Test Enhanced Learning

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The key idea underlying our research is that frequent classroom testing (and student self-testing) can greatly improve education from kindergarten through university. This is a bold claim that runs counter to current wisdom in educational circles, where many teachers and administrators decry emphasis on standardized testing in the schools and "teaching to the test" rather than encouraging creativity. Further, some argue that classroom testing takes away valuable class time that could be used for instruction or discussion. However, in a system of test enhanced learning, we emphasize testing as an aid to learning, a practice that should be part and parcel of a good educational system.

The starting place for our research is in experiments on the testing effect, an experimental finding that dates back nearly 100 years. In this type of experiment, different groups of students learn the same material in preparation for a final criterial test at some later point. Some groups take an intermediate test shortly after study, whereas the other groups do not. The group taking an initial test performs better on the final test relative to the group who only studied the material (even if no feedback is given on the initial test).

One explanation for the testing effect is that the group receiving the initial test simply gets another study opportunity for the material during the test. However, several experiments have ruled out this idea. For example, in a paper in Psychological Science this month (see "Test-enhanced Learning: Why cramming is a poor strategy" on Page 10), Roediger and Karpicke show that giving tests after reading prose material produces a greater benefit on a final test given a week later than do many additional readings of the material. This outcome occurs despite the fact that students in the repeated study condition are re-exposed to the entire set of material, whereas those in the testing group are re-exposed to only what they can recall. Further, repeated testing boosts the testing effect, so the positive effects of testing cumulate.

The research sponsored by IES is permitting us to ask many questions about this phenomenon using educationally relevant materials. For example, do various types of test foster different benefits on a final test? Kathleen McDermott, working with Sean Kang, examined initial testing with a short-answer test or a multiple-choice test. The final criterial test could be either the same as or different from the intermediate test. They found facilitative testing effects for both kinds of test (relative to a nontested control condition), but also found that the short answer test, requiring students to produce answers, led to a greater benefit on the final test regardless of the nature of the final test (as long as feedback was given on the test). This finding has parallels to work from the list-learning literature showing that recall tests produce a greater testing effect than do recognition tests.

Mark McDaniel, Janis Anderson and their colleagues conducted an experiment on the effects of testing in a within-student design in a University of New Mexico "Brain and Behavior" course. For different textbook chapters within the course, students took either short-answer or multiple-choice quizzes (with feedback), or they read statements covering the critical facts without having taken a test. As a control, some of the content from the chapters was not tested or re-exposed. On multiple-choice exams given

later, students performed better on the content that had been quizzed than they did on content either reread or not additionally exposed. As in the laboratory study described in the previous paragraph, the short-answer conditions provided a greater benefit than did multiple-choice testing.

In other research, we (and other groups of researchers, too) are asking questions such as the best temporal placement of tests. Other important issues concern the placement of feedback (studies conducted by Andrew Butler) and the effects of taking a test covering part of a chapter on other (nontested) material in the chapter (experiments by Jason Chan).

Besides the direct effects of testing in improving knowledge of the tested material, using frequent testing in the classroom causes students to study at a more regular pace and also seems to reduce test anxiety. Test-enhanced learning is, we believe, an exciting prospect for improving learning throughout the educational system.

References

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