

Learning From Our Mistakes: Interactive Testing That Rewards Real-Time Learning

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By their very nature, multiple-choice tests reduce variance in grading and simplify the grading process. However, these benefits have traditionally been achieved at a cost of reducing the learning experience of the exam. The technique we describe enhances the learning experience while preserving the objectivity of multiple-choice exams. While some test formats have been developed that allow students to select more than one response and earn partial credit (Epstein et. al., 2002; Bush, M., 2001), we do not know of any technique that provides a more rigorous learning experience than our real-time learning technique.

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A criticism of testing in general is the absence of immediate feedback during the moment in which students are most engaged with the material. The development of the Immediate Feedback Assessment Test (IF AT) (Dihoff & Epstein, 2003; Epstein et al., 2002) allows students to immediately view the accuracy of their responses. Many instructors using the IF AT form award partial credit for a correct response on the second try. Epstein demonstrates that this alone increases retention of knowledge. One theory is that once students have seen the correct response, they will understand why it is correct and, thereby, learn from the question.

The current research extends Epstein's results in two directions to create a more rigorous learning experience. First, we assess whether students profit differentially depending on their level of anxiety and goals. Second, we provide students with a real-time opportunity to demonstrate that they have learned from their mistakes.

Does a student's baseline level of anxiety influence her performance on an immediate feedback test? Are anxious people more likely to be made more anxious by immediate feedback? How will their performance be affected? Will students be more satisfied with this form of multiple-choice testing? Psychological studies suggest that students have either a performance or learning goal orientation (Dweck, 1988; Nicholls, Cheung, Lauer, & Patashnick, 1989). Students with a performance goal focus more on outcomes such as grades. Students with a learning goal focus more on acquiring knowledge. Do student goals mediate the effects of anxiety? Will students with a performance goal lower their anxiety by feedback? Will students with a learning goal experience no change in anxiety?

We believe that a good test should be a learning experience rather than just an assessment of knowledge. Part of learning is making mistakes and then understanding why they are wrong. Can students truly learn from their mistakes? We believe that if students can identify why their answer is wrong, then that is evidence of real-time learning. Early results suggest that students can select the correct reason that their answer is wrong with a high degree of accuracy.

Methodology

Early in the course, students are surveyed to measure their baseline anxiety about taking multiple-choice tests and their chronic goal orientation. Students then take an exam with two assessments. The first assessment uses the IF AT form with 50 questions. Each question has four or five answers. Students scratch off the box corresponding to their response to each question. If the box reveals a star, then they have found the correct answer. If the box is blank, then they continue scratching until they find the correct answer. Students earn full credit for questions answered correctly on the first try.

For questions that students miss, they are given a second assessment to gauge whether they can identify the reason that their first response was incorrect. If they are able to do so, they earn partial credit for their answers to those questions. The partial credit assessment has a multiple-choice question corresponding to each wrong

answer. Yes, that is a lot of questions!

For example, assume the original question was "choose the first University not located in one of the original 13 colonies," and the student incorrectly answers "University of Michigan." The partial credit options might be: (1) "Ohio University was the first university founded in the Northwest Territory in 1804"; (2) "Indiana University was the first university founded west of the Appalachian mountains in 1787"; and (3) "The University of Virginia was the first university founded south of the Mason-Dixon line in 1825." To earn partial credit, the student would have to choose option (1), Ohio University.

Students then turn in the partial credit assessment for scoring. While the instructor is computing the grade, students are asked to fill out a posttest survey to measure how their satisfaction and anxiety were influenced by the assessments.

Lessons Learned

We learned a number of valuable lessons from this research.

1. First, write the test with the IF AT form in front of you. The IF AT forms are preprinted with the answers in a set order. The test answers must appear in the same order. To combat cheating, there are multiple sequences available.
2. Second, avoid questions that have "all of the above," "A & B only," or other variants as answer options. Such questions make the partial credit assessment rather trivial--that is, students need only respond that their answer was correct but just incomplete.
3. Third, number questions on the test consecutively from 1 to 50 rather than restarting numbering with sections. This will make it much easier for students to find the questions on the partial credit assessment.
4. Fourth, avoid questions whose stem is phrased negatively--e.g., "Which of the following is NOT. . . ." It is difficult and confusing to write partial credit questions for negative phrasing.
5. Fifth, avoid matching questions. Matching questions often assume that each item is used once, but the preprinted forms rarely have a run of, say, five questions, each of which has a different letter answer.
6. Sixth, don't write the partial credit assessment until the test is completely edited. Any change to the test will result in the need for multiple changes to the partial credit assessment.
7. Seventh, when writing the test it is helpful to boldface or color the correct response. This makes it easier to write the partial credit assessment. However, such markings should obviously be removed before printing.

The session describes the design of a multiple-choice test that creates a learning experience for students. The design is based on immediate feedback coupled with the opportunity to provide explanations for incorrect responses. Also studied are psychological variables that might affect performance in an immediate feedback test format. The technique is designed to accomplish four goals--create a more rigorous learning experience, provide immediate feedback, avoid variance in grading, and simplify the grading process.

References

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