

Adaptive Quizzing Associated with an Increase in Overall Learning

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What is Adaptive Quizzing?

Computerized adaptive quizzes present students with a series of questions, altering the difficulty and/or content of future questions based on student performance (EdGrowth Advisors, 2013). Typically, students who answer more questions correctly are required to complete less questions overall in order to get the same final score. This should motivate students to attempt to answer the questions correctly, rather than simply clicking through the assignment. Adaptive quizzing is designed to increase meta-cognition through continuous feedback. Ideally, the software is used after a student has already read the material so that it can be used as a method to improve retention through retrieval practice. This allows students to identify what they already know in addition to gaining more experience in areas that they struggle with.

Does it work?

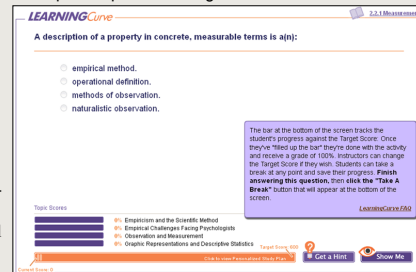
Limited research is positive. Unpublished reports from textbook publishers have found, compared to sections without adaptive quizzing:

- Higher pass rates in sections with adaptive learning quizzes
- Higher percentage earning A or B, and same percentage earning D and F.
- Higher exam scores on module exams.
- Frequent, non-adaptive quizzing associated with higher exam scores on midterms, but lower scores on the final exam. (McGraw-Hill, n.d. & Pearson, n.d)

Methodological problems are common: No/weak controls, varying dependent measures, etc. (Bowen & Lack, 2012).

However, Becker-Blease (2013) found a positive correlation between adaptive learning completion rates and improvement using a pre/post design. We replicate these findings with two recent sections of an introductory psychology course.

Example Adaptive Quizzing Question



Method

Students in one section of an Introductory Psychology course at a medium-sized university were invited to participate. One hundred and fifty students chose to participate.

All were assigned the same, weekly adaptive quizzing assignments. Students were assigned 3 or 4 adaptive quizzes each week using LearningCurve, an adaptive quizzing tool available with the textbook. Students who reached a predetermined level of mastery were awarded full credit for that quiz. Each quiz was worth the same number of points.

Students completed the pretest on the first day of class, and the same test as post-test at the final exam for extra credit. The pre-/post-test questions were drawn from a variety of sources (e.g. practice AP Psychology test questions), but not the textbook testbank. The instructor was not the experimenter and he was blind to the pre-/post-test questions.

Hypotheses:

1. Adaptive quiz scores will be positively associated with learning, as measured by a final post-test.
2. Adaptive quiz scores will remain positively associated with post-test scores after controlling for pre-test scores.
3. Students who complete all of their adaptive learning quizzes versus those who did not would receive higher post test scores

Results

Total adaptive quiz scores ranged from 0 to 100% ($M = 90\%$, $SD = 17$). Pre-test scores ranged from 17% to 87%. Post-test scores ranged from 27% to 97%.

Adaptive quiz scores were positively associated with post-test scores ($r = .23$, $p = .006$, Mean Change = 5.536), and remained significant after controlling for pre-test scores ($r = .221$, $p = .009$).

When students were separated dichotomously into those who completed all of the adaptive quizzes and those who did not, there was a significant difference in mean change from pre to post test ($t = 2.207$, $df = 140$, $p = 0.029$). **Students who completed all of the quizzes gained an average of 1.24 (4%) points more than students who did not.**

Discussion

Students who completed more adaptive quizzing assignments earned higher scores on a test of standard Introductory Psychology concepts. This result was not influenced by the instructors' choice of exam questions, or the similarity of quiz questions to testbank questions. The result remained significant after controlling for pre-test scores that measured prior psychology knowledge, and served as a proxy for motivation and general test-taking ability. Researchers should continue to test adaptive quizzing in classrooms using strong research designs. Future research could focus the other benefits of adaptive quizzing (e.g. is it more time efficient, are student's using it correctly, etc.).

Future Research Endeavors:

1. Is the goal academic success or learning?

Academic success:

- Grades or fail rate in current course.
- Grades or fail rate in higher level course.

Learning:

- Higher exam scores on final exam or standardized test.

Grades may be influenced by a high percentage of points shifted from exams to online quizzing, boosting success but not necessarily learning.

2. Is the goal to close an achievement gap or benefit all students?

Does adaptive quizzing differentially benefit struggling students? High achieving students?

Higher achieving students, who may be more conscientious, use better strategies or have more time to complete quizzes may well benefit as much or more than struggling students (Ceci & Papierno, 2005).

3. Are there unintended downsides?

Do frequent quiz scores lead to over-confidence? Does it encourage poor study habits?

Quizzing can lead to higher midterm scores, and lower final exam scores, possibly because students cram for midterms using online quizzes, obtain higher scores and feel over-confident going into a cumulative final (Pearson, n.d.)

4. What's the effect size?

Is adaptive quizzing worth the cost?

How does it compare to other study techniques?

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