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## **Close the Book. Recall. Write It Down.**

**That old study method still works, researchers say. So why don't professors preach it?**

By DAVID GLENN

The scene: A rigorous intro-level survey course in biology, history, or economics. You're the instructor, and students are crowding the lectern, pleading for study advice for the midterm.

If you're like many professors, you'll tell them something like this: *Read carefully. Write down unfamiliar terms and look up their meanings. Make an outline. Reread each chapter.*

That's not terrible advice. But some scientists would say that you've left out the most important step: *Put the book aside and hide your notes. Then recall everything you can. Write it down, or, if you're uninhibited, say it out loud.*

Two psychology journals have recently published papers showing that this strategy works, the latest findings from a decades-old body of research. When students study on their own, "active recall" — recitation, for instance, or flashcards and other self-quizzing — is the most effective way to inscribe something in long-term memory.

Yet many college instructors are only dimly familiar with that research. And in March, when Mark A. McDaniel, a professor of psychology at Washington University in St. Louis and one author of the new studies, gave a talk at a conference of the National Center for Academic Transformation, people fretted that the approach was oriented toward robotic memorization, not true learning.

### **Don't Reread**

A central idea of Mr. McDaniel's work, which appears in the April issue of *Psychological Science* and the January issue of *Contemporary Educational Psychology*, is that it is generally a mistake to read and reread a textbook passage. That strategy feels intuitively right to many students — but it's much less effective than active recall, and it can give rise to a false sense of confidence.

"When you've got your chemis-try book in front of you, everything's right there on the page, it's all very familiar and fluent," says Jeffrey D. Karpicke, an assistant professor of psychology at Purdue University and lead author of a paper in the May issue of *Memory* about students' faulty intuitions about effective study habits.

"So you could say to yourself, 'Yeah, I know this. Sure, this is all very familiar,'" Mr. Karpicke continues. "But of course, when you go in to take a classroom test, or in real life when you need to reconstruct your knowledge, the book's not there. In our experiments, when students repeatedly read something, it falsely inflates their sense of their own learning."

These findings about active recall are not new or faddish or parochial. The research has been deepened and systematized recently by scholars at the University of California at Los Angeles and Washington University in St. Louis (where Mr. Karpicke earned his doctorate in 2007). But the basic insight goes back decades. One of the new papers tips its hat to a recitation-based method known as "SQ3R," which was popularized in *Effective Study*, a 1946 book by Francis P. Robinson.

So if this wisdom is so well-established — at least among psychologists — should colleges explicitly try to coax students to use these study techniques? And if so, how? That is the question that the authors of these papers are now pondering.

"I think it's a mistake for us to think that just publishing this work in a few journals is going to have a huge impact in the classroom," says Mr. McDaniel.

After a decade of working in this area, Mr. McDaniel feels enough confidence in his findings that he is willing to proselytize about them. He and his colleagues have also been promoting the idea of frequent low-stakes classroom quizzes (*The Chronicle*, June 8, 2007).

Among other things, Mr. McDaniel has recently collaborated with a network of biology instructors who would like to improve the pass rates in their introductory courses.

One of those scholars is Kirk Bartholomew, an assistant professor of biology at Sacred Heart University. He first crossed paths with Mr. McDaniel at a conference sponsored by a textbook publisher.

"He basically confirmed my ideas — that after you've read something once, you've gotten what you're going to get out of it, and then you need to go out and start applying the information," Mr. Bartholomew says.

The two scholars collaborated on a Web interface that encouraged students to try different study techniques. The first round of research did not turn up any dramatic patterns, Mr. Bartholomew says — other than the unsurprising fact that his students did better if they spent more time studying. But he says that he looks forward to refining the system.

### **Rote learning?**

In March, however, when Mr. McDaniel took his message to the National Center for Academic Transformation meeting, his talk was not entirely well received.

Several days after his appearance, he got a note from Carol A. Twigg, the center's chief executive. "She said, 'We really loved having you, but you created some controversy here,'" Mr. McDaniel says. According to Ms. Twigg's note, some people worried that Mr. McDaniel's techniques might generate rote memorization at the expense of deeper kinds of learning.

Michael R. Reder, director of Connecticut College's Center for Teaching and Learning, had a similar reaction to one of Mr. McDaniel's new papers on studying.

The paper seems perfectly valid on its own terms and might offer a "useful tool," Mr. Reder says. But in his view, the paper also "suggests an old model of learning. You know, I'm going to give information to the students, and the students then memorize that information and then spit it back."

Mr. McDaniel finds such reactions frustrating. One experiment in his new paper suggests that a week after reading a complex passage, people who recited the material after reading it did much better at solving problems that involved analyzing and drawing inferences from the material than did people who simply read the passage twice.

"I don't think these techniques will necessarily result in rote memorization," Mr. McDaniel says. "If you ask people to free-recall, you can generate a better mental model of a subject area, and in turn that can lead to better problem-solving."

And in some college courses, he continues, a certain amount of memorization is impossible to escape — so it might as well be done effectively.

In Biology 101, for example, "you've got a heavily fact-laden course. When I talk to biology instructors at Big Ten universities, they're working really hard to create interesting, interactive courses where they've got 500 or 600 kids in a lecture class. But no matter how engaging you make the course, the students need to have the knowledge base to do the inquiry-based problem-solving activities that you've designed."

### **From Lab to Classroom**

Mr. McDaniel and several other scholars recently wrote an essay about applying basic research about learning in real-world classrooms, which will appear in a forthcoming edited volume on the teaching of psychology.

One of his co-authors says that he is a bit more cautious than Mr. McDaniel about trying to bring new findings from the lab into the real world. "You need to be careful when you move from a relatively simple environment like the laboratory to a complex classroom environment where people have different motivations, different background knowledge, all those sorts of things," says David B. Daniel, an associate professor of psychology at James Madison University.

Mr. Daniel points to a disheartening 2004 study that found that some features of contemporary textbooks — prominent subject headings, questions and outlines at the beginning of chapters, and so on — actually seem to hinder some students' learning, because students read only the bells and whistles and skip the main text. Many of those

textbook features were based on scientific studies of learning — but putting them into real-world practice may have backfired, at least for some students.

Mr. Karpicke, of Purdue, agrees that scholars should be sensitive to real-world complexities. One way to ensure that sensitivity, he says, would be for college "teaching centers" to foster conversations between research psychologists and classroom instructors from various disciplines. That is happening at Purdue, at least to a limited extent, Mr. Karpicke says, and more colleges should do the same.

"I think that's the wave of the future in education research," he says. "We need to be getting teams of people together. People who are useful — at least I'd like to think that I'm useful, as someone who knows the cognitive science behind learning. And people like me need to talk to people who are doing research in actual classrooms, and then people who know the course content. You've got to have those three components."

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