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5-2018

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Emily Faulconer

Embry-Riddle Aeronautical University, faulcone@erau.edu

John Griffith

Embry-Riddle Aeronautical University, griff2ec@erau.edu

Hayden Frank

Embry-Riddle Aeronautical University

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Faulconer, E., Griffith, J., & Frank, H. (2018). If At First You Do Not Succeed: The Student Benefits of Multiple Trials on Summative Assessments. . (). Retrieved from <https://commons.erau.edu/publication/964>

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If At First You Do Not Succeed: The Student Benefits of Multiple Trials on Summative Assessments

Emily Faulconer, Ph.D., John Griffith, Ph.D., and Hayden Frank

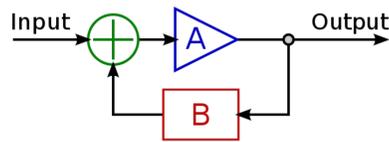
Embry-Riddle Aeronautical University

Background

Learning management systems offer flexibility in assessments. In Canvas, questions can be pulled from pools, customizing each quiz. Canvas also allows unique feedback options. Unique feedback can be programmed for students whether they got the question correct or incorrect. Feedback can even be customized based on which wrong answer was selected. Canvas also allows multiple attempts on assessments, with various options for awarding credit (final attempt, best score, average score, etc.). Combining immediate feedback with multiple attempts is a power – yet underexplored – tool.

Previous research on multiple attempts reveals that multiple attempts alone do not result in stronger performance on assessments as students are not likely to self-diagnose errors.

- ✓ Question pools reduce rate bank is compromised
- ✓ Timely feedback is a best practice
- ✓ Allowing opportunity for application of feedback is a best practice



HYPOTHESES

H_{1a} Students who do not earn an A on their initial attempt take advantage of the multiple attempts

H_{1b} Students who take advantage of multiple attempts outperform students who do not take advantage of multiple attempts

H_{1c} Students' second attempt on the assessment outperforms their first attempt

H_{1d} Students who used multiple attempts spent more time on the assessment than those who used one attempt

H_{1e} Student utilization of the second attempt varied across the term

H_{1f} Time spent on task correlates to the grade earned on the first attempt

H_{1g} Time spent on task correlates to the final grade earned

Methods

- CHEM 139/141
 - Module Quizzes (2 attempts)
 - Pre-Lab Quizzes (3 attempts)
 - October / November 2017
- Feedback
 - Actionable
 - Available once immediately after attempt
- Assessment Programming in LMS
 - No penalty for stopping on first attempt
 - Closed questions from pools
 - Questions one-at-a-time
 - Save and resume option
 - Timed – 1 hour
 - Keep highest score
 - Multiple attempts communicated multiple ways
 - Auto-graded by LMS

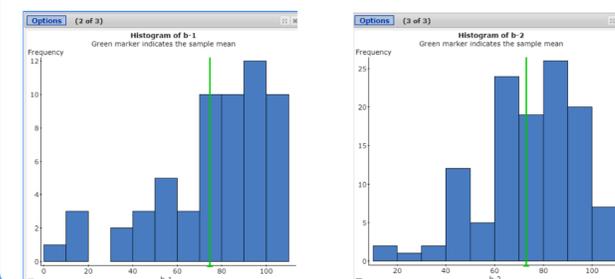
Exploring the Data

Do students who need to take advantage of a second attempt do so? (H_{1a})

- Chi Square with $\alpha = 0.05$
- **Reject null, accept alternative hypothesis**
 - <A tend to try again on quiz
 - <A tend to try 2nd attempt on pre-lab
 - <A tend to try 3rd attempt on pre-lab

Do those who used multiple attempts outperform those who did not? (H_{1b})

- Quizzes
 - T-test with $\alpha = 0.05$
 - P value on one tailed test = 0.6804
 - **Fail to reject the null hypothesis**
 - No difference in final scores between 1 and 2 attempts
- Pre-Labs
 - ANOVA
 - P value = 0.8667
 - Post-hoc Tukey HSD test
 - **Fail to reject the null hypothesis**
 - No difference in final scores between those who took 1, 2, or 3 attempts



Exploring the Data (cont'd)

Do students do better on a future attempts after receiving feedback? (H_{1c})

- Paired sample t-test with $\alpha = 0.05$
- P value = 0.0001
- **Reject null, accept alternative hypothesis**
 - Students who took the quiz twice scored significantly higher on the second attempt

Do students spend more time on task when using multiple attempts (H_{1d})

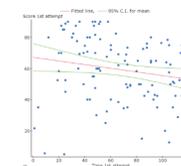
- Two sample t-test with $\alpha = 0.05$
- P-value = 0.0001
- **Reject null, accept alternative hypothesis**
 - Students who used multiple attempts spent much longer on the assessment (nearly double on average)

Does student use of multiple attempts vary during the term? (H_{1e})

- Regression analysis
- Pearson's r correlation coefficient = 0.015 and coefficient of determination = 0.0002
- **Week of term is not a good predictor of utilization of multiple attempts**

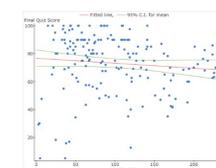
Does time on task correlate to the grade earned on the first attempt? (H_{1f})

- Regression analysis
- Pearson's r correlation coefficient = -0.1866 and coefficient of determination = 0.0348
- **Time on task is NOT a predictor of score on first attempt**
 - Model only explains 4% of variation



Does the total time on task correlate to a better final grade? (H_{1g})

- Regression analysis
- Pearson's r correlation coefficient = -0.106 and coefficient of determination = 0.0112
- **Time on task is NOT a predictor of score on multiple attempts**
 - Model only explains 2% of variation



Pedagogical Implications

- ✓ Students self-select to take advantage of multiple attempts
 - ✓ Score higher on 2nd attempt
 - ✓ Spend more time on the assignment
 - ✓ Used multiple attempts throughout the term
- ✓ Assessment design with multiple attempts that incorporate feedforward allows students to demonstrate stronger mastery of content
- ✓ Multiple attempts are a time investment that is not correlated to better performance (but time on task on the first attempt is not a predictor, either)

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