MIND

Getting It Wrong: Surprising Tips on How to Learn

New research makes the case for hard tests, and suggests an unusual technique that anyone can use to learn

By Henry L. Roediger, Bridgid Finn on October 20, 2009

Credit: Magdalena Tworkowska

For years, many educators have championed “errorless learning," advising teachers (and students) to create study conditions that do not permit errors. For example, a classroom teacher might drill students repeatedly on the same multiplication problem, with very little delay between the first and second presentations of the problem, ensuring that the student gets the answer correct each time.

The idea embedded in this approach is that if students make errors, they will learn the errors and be prevented (or slowed) in learning the correct information. But research by Nate Kornell, Matthew Hays and Robert Bjork at U.C.L.A. that recently appeared in *the Journal of Experimental Psychology: Learning, Memory and Cognition* reveals that this worry is misplaced. In fact, they found, learning becomes better if conditions are arranged so that students make errors.

People remember things better, longer, if they are given very challenging tests on the material, tests at which they are bound to fail. In a series of experiments, they showed that if students make an unsuccessful attempt to retrieve information before receiving an answer, they remember the information better than in a control condition in which they simply study the information. Trying and failing to retrieve the answer is actually helpful to learning. It’s an idea that has obvious applications for education, but could be useful for anyone who is trying to learn new material of any kind.

In one of their experiments, students were required to learn pairs of “weak associates,” words that are loosely related such as *star-night* or *factory-plant*. (If students are given the first word and asked to generate an associate, the probability of generating the target word is only 5 percent.) In the pretest condition, students were given the first word of the pair (*star*- ???) and told to try to generate the second member that they would have to later remember. They had 8 seconds to do so. Of course, almost by definition, they nearly always failed to generate the correct answer. They might generate *bright* in the case of *star-???*. At that point they were given the target pair (*star–night*) for 5 seconds. In the control condition, students were given the pair to study for 13 seconds, so in both conditions there were a total of 13 seconds of study time for the pair.

The team found that students remembered the pairs much better when they first tried to retrieve the answer before it was shown to them. In a way this pretesting effect is counterintuitive: Studying a pair for 13 seconds produces worse recall than studying the pair for 5 seconds, if students in the latter condition spent the previous 8 seconds trying to retrieve or guess the answer. But the effect averaged about 10 percent better recall, and occurred both immediately after study and after a delay averaging 38 hours.

Some readers may look askance at the use of word pairs, even though it is a favorite tactic of psychologists. In another article, in the *Journal of Experimental Psychology: Applied,* Lindsey Richland, Nate Kornell and Liche Kao asked the same question, but they used more educationally relevant text material (an essay on vision). Students were asked to read the essay and prepare for a test on it. However, in the pretest condition they were asked questions about the passage before reading it such as "What is total color blindness caused by brain damage called?" Asking these kinds of question before reading the passage obviously focuses students' attention on the critical concepts. To control this "direction of attention" issue, in the control condition students were either given additional time to study, or the researchers focused their attention on the critical passages in one of several ways: by italicizing the critical section, by bolding the key term that would be tested, or by a combination of strategies. However, in all the experiments they found an advantage in having students first guess the answers. The effect was about the same magnitude, around 10 percent, as in the previous set of experiments.

This work has implications beyond the classroom. By challenging ourselves to retrieve or generate answers we can improve our recall. Keep that in mind next time you turn to Google for an answer, and give yourself a little more time to come up with the answer on your own.

Students might consider taking the questions in the back of the textbook chapter and try to answer them before reading the chapter. (If there are no questions, convert the section headings to questions. If the heading is Pavlovian Conditioning, ask yourself *What is Pavlovian conditioning?*). Then read the chapter and answer the questions while reading it. When the chapter is finished, go back to the questions and try answering them again. For any you miss, restudy that section of the chapter. Then wait a few days and try to answer the questions again (restudying when you need to). Keep this practice up on all the

chapters you read before the exam and you will be have learned the material in a durable manner and be able to retrieve it long after you have left the course.

Of course, these are general-purpose strategies and work for any type of material, not just textbooks. And remember, even if you get the questions wrong as you self-test yourself during study the process is still useful, indeed much more useful than just studying. Getting the answer wrong is a great way to learn.

Are you a scientist? Have you recently read a peer-reviewed paper that you want to write about? Then contact Mind Matters co-editor Gareth Cook, a Pulitzer prize-winning journalist at the Boston Globe, where he edits the Sunday Ideas section.

ABOUT THE AUTHOR(S)

Henry L. Roediger, III is the James S. McDonnell Distinguished University Professor at

Washington University in St. Louis. Bridgid Finn earned her Ph.D. in Cognitive Psychology at Columbia University in New York City. She is now working as a post-doctoral research fellow at Washington University in St. Louis.

LOAD COMMENTS

LATEST NEWS

ARTS & CULTURE

A Topology Joke to Celebrate National Doughnut Day

1 hour ago — Eliene Augenbraun, Benjamin Meyers and James Drew

ENERGY

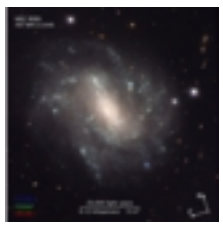
Nuclear Option Could Be Best Bet to Combat Climate Change

25 minutes ago — Umair Irfan and ClimateWire

SPACE

Universe May Be Expanding Faster Than Astronomers Thought

1 hour ago — Mike Wall and SPACE.com



ARTS & CULTURE

Marketing the Military, 1916

18 minutes ago — Dan Schlenoff

AUTOMOTIVE

Semiautonomous Cars Are Here--but How Well Do They Perform?

2 hours ago — David Pogue

NEUROLOGICAL HEALTH

Autistic Children Benefit from Early Intervention

3 hours ago — Nicholas Lange and Christopher J. McDougle