NISOD
Vol. XXXVIII, No. 28
INNOVATION ABSTRACTS

Teach Students HOW to Learn: Metacognition is the Key!

"Miriam, a freshman calculus student at Louisiana State University (LSU), made 37.5 percent on her first exam, but 83 percent and 93 percent on the next two exams. Robert, a first-year general chemistry student at LSU, made 42 percent on his first exam and followed that up with three 100 percent grades in a row. Matt, a first-year general chemistry student at the University of Utah, scored 65 percent and 55 percent on his first two exams and 95 percent on his third exam. And I could go on. I could tell you scores of stories like this from the last 15 years of my teaching career."

Those are the opening sentences of *Teach Students How to Learn*, the book I wrote to convey that educators can teach students simple, straightforward metacognitive strategies that have the power not only to dramatically improve academic performance, but also to transform students' approach to learning. When students are taught how to learn as deeply as possible, those students become progressively skilled as learners and increasingly more intelligent throughout the course of their lives. Conversely, if students stick to rote learning and cramming, their intellectual lives stagnate at an early age, and their full potential is lost to society. I present workshops and webinars about teaching students how to learn so anyone can introduce students to powerful and transformative learning strategies. Participants learn, step by step, exactly how to deliver the strategies in an engaging, interactive manner. In this short article, I introduce two of the most effective metacognitive strategies, explain the theoretical framework behind the development of these strategies, and describe individual and group interventions to present these strategies to students.

One of the first strategies I introduce to students is an approach to reading. Students' ability to comprehend and digest extensive reading assignments in a timely fashion is crucial for success at the undergraduate level and beyond. This reading strategy involves a three-step process. The first step, surveying or previewing, involves skimming through a sizable chunk of assigned reading and noting only chapter headings, subheadings, and bold or italicized terms. For novels or essays, students can preview the first and last sentences of every large section or paragraph. The second step requires students to generate questions, based on their previewing efforts, that they want the text to answer. For example, a subheading might read, "Strong Acids" or "Marx's Critique of Hegel." Corresponding questions might be: "What is the difference between strong acids and weak acids?" or "What did Hegel believe and what did Marx disagree with?" The third and final step equips students with a method for reading efficiently without repeatedly needing to re-read. Students should read only one paragraph at a time and then paraphrase the paragraph in their own words aloud and/or by writing it in their notes. After doing the same with the next paragraph, they should then fold in the new information with everything they have read up to that point (i.e., review). Therefore, at the end of every paragraph, students have an integrated, comprehensive understanding of the text they're working with. At the end of a large section, say an entire chapter, students can undertake a more extensive review, making connections across subtopics. After giving one freshman this strategy the night before a psychology exam, he scored 82 percent compared to 52 percent on his previous exam.

STEM students, whose homework primarily consist of problem sets, should use the following strategy to do their homework in a way that trains them to demonstrate mastery of concepts. This strategy differs from how most students do their homework. Typically, students work on problems while simultaneously looking at solutions to example problems in the textbook or in their class notes. Instead, students should first study the information that the homework covers *before* looking at any of the assigned problems. When they come across examples, they should work the example problems straight through—*without looking at the solutions*—until they get an answer. Once they have an answer, they can check to see if they got it correct. If the answer is not correct, students should go back to the text or notes to figure out where the mistake was made, still *without* consulting the solution. The process of figuring out where the mistake was made is very important to gain a deeper understanding of the material. After they have correctly worked through all of the example problems, students should then work on their assigned homework problems. However, students should approach their homework as if they are taking a test; trying to solve problems at a quicker pace in order to simulate similar time constraints under which they are tested.

When students do not use this homework strategy, they become like runners who show up on race day only having trained in much easier conditions. Even though it is nearly everyone's first instinct to work on a set of assigned problems alongside solved examples, the comparison to competitive running makes it clear how senseless it is to follow that instinct. When students treat homework as an opportunity to train themselves to solve problems independently without any aids, their exam performance often skyrockets. After one physics student learned this strategy, she made 91 percent on her next exam, compared to 54 percent on the one before.

The idea underlying these two strategies is *metacognition*, often described as thinking about thinking. When students use metacognition, they monitor the workings of their own minds and learn to become much more aware of how deeply they understand subject material. Instead of being overconfident or hoping for the best, they learn how to figure out what they need to do in order to get the results they want. Before I introduce metacognitive strategies to students, I do a short, simple exercise to help them understand why they need metacognition. First, I ask them to articulate the difference between studying and learning. Answers vary, but most students express a contrast between shallow and deep understanding. Next, I ask students whether they would rather work harder to make an "A" on an exam or teach a classroom of students the material on that exam. They quickly realize that deeper understanding is necessary in order to teach the material and that, if they want high grades, they should seek that depth of understanding. I then show them *Bloom's Taxonomy*, a framework of six learning levels that range from the lowest, *remembering*, or rote memorization, to the highest, *creating*, or having mastered information so completely that students can use it to invent new ideas, concepts, or apparatuses. I ask my students at what level of the taxonomy students need to operate in high school, and they usually respond with level 1 or 2. Yet, when I ask them at what level they need to operate in order to excel in college, they respond with level 3 or 4. At that point, I give them a way to ascend Bloom's Taxonomy: The Study Cycle, using Focused Study Sessions. The Study Cycle has five steps:

1) Preview material to be discussed in class (5-15 minutes);
2) Go to class;
3) Review material after class (5-15 minutes);
4) Study using metacognitive strategies during Focused Study Sessions; and
5) Assess mastery and adjust methods if necessary.

Focused Study Sessions happen in a specific time window of intensive concentration, not necessarily an hour, with four steps:

1) Set a goal (1-2 minutes);
2) Study with focus (30-50 minutes);
3) Take a break (10-15 minutes); and
4) Review (5 minutes).

I advise students to complete three to five Focused Study Sessions per day, sandwiched individually or grouped in sets of two or three in between classes and/or other activities, so that students never face unending, amorphous blocks of five or six hours of time during which they are supposed to "study." Here it becomes clear that even though metacognitive strategies seem to work like magic, the secret is that students are actually going to class and spending dramatically more time working productively with the information they need to master. There is no mystery.

How do we best deliver these strategies to students? I have already described the heart of the intervention, which includes asking students self-reflecting questions before presenting Bloom's Taxonomy, metacognitive strategies, and the Study Cycle. Here I discuss how to prepare students for an intervention, how to elicit commitment from students, and how the intervention can be delivered one-on-one or to groups of students.

Students are best prepared to receive the intervention after they receive the results of their first major assessment. Otherwise, they have little to no interest in changing their behavior. Additionally, educators should *not* inform students that learning strategies will be presented in class; students should assume that class will cover regular course content. Another important way of getting students' buy-in is to present before-and-after grades of students who have already successfully used metacognitive learning strategies to turn around their academic performance. After presenting the core of the intervention, it is important to elicit a commitment from students to actually try the strategies. If they don't try them, they can't know how well they work or get excited about continuing to use them. Ask students to choose two or three of the metacognitive strategies you have presented and then have them explain exactly how they will try them.

This intervention appears to work not only one-on-one, but also in groups. Cook, Kennedy, and McGuire (2013) describe the association between a 50-minute intervention given to a large lecture-style class at a public university and the students' final course grades. The students who attended the intervention lecture received an average final course grade of 81.5 (B), while those who did not attend received an average final grade of 72.6 (C). Students had no way of knowing that learning strategies would be presented in class, rather than regular course content, and Cook et al. (2013) discusses additional steps taken in order to isolate the effect of the intervention as strongly as possible. Through group interventions, the potential to disseminate metacognitive learning strategies to large numbers of students is vast.

Teach Students How to Learn also contains four additional core strategies for students; more detail and guidance about delivering the intervention; time management, study, and test-taking tips; ways for instructors to helpfully structure their courses; crucial information about non-cognitive factors like mindset and motivation; how to partner with the campus learning center; and more. I wrote the book to be a relatively quick, fun read because I want every instructor, administrator, parent, and student to be aware of metacognitive strategies and their transformative power. I used to believe that some students were smart—cut out for high-level subjects like physics and philosophy—and that other students were less smart. Now I know that, aside from enormously gifted outliers, students who appear smarter than others are simply using learning strategies, perhaps intuitively, while students who appear less smart have not yet been given the strategies to unlock their full intellectual potential.

Every student can excel if they are given the right tools. I want to live in a world where every adult who influences a student's education knows that the sky is the limit for any student, no matter how terrible their initial assessments may be. An LSU math major who flunked out of school, not once but twice, invested in metacognitive strategies and ultimately graduated from LSU with a 3.4 GPA. He is now living his dream of teaching middle school math and coaching football. It is true that to reach some students requires quite a bit of patience and creativity, but motivated students who believe in themselves can do anything they put their minds to. We can *teach* every student *how* to be motivated, positive, hardworking, and successful. If we can do that, why wouldn't we?

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Interested in learning more about metacognition and the learning strategies described above? Join Dr. McGuire in NISOD's December 1 webinar, "Teach Students How to Learn: Metacognition is the Key!" Sign up today!

References

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November 17, 2016, XXXVIII, No. 28

www.nisod.org

Innovation Abstracts is published weekly following the fall and spring terms of the academic calendar, except Thanksgiving week, by NISOD, College of Education, 1912 Speedway, D5600, Austin, Texas 78712-1607, (512) 471-7545, Email: abstracts@nisod.org