"The Boss of My Brain"

by Donna Wilson and Marcus Conyers

Explicit instruction in metacognition puts students in charge of their learning.

Thomas, a 5th grader, is working on an assignment designed to check his understanding of a novel he read in class. He breezes through the first few questions: *Who wrote this book? Is it fiction or nonfiction? Who are the main characters? Where and when does it take place?* But then the questions get harder as they focus on evaluating a deeper understanding of the text: *What motivates the main characters' actions in the climax of this story? Compare their actions and reactions to the events that unfold.* Thomas looks back over the last few chapters, but he can't find any explanation in the text for the characters' actions. The next day, Thomas and his teacher review the assignment -together.

THOMAS: The writer left that part out! I couldn't find anything in the story about why they did what they did.
TEACHER: Do you remember when we talked about characters' motivation? In many stories, the author tells what the characters do and say and leaves it up to readers to figure out the "why." What are some strategies for thinking as you read that we've discussed that might help you think about the characters' motivation?
THOMAS: Questioning, maybe? I could ask myself, "Why did that happen? Does it make sense?"
TEACHER: That's true. Readers develop a deeper understanding of the story when they think about the details the author provides about who the characters are and what they do. Sometimes I'm surprised by the way a book ends, so I go back and look for the clues the author put in the story that support the ending. Then I can see more clearly why the characters acted the way they did.
THOMAS: So when the story doesn't end the way you predicted, you have to figure out why.
TEACHER: Exactly! Prediction is another good strategy to check your understanding as you read.

A few weeks later, the class is discussing another story, and the teacher asks, "What motivated the main character's action?" Thomas raises his hand and says, "She wanted to protect her friend." When the teacher asks what clues point to this motivation, Thomas explains that he thought about what he knew about the characters and about what might happen in the story. "I totally saw it coming!" he says, as other students chime in with their observations.

Thinking Smarter

Research demonstrates that explicit instruction in *meta-cognition*—the ability to monitor our own thinking and learning—can lead to learning success across subjects and grade levels from primary school through college (Baker, 2013; Dunlosky & Metcalfe, 2009; Hattie, 2009; Wang, Haertel, & Walberg, 1993). The shorthand definition of meta-cognition is "thinking about thinking." Meta-cognition supports learning by enabling us to actively think about which cognitive strategies can help achieve learning, how we should apply those strategies, how we can review our progress, and whether we need to adjust our thinking. Students skilled in meta-cognitive strategies ask fundamental questions that guide their -learning:

- What are my learning goals?
- How am I going to learn this?
- How will I double-check that I have it right?

- How does this new content fit in with what I already know?
- How well do I know this? Can I apply this new knowledge or skill in other subject areas or situations?

Explicit instruction and coaching in metacognition should emphasize that it helps us think smarter. In the words of a Texas 3rd grader who was introduced to the concept of metacognition and some useful cognitive strategies, "From now on, I'm going to be the boss of my brain."

Two key words here are *explicit instruction*. Most children are not naturally metacognitive, but all students, from struggling learners to high performers, can benefit from being taught how and when to use a variety of cognitive strategies to monitor and improve their learning. Texas teacher Diane Dahl[1] reports that she began teaching lessons on metacognition, which had previously been reserved only for students identified as gifted, to her entire 2nd grade class. Ms. Dahl introduces a new cognitive strategy each week, giving her students practice in such skills as visualizing, questioning, predicting, synthesizing, and activating schema. After teaching in this way, Ms. Dahl had more students qualify for gifted placement than ever before.

A Missed Opportunity

Despite the evidence of the benefits of teaching students to wield meta-cognitive strategies, "instruction [in meta-cognition] is still not commonly observed in most primary and secondary classrooms, and interviews with teachers have revealed limited knowledge about metacognition and how to foster it" (Baker, 2013, p. 421). Researchers studying 1,500 classrooms found that only 3 percent of them were teaching their students higher-order thinking skills (Schmoker, 2006).

The emphasis on standardized testing that has permeated U.S. schools for the last couple of decades may partially account for this neglect of meta-cognition. Wagner (2008) contends that school systems often place more emphasis on memorizing facts for multiple-choice tests than on developing critical-thinking skills. Some school systems have also been slow to set aside the traditional view of young children as concrete, simplistic thinkers and to embrace more recent findings that these children can learn critical thinking and self-regulatory skills—and benefit from doing so (Tough, 2012).

Unfortunately, many school systems have not yet recognized and incorporated into their policies and practice new understandings about the cognitive potential of virtually all students. Without support for teaching about metacognition at the policy level, teachers may feel too pressed for time to fit this instruction into the already-packed school day.

Ironically, policies designed to hold schools responsible for raising student achievement have been missing a tremendous opportunity to improve students' academic and career success by teaching meta-cognitive skills. Equipping students with meta-cognitive strategies to support deeper levels of understanding across subject areas is consistent with the aims of the Common Core State Standards. As implementation of these standards continues, we may see increased emphasis on incorporating meta-cognition throughout the curriculum.

Moving Toward Metacognitive Classrooms

To lay the foundation for instruction on meta-cognitive strategies, teachers should instill in students the belief that everyone can make academic advances if they commit to the some times-hard work required for learning. Lessons about neuroplasticity—how learning new information and skills changes the structure and functioning of the brain—are especially inspiring for struggling students, who may have internalized the idea that they cannot become academically successful.

Nisbett (2009) reports that middle school students who were taught "that learning changes the brain by forming new neurological connections and that students are in charge of this change process" (p. 143) worked harder

and made greater learning gains than did their peers in control groups. Lovett (2008) found that students who believed they could succeed academically had higher motivation and persistence in learning tasks.

In addition to making students aware that self-regulation can make their brains "smarter," we need to teach students how and when to use cognitive and metacognitive strategies. (See "Fitting Metacognition into Classroom Instruction" for some suggestions.) This instruction should begin early and continue throughout school, as the following examples demonstrate.

Primary Grades: Plan–Do–Review

One effective metacognitive approach to problem solving involves three main steps: (1) identify possible solutions and plan how to implement the most likely one, (2) implement the solution, and (3) assess its effectiveness and make adjustments if necessary.

Before young children learn this systematic approach, they typically try the first idea that comes to mind without planning it out, and they often give up in frustration if it doesn't work. However, when children receive explicit instruction and guidance to develop their problem-solving skills, they are equipped with a versatile tool to help them take charge of their learning across the curriculum.

At the Out-of-Door Academy in Sarasota, Florida, library media specialist Kelly Rose introduces preK–2 students to the plan–do–review process (Eisenberg & Eisenberg, 2007) for solving problems and completing projects. For example, she reads the students *Turkey Trouble* by Wendi Silvano (Marshall Cavendish, 2009), in which the main character is worried about ending up as the main course on Thanksgiving. He plans to masquerade as other farm animals, but one disguise after another falls short. The turkey assesses the shortcomings of each plan and takes advice from other animals, which guides him to come up with a very different and ultimately successful disguise.

His path to a solution inspires classroom discussions about collaboration and the importance of listening to feedback from peers. "He has to plan, do, review, plan, do, review, and so on until he finally finds a plan that works," Ms. Rose notes. "The children realize that perseverance and creativity are extremely important when self-monitoring!" They recognize that mistakes represent not failure, but an opportunity to learn.

Ms. Rose provides scaffolding and modeling for all three stages as her student engage in learning. For example, she worked with a group of kindergartners who were excited about finding sharks' teeth on the beach and who wondered what type of sharks they came from. The students took ownership of their question and developed a plan to identify the most useful resources where they could find the information they needed, including websites, encyclopedias, books, and experts. The first source they consulted, the encyclopedia, didn't have clear pictures. So they looked further in the library's resources and found diagrams of different Florida shark teeth, spread the diagrams on the floor, and compared the teeth they found to the diagrams. "They carried out the plan, and when they reviewed, they discovered they had more questions," Ms. Rose says.

Middle Grades: Managing Stress

In middle school, many students begin to feel more pressure to perform well on standardized tests, and the resulting stress can impair their performance. Teaching students to be mindful of signs of academic stress and to use self-regulation techniques to manage their stress levels can improve their learning readiness and equip them with useful strategies for high school, college, and beyond.

In her English and language arts classes, Cecelia Beagle talks with her students about how stressing out before or during a test can make it harder to think clearly and remember what you've learned. Ms. Beagle asks students whether they typically feel nervous before a big test and whether they think stress has a positive or negative

impact on how well they do. The students share responses like this one: "I studied really hard, but when I looked at the test, it was like my mind went blank."

The good news, Ms. Beagle tells her students, is that it is possible to recognize when you're getting stressed and take steps to relax, get in a more positive state for learning, and do better on tests. Then she leads them in an exercise and stretching regimen to turn their stress into positive energy. She asks them to notice how they feel after they finish this routine. Are they more relaxed and ready to focus on the test?

Over time, this stress-reduction strategy has become a routine before tests, and students volunteer to lead the class in the stretching regimen. Ms. Beagle reports a "remarkable difference in the confidence and energy that flows in my classroom while the students are testing."

Further, this emphasis on being mindful about how the brain learns best has piqued some students' interest. One student, in particular, "has come to me, sharing articles she's found online about the brain and what we need to do to stay healthy for the brain's sake," Ms. Beagle adds. "This introduction to how the brain and body work together has inspired her to seek out even more information on her own."

High School: Study Skills

Learning to become more meta-cognitive about study habits also benefits students. As one example, teachers might hold a lunch session on study skills, helping students think through which of their current habits (such as cramming and pulling all nighters) are unsuccessful and how they can implement other strategies, such as planning a schedule for distributed practice, studying their notes side by side with the text, and forming study groups.

We know from our conversations with teachers that high school students also are motivated to become "the boss of their brains" when they learn that their brains change as they learn and that they can get functionally smarter. Teacher Jeremy Green frames the need to think meta-cognitively about one's learning by launching his advanced placement (AP) Psychology and U.S. History courses with a presentation on neuro-plasticity, which emphasizes that our brains can change and that we're always getting smarter. Mr. Green explains, "We talk about neuro-plasticity on the first day of class—how you're not just what you are today, and that hard work really matters."

Mr. Green teaches his students strategies to employ when taking advanced placement exams, such as breaking words into parts to discern their meaning: "For reading and standardized tests, they have to be able to break down words they don't know. I can't teach my students every word in the English language, but we can all know that *co-*, *con-* and *com-* mean *with*, so if they see the word, *-collaborate*—as in, Who collaborated with Alexander Hamilton to write the *Federalist Papers*?—well, *labor* is in the middle of that word, so putting the two parts together as *co-labor* helps them understand its meaning." In addition to test taking, students learn they can apply strategies like these to aid in reading comprehension in all their classes.

Metacognitive for Life

Imagine a school system where, from their first days in a classroom, students are inspired by the idea that they are the active creators of their own learning, literally shaping their brains as they cultivate skills to monitor and adjust their thinking to achieve their learning goals. This synergy of using thinking skills to better acquire content knowledge establishes a foundation for deeper understanding of concepts and enhanced thinking, engagement, and motivation for learning. As students become masters of metacognition, they are developing essential skills for innovation and problem solving, laying the groundwork for success in college and career.

Author's Note: The teachers described in this article are graduates of a degree program in brain-based teaching at Nova Southeastern University in Davie, Florida, who shared their classroom experiences with the authors through conversations and personal correspondence.

Fitting Metacognition into Classroom Instruction

Here are some guidelines for incorporating metacognition instruction into the school day.

- Underscore *how* students are learning as well as *what* they are learning.
- Share the goals of learning activities in advance, and guide students to plan strategies and monitor their progress toward achieving those goals.
- Model your own use of metacognition by thinking out loud. When reading aloud, make—and correct—mistakes and show how you use context to establish the meaning of unfamiliar words. Predict what might happen in a science experiment. Talk through the steps of solving a math problem.
- Call attention to the usefulness of metacognition in making academic gains. For example, "This project obviously took work and planning! How did you accomplish that?"
- Add steps to encourage self-reflection into lessons and learning. For example, Lovett[1] recommends using *exam wrappers*—forms students complete as they review test results to describe how they studied for the exam, to analyze their test results, and to come up with future strategies for improvement. The forms are returned to students before their next exams.
- Connect the metacognitive strategies you're using in the classroom to students' future education and careers. For example, say "How might monitoring and managing your stress levels come in handy when you're preparing for a job interview?"

[1] Lovett, M. C. (2008). *Teaching metacognition* [PowerPoint presentation]. Retrieved from http://net.educause.edu/upload/presentations/ELI081/FS03/Metacognition-ELI.pdf

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