouds and teach them to monitor their reading by constantly asking themselves if they understand what the text is about. Teach them to take notes or highlight important details, asking themselves, “*Why is this a key phrase to highlight?*” and “*Why am I not highlighting this?*”
- **Writing:** Model pre-writing strategies for organizing thoughts, such as brainstorming ideas using a word web, or using a graphic organizer to put

ideas into paragraphs, with the main idea at the top and the supporting details below it.

- **Social Studies and Science:** Teach learners the importance of using organizers such as KWL charts, Venn diagrams, concept maps, and anticipation/reaction charts to sort information and help them learn and understand content. Learners can use organizers prior to a task to focus their attention on what they already know and identify what they want to learn. They can use a Venn diagram to identify similarities and differences between two related concepts.
- **Math:** Teach learners to use mnemonics to recall steps in a process, such as the order of mathematical operations. Model your thought processes in solving problems—for example, “*This is a lot of information; where should I start? Now that I know____, is there something else I know?*”

The goal of teaching metacognitive strategies is to help learners become comfortable with these strategies so that they employ them automatically to learning tasks, focusing their attention, deriving meaning, and making adjustments if something goes wrong. They do not think about these skills while performing them but, if asked what they are doing, they can usually accurately describe their metacognitive processes.

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About the TEAL Center: The Teaching Excellence in Adult Literacy (TEAL) Center is a project of the U.S. Department of Education, Office of Vocational and Adult Education (OVAE), designed to improve the quality of teaching in adult education in the content areas.