

Learning Through Testing

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Testing memory not only assesses what we know but changes it,” said Henry L. Roediger, III, as he summed up his most recent years of research in his William James Fellow Award Address at the 24th APS Annual Convention in Chicago.

Roediger’s discovery is a new concept for teachers, researchers, and students, who tend to assume that people learn while studying and that tests measure what they learned. However, Roediger’s research shows that testing is a valuable, but under-used, tool.

The traditional academic model of a few tests a year, interspersed with lots of opportunities to study, could go by the wayside if teachers and students follow Roediger’s recommendations. He found that testing as often as studying leads to better long-term retrieval, and that studying once and then testing often leads to retaining the information well in both the short and long term.

He joked that his first study accidentally showed that having more opportunities to study resulted in poorer test results for learners, overturning results that had held true since the 1890s when Hermann Ebbinghaus pioneered the experimental study of memory. But of course, the study actually showed that replacing a study period with a test was the key to better performance.

William James’ insights in *Principles of Psychology* from over a century ago shows that James was almost prescient in his conclusions of how learning and memory relate. “It pays better to wait and recollect by an effort from within, than to look at the book again,” James wrote. “If we recover the words in the former way, we shall probably know them the next time; if in the latter way, we shall very likely need the book once more.”

The first experiment of how testing can change recall was done in 1909 by a woman named Edwina Abbott, Roediger said, but interest in the subject faltered.

Popular study methods such as rereading, highlighting, summarizing, or outlining are sometimes replaced with another self-test method that Roediger found was common — using flash cards and removing cards as the material is learned. His studies showed that using this method gave faster learning and more complete recall.

“But what leads to fast learning also leads to fast forgetting,” Roediger said, citing his 2007 study showing that, after one week, flash-card learners only retained half as much as studiers.

This result explains why cramming is a popular study technique: It works, even if only for the short term.

“If you read the material a few times before you walk into the test, you’ll probably do okay,” he said.

“You won’t remember anything a week later, but you’ll do okay for the moment.”

William James knew this, too, Roediger said. “The reason why cramming is such a bad idea is now made clear: Things learned in a few hours, on one occasion, for one purpose, cannot possibly have formed many associations with other things in the mind,” James wrote.

But can this approach work in the real world, such as in a classroom where learning is more complex than the simple word pairs and picture recalls used in the lab?

Yes, Roediger found. He and a team that also includes his wife, psychological scientist Kathleen McDermott, have tracked the phenomenon in the wilds of the middle-school (grades 6-8) science classes. Using materials provided by the classroom teachers, the researchers gave additional quizzes on some facts (leaving comparable facts alone for control) and used chapter tests and end-of-semester tests to see how well the students recalled the quizzed facts. Adding more tests meant better short-term and long-term recall than standard study techniques did. The team is now trying the experiment in a nearby high school.

The purpose, Roediger said, is to examine how learning can be more efficient. He recommends that students test themselves as a main study method — and continue testing long past the time they’ve mastered the material. Teachers should quiz students much more frequently — it will give the feedback on the students’ performance, find gaps in their knowledge, make sure they’re studying more often (a teacher’s favorite benefit, he joked), and also lead to better recall.