Metacognition

by Nancy Chick, CFT Assistant Director

CENTER for TEACHING
VANDERBILT UNIVERSITY
615-322-7290
cft.vanderbilt.edu

Thinking about One's Thinking

Metacognition is, put simply, thinking about one's thinking. More precisely, it refers to the processes used to plan, monitor, and assess one's understanding and performance. Metacognition includes a critical awareness of a) one's thinking and learning and b) oneself as a thinker and learner.

Initially studied for its development in young children (Baker & Brown, 1984; Flavell, 1985), researchers soon began to look at how experts display metacognitive thinking and how, then, these thought processes can be taught to novices to improve their learning (Hatano & Inagaki, 1986). In *How People Learn*, the National Academy of Sciences' synthesis of decades of research on the science of learning, **one of the three key findings of this work is the effectiveness of a "'metacognitive' approach to instruction"** (Bransford, Brown, & Cocking, 2000, p. 18).

Metacognitive practices increase students' abilities to transfer or adapt their learning to new contexts and tasks (Bransford, Brown, & Cocking, p. 12; Palincsar & Brown, 1984; Scardamalia et al., 1984; Schoenfeld, 1983, 1985, 1991). They do this by gaining a level of awareness *above the subject matter*: they also think about the tasks and contexts of different learning situations and themselves as learners in these different contexts. When Pintrich (2002) asserts that "Students who know about the different kinds of strategies for learning, thinking, and problem solving will be more likely to use them" (p. 222), notice the students must "know about" these strategies, not just practice them. As Zohar and David (2009) explain, there must be a "*conscious* meta-strategic level of H[igher] O[rder] T[hinking]" (p. 179).

Metacognitive practices help students become aware of their strengths and weaknesses as learners, writers, readers, test-takers, group members, etc. A key element is recognizing the limit of one's knowledge or ability and then figuring out how to expand that knowledge or extend the ability. Those who know their strengths and weaknesses in these areas will be more likely to "actively monitor their learning strategies and resources and assess their readiness for particular tasks and performances" (Bransford, Brown, & Cocking, p. 67).

The absence of metacognition connects to the research by Dunning, Johnson, Ehrlinger, and Kruger on "Why People Fail to Recognize Their Own Incompetence" (2003). They found that "people tend to be blissfully unaware of their incompetence," lacking "insight about deficiencies in their intellectual and social skills." They identified this pattern across domains—from test-taking, writing grammatically, thinking logically, to recognizing humor, to hunters' knowledge about firearms and medical lab technicians' knowledge of medical terminology and problem-solving skills (p. 83-84). In short, "if people lack the skills to produce correct answers, they are also cursed with an inability to know when their answers, or anyone else's, are right or wrong" (p. 85). This research suggests that increased metacognitive abilities—to learn specific (and correct) skills, how to recognize them, and how to practice them—is needed in many contexts.

Putting Metacognition into Practice

In "Promoting Student Metacognition," Tanner (2012) offers a handful of specific activities for biology classes, but they can be adapted to any discipline. She first describes four **assignments for explicit instruction** (p. 116):

- Preassessments—Encouraging Students to Examine Their Current Thinking: *"What do I already know about this topic that could guide my learning?"*
- The Muddiest Point—Giving Students Practice in Identifying Confusions: *"What was most confusing to me about the material explored in class today?"*
- Retrospective Postassessments—Pushing Students to Recognize Conceptual Change: *"Before this course, I thought evolution was…Now I think that evolution is …."* or *"How is my thinking changing (or not changing) over time?"*
- Reflective Journals—Providing a Forum in Which Students Monitor Their Own Thinking: *"What about my exam preparation worked well that I should remember to do next time? What did not work so well that I should not do next time or that I should change?"*

Next are recommendations for **developing a "classroom culture grounded in metacognition"** (p. 116-118):

- Giving Students License to Identify Confusions within the Classroom Culture: *ask students what they find confusing, acknowledge the difficulties*
- Integrating Reflection into Credited Course Work: *integrate short reflection (oral or written) that ask students what they found challenging or what questions arose during an assignment/exam/project*
- Metacognitive Modeling by the Instructor for Students: *model the thinking processes involved in your field and sought in your course by being explicit about "how you start, how you decide what to do first and then next, how you check your work, how you know when you are done" (p. 118)*

To facilitate these activities, she also offers three useful tables:

- Questions for students to ask themselves as they plan, monitor, and evaluate their thinking within four learning contexts—in class, assignments, quizzes/exams, and the course as a whole (p. 115)
- Prompts for integrating metacognition into discussions of pairs during clicker activities, assignments, and quiz or exam preparation (p. 117)
- Questions to help faculty metacognitively assess their own teaching (p. 119)

Weimer's "Deep Learning vs. Surface Learning: Getting Students to Understand the Difference" (2012) offers additional recommendations for developing students' metacognitive awareness and improvement of their study skills:

"[I]t is terribly important that in explicit and concerted ways we make students aware of themselves as learners. ***We must regularly ask, not only 'What are you learning?' but 'How are you learning?' We must confront them with the effectiveness (more often ineffectiveness) of their approaches. We must offer alternatives and then challenge students to test the efficacy of those approaches.***" (emphasis added)

She points to a tool developed by Stanger-Hall (2012, p. 297) for her students to identify their study strategies, which she divided into "**cognitively passive**" *("I previewed the reading before class," "I came to class," "I read the assigned text," "I highlighted the text," et al)* and "**cognitively active study behaviors**" *("I asked myself: 'How does it work?' and 'Why does it work this way?'" "I wrote my own study questions," "I fit all the facts into a bigger picture," "I closed my notes and tested how much I remembered," et al).* The specific focus of Stanger-Hall's study is tangential to this discussion,[1] but imagine giving students lists like hers adapted to your course and then, after a major assignment, having students discuss which ones worked and which types of behaviors led to higher grades. Even further, follow Lovett's advice (2013) by assigning "exam wrappers," which include students reflecting on their previous exam-preparation strategies, assessing those strategies and then looking ahead to the next exam, and writing an action plan for a revised approach to studying. A common assignment in English composition courses is the self-assessment essay in which students apply course criteria to articulate their strengths and weaknesses within single papers or over the course of the semester. These activities can be adapted to assignments other than exams or essays, such as projects, speeches, discussions, and the like.

As these examples illustrate, for students to become more metacognitive, **they must be taught the concept and its language explicitly** (Pintrich, 2002; Tanner, 2012), though not in a content-delivery model (simply a reading or a lecture) and not in one lesson. Instead, the explicit instruction should be "designed according to a knowledge construction approach," or students need to recognize, assess, and connect new skills to old ones, "and it needs to take place over an extended period of time" (Zohar & David, p. 187). This kind of explicit instruction will help students expand or replace existing learning strategies with new and more effective ones, give students a way to talk about learning and thinking, compare strategies with their classmates' and make more informed choices, and render learning "less opaque to students, rather than being something that happens mysteriously or that some students 'get' and learn and others struggle and don't learn" (Pintrich, 2002, p. 223).

Metacognition instruction should also be embedded with the content and activities about which students are thinking. Why? Metacognition is "not generic" (Bransford, Brown, & Cocking, p. 19) but instead is most effective when it is adapted to **reflect the specific learning contexts** of a specific topic, course, or discipline (Zohar & David, 2009). In explicitly connecting a learning context to its relevant processes, learners will be more able to adapt strategies to new contexts, rather than assume that learning is the same everywhere and every time. For instance, students' abilities to read disciplinary texts in discipline-appropriate ways would also benefit from metacognitive practice. A literature professor may read a passage of a novel aloud in class, while also talking about what she's thinking as she reads: how she makes sense of specific words and phrases, what connections she makes, how she approaches difficult passages, etc. This kind of modeling is a good practice in metacognition instruction, as suggested by Tanner above. Concepción's "Reading Philosophy with Background Knowledge and Metacognition" (2004) includes his detailed "How to Read Philosophy" handout (pp. 358-367), which includes the following components:

- What to Expect (when reading philosophy)
- The Ultimate Goal (of reading philosophy)
- Basic Good Reading Behaviors
- Important Background Information, or discipline- and course-specific reading practices, such as "reading for enlightenment" rather than information, and "problem-based classes" rather than historical or figure-based classes
- A Three-Part Reading Process (pre-reading, understanding, and evaluating)
- Flagging, or annotating the reading
- Linear vs. Dialogical Writing (Philosophical writing is rarely straightforward but instead "a monologue that contains a dialogue" [p. 365].)

What would such a handout look like for your discipline?

Students can even be metacognitively prepared (and then prepare themselves) for the **overarching learning experiences expected in specific contexts**. Salvatori and Donahue's *The Elements (and Pleasures) of Difficulty* (2004) encourages students to embrace difficult texts (and tasks) as part of deep learning, rather than an obstacle. Their "difficulty paper" assignment helps students reflect on and articulate the nature of the difficulty and work through their responses to it (p. 9). Similarly, in courses with sensitive subject matter, a different kind of learning occurs, one that involves complex emotional responses. In "Learning from Their Own Learning: How Metacognitive and Meta-affective Reflections Enhance Learning in Race-Related Courses" (Chick, Karis, & Kernahan, 2009), students were informed about the common reactions to learning about racial inequality (Helms, 1995; Adams, Bell, & Griffin, 1997; see student handout, Chick, Karis, & Kernahan, p. 23-24) and then regularly wrote about their cognitive and affective responses to specific racialized situations. The students with the most developed metacognitive and meta-affective practices at the end of the semester were able to "clear the obstacles and move away from" oversimplified thinking about race and racism "to places of greater questioning, acknowledging the complexities of identity, and redefining the world in racial terms" (p. 14).

Ultimately, metacognition requires students to "externalize mental events" (Bransford, Brown, & Cocking, p. 67), such as what it means to learn, awareness of one's strengths and weaknesses with specific skills or in a given learning context, plan what's required to accomplish a specific learning goal or activity, identifying and correcting errors, and preparing ahead for learning processes.

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[1] Students who were tested with short answer in addition to multiple-choice questions on their exams reported more cognitively active behaviors than those tested with just multiple-choice questions, and these active behaviors led to improved performance on the final exam.

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