Do students learn better using online testing with multiple attempts?

1. Introduction
   • A new method to assess student learning was implemented for IE 305 Engineering Economic Analysis
   • Students were evaluated with online testing modules which they could take repeatedly until they passed
   • Questions were randomized; very unlikely that a student ever received the exact same question

   Goal: Evaluate students’ performance when they are allowed multiple attempts of online tests and compare student performance to traditional assessment methods

2. Method
   Fall 2017
   • Engineering Economics course with 242 students
   • Students had to take 7 online testing modules (TMs), which accounted for their semester grades
   • Each TM had 7 or 8 calculation questions
   • Questions were randomly selected from a large pool for each attempt
   • The solution allowed ±1% of rounding error
   • Passing an TM required answering all but one question correctly (no partial credit)
   • Two additional TMs required for students to earn an A
   • Students could use class notes, book, calculators, Microsoft Excel, and Internet to solve the questions

   Spring 2017
   • Traditional assessment method was used for 163 in-class students
   • Three 50 minutes tests, a final online exam, a group project, and eight homework with 5-7 problems each accounted for the semester grades

3. Results
   • B is average grade for fall and B- is average grade for spring
   • 52% of fall students earned an A or an A-
   • Higher percentage of D, D-, and F for fall compared with spring

   Students survey
   • 80% of students feel anxious during in-class exams
   • 73% of students are not anxious during online tests
   • Students prefer online testing

<table>
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<th>Anxious during in-class exam</th>
<th>Anxious during online exam</th>
<th>Engage-ment in course with online test</th>
<th>Prefer online testing</th>
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4. Conclusion
   • Students feel less anxious with online tests
   • Students take advantage of opportunity for multiple attempts to pass the online test
   • Greater percentage of students earn A with online tests
   • Some students procrastinated too much and performed very badly with the online tests

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