

### Quick Quiz – Is it Really Recall?

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Review of: *Retrieval Practice Produces More Learning Than Elaborative Studying With Concept Mapping*; J. D. Karpicke and J. R. Blunt; (2011). *Science* **331**:772-775.

The concept of active learning represented a paradigm shift. In part, it moved the focus from what the instructor does — teach — to what we want the students to do — learn. A recent paper from Karpicke and Blunt (1), which follows years of previous work (2), suggests another shift of similar importance. In this case, the question is, What is the best way to learn? According to this paper, best practice involves the relatively overlooked method of recall.

Most people reading this review will likely agree that lecturing with note-taking is not a particularly effective way for students to learn. Indeed, current pedagogy favors active-learning methods. That is, we cannot transfer the knowledge from our minds to those of our students; they need to construct their own knowledge. However, once that knowledge has been constructed or encoded, how do we best ensure that the students will retain the information?

There are certainly many hypotheses, but the one that we favor is the frequent quiz approach (3). The justification for this methodology can be found in work by Dr. Mark McDaniel (4). Our interpretation of the work from McDaniel's group is that frequent quizzes benefit the students in multiple ways. First, quizzes help the students evaluate their actual, rather than their perceived, depth of knowledge. Second, quizzes help identify knowledge gaps, allowing students to effectively focus their study time. Third, because students are introduced to large amounts of information in a typical course, they attempt

to continue encoding without ever examining what they have learned, right up to (typically the night before) the big exam. Frequent quizzes prevent this from happening, and force students to routinely recall previously learned information in more manageable segments.

The work of Karpicke and Blunt is complementary to that of McDaniel. In brief, their paper compares the learning gains of two methods — concept mapping (which they refer to as a method of encoding new information) and retrieval practice. Retrieval practice consisted of an initial study session followed by the administration of a free recall test in which the students recalled as much of the information as possible. Students then restudied the material and a second free recall test was administered. Learning gains from retrieval practice were substantially higher than for concept mapping.

However, this work brings up many unanswered questions. Are learning gains due to a fundamental difference between recall and elaborative encoding, or does the accompanying testing following recall promote a re-encoding of information? For example, a “fill-in-the-blank recall” exam that focused solely on recall might yield different results from the “free recall” exam used in this paper, in which the students both remember facts and reformulate that information in the process of writing down their answers. Furthermore, with the retrieval practice method we must ask whether the learning gains are simply attributable to focused study during the second session, akin to the improved outcome from standard quizzes (4). Finally, is there any essential difference in the methodology of “retrieval practice” and frequent quizzing and, if so, which yields higher learning outcomes? Further research is needed to answer these questions.

One other question needs to be addressed: if retrieval practice is so beneficial, why don't more instructors incorporate it into their teaching methodology? Perhaps one answer can be found in additional results from Karpicke and Blunt (1). They found that students predicted that repeated studying (i.e., additional encoding) would provide the best results with regard to long-term retention, and that retrieval practice would have the worst outcome. We suspect that most instructors have been making the same assumption.

1. **Karpicke, J. D., and J. R. Blunt.** 2011. Retrieval practice produces more learning than elaborative studying with concept mapping. *Science* **331**:772–775.
2. **Karpicke, J. D., and H. L. Roediger III.** 2008. The critical importance of retrieval for learning. *Science* **319**:966–968.
3. **Klionsky, D. J.** 2008. The quiz factor. *CBE Life Sci. Educ.* **7**:265–266.
4. **McDaniel, M. A., J. L. Anderson, M. H. Derbish, and N. Morissette.** 2007. Testing the testing effect in the classroom. *Eur. J. Cog. Psych.* **19**:494–513.

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## REVIEWS

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