Using Exams as a Teaching Tool

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Abstract

In writing assignments, instructors ask students to revise and resubmit their work. Unlike writing assignments, exams are a culmination event. Revising exams would reduce the incentive to study prior to the exam. However, self-assessment can be quite beneficial for learning. The assignment discussed in this work facilitates the revise/resubmit stage but maintains the exam as a culmination event. The findings include a statistically significant increase in the mean score on exams after using the assignment.

Key Words: pedagogy, formative assessment, self-assessment, feedback

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“All too often, however, the learning function of testing is overlooked.” (Angelo and Cross, 1993: 359)

1. Introduction

The study presented here spans my experiences from ten years of teaching a course on money and banking. The course content has largely remained the same. Students who performed poorly on the first exam have traditionally visited office hours or simply complained to their friends. Knowing that post-exam review is important and managing an in-class post-exam review proved to be two different issues. Going through the exam in front of the class could get out of hand fast, and allowing them to review in groups resulted in students sharing their scores with others, which was uncomfortable for them. The tool discussed here, second chance assignment, allows for a post-exam review that actually increases scores on the next exam.

Additional motivation for studying the second chance assignment comes from research on pedagogy. The assignment allows for summative assessments such as exams to support continued learning through a post-exam review of content and study habits. Students are asked to review the questions they missed, find a pattern in the types of questions they missed, report their study strategy for the exam, and make a plan for improvement. In economics, the review of questions they missed is especially important, given the building-block nature of the curriculum. In terms of classroom management, this assignment allows students to reflect on their exam feedback, review their study habits, and take responsibility for their performance.

As mentioned, the study includes an upper-level economics course, Money and Banking. The student performance data come from 10 years of teaching the course (2004-2014), with approximately one section per year, and includes 336 students. The teaching tool was implemented in 2008, while the structure of the course, including content coverage, has remained unchanged, with the exception of inclusion of the 2007-2009 financial crisis.

2. Literature Review

Pedagogical support for this activity comes from the literature on classroom assessment, feedback, and reflection. Angelo and Cross (1993) provide two specific techniques that relate to this activity, Assignment Assessments and Exam Evaluations. The goals of exam evaluations are as follows: “develop appropriate study skills, strategies, and habits; learn to evaluate methods and material in this subject; cultivate an active commitment to honesty; develop a capacity to think for oneself” (p. 359). To be successful, they recommend using the exam evaluation for an exam type you are going to give again, not just at the end of the course. They also recommend separating comments about grading fairness from comments about learning value. This assignment includes a separate question about grading concerns. Lastly, the activity is more likely to succeed if instructors avoid asking about things that will not be addressed or changed.

Formative assessment received a comprehensive review with the meta-analysis of Black and Wiliam (1998). Formative assessment has two main tenets: realization by the learner of a disconnect between the current state and goal and action to move the learner toward the goal. The assignment presented here meets both of these principles. Students receive their exam score to indicate the gap between their current knowledge and their goal. In the assignment, students review the questions to reinforce the content and make plans for strategies to improve on the next exam.

Similar to formative assessment is self-assessment. This skill is part of executive function descriptions and is referenced by Sadler (1989) in the recommendation that students need to learn how to interpret feedback. The connections between exam score, learning, and studying are not readily apparent to students. The feedback assignment presented here helps students reflect on their learning process and coach them on strategies for improvement. By collecting written reflection and
improvement plans, students can reference the process and plan before the next exam, which is consistent with Yinger and Clark (1981).

Moreover, the second chance assignment reflects suggestions from Smith and Pilling (2007), specifically the claim that student learning increases when there is opportunity for reflection and plans for improvement. Additionally, students are able to practice the reflective practices needed when they transition from student to professional (see also Rushton (2005) and Schon (1983)).

Likewise, Boud (2000) discusses self-assessment and indicates that frequent self-evaluation can lead to gains in student learning. According to Boud, assessment activities, such as exams, need to serve two purposes to be most effective. The second chance assignment satisfies the three ways he lists for meeting the dual purposes:

- They have to encompass formative assessment for learning and summative for certification.
- They have to have a focus on the immediate task and on implications for equipping students for lifelong learning in an unknown future.
- And they have to attend to both the learning process and the substantive content domain [field of study].

(Boud (2000), page 160)

In reference to feedback, Mutch (2003) reviews a dataset of feedback to consider the quality and value of feedback in business courses and concludes that effective feedback comes with class time to reflect on the feedback and make a plan for improvement. The assignment presented here allows students time to reflect on their learning and engage with the exam material again in a setting where they can get help from the teacher and their classmates. This method is consistent with the suggestion to allocate class time for reflection from Higgins, Hartley, and Skelton (2002).

With respect to learning the content, Kuo and Simon (2009) looked at the frequency of testing. Especially for the low performing students, it is critical that exams have timely feedback and further instruction for content that has not been mastered.

For more on feedback, Hounsell, McCune, Hounsell, and Litjens (2008) presents a guidance and feedback loop to illustrate the learning students gain from reflecting on feedback. The second chance assignment helps to foster steps 4, 5 and 6. Step 4 is feedback on performance/achievement, which would be provided through the exam scores that students receive. Step 5 is supplementary support, which comes from the instructor, classmates, and course materials that students use to complete the exam revisions. Step 6 is feed-forward, which is included in the assignment with the plans for improvement.

Additionally, feeding forward is a term used by Quinton and Smallbone (2010) to describe a teaching model in which students engage with and reflect on feedback in the classroom with a thought toward using that information in the next assessment. “In order to enable students to learn from experience and to feed forward into continual personal and professional development, reflection needs to be captured and recorded in some way” (p. 126).

3. Methodology of the Study

The study examines the exam scores and course grades for students who completed the second chance assignments. The assignment was administered after the exam as an in-class assignment during which the students could use their books, notes, and classmates. The study was conducted using upper-level students in an economics course made up of business and economics majors. The course had principles of microeconomics and principles of macroeconomics as prerequisites. Class sizes ranged from 20-55 students. The activity usually took no more than 20 minutes. The exams included multiple choice, calculation, and short-answer or graphing questions. All exams were conducted using pencil and
paper. The sample includes only on-campus courses. The logistics for how the assignment is conducted are provided in the appendix.

The comparison of treatment and control groups will be based on a T-test of the mean and F-test of the variance of exam scores and course grade. The treatment was the assignment. While there was feedback given on the assignments, the assignment scores were based mostly on participation. Therefore the treatment for this study is whether the assignment was given as part of the course.

4. Results

As a starting point, the mean exam 1 scores are not statistically different between treatment and control groups. The assignment was administered after exam 1. Students reflected on their performance and made a plan to improve their scores. Students in the section in which the second chance assignment was used increased their scores from exam 1 to exam 2 by a statistically significant margin.

Table 1: Exam Performance results

<table>
<thead>
<tr>
<th></th>
<th>Control Group (No second chance assignment in the course)</th>
<th>Treatment Group (Second chance assignment used in the course)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of observations</td>
<td>101</td>
<td>235</td>
</tr>
<tr>
<td>Exam 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>79.378</td>
<td>77.759</td>
</tr>
<tr>
<td>variance</td>
<td>179.9</td>
<td>166.77</td>
</tr>
<tr>
<td>Exam 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>79.168</td>
<td>81.615*</td>
</tr>
<tr>
<td>variance</td>
<td>169.54</td>
<td>139.155</td>
</tr>
<tr>
<td>Improvement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(exam 2 – exam 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>-0.21</td>
<td>3.86 **</td>
</tr>
<tr>
<td>variance</td>
<td>137.26</td>
<td>130.24</td>
</tr>
<tr>
<td>Course Grade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean</td>
<td>83.66</td>
<td>83.9</td>
</tr>
<tr>
<td>variance</td>
<td>87.88</td>
<td>90.79</td>
</tr>
</tbody>
</table>

* Significantly different using a T-test at the 10% level.
** Significantly different using a T-test at the 1% level.

The effect of the assignment is highlighted by the improvement from exam 1 to exam 2. Students in the control group had no significant difference in their performance on exams 1 and 2. In the treatment group, the average improvement was 3.86% in the exam score. This is reflected by a significant difference in exam 1 and 2 scores in the treatment group using T-test at the 1% level. Exam 2 scores in the treatment group are significantly higher than in the control group using a T-test at the 10% level. The variances in exam scores and final course grade were not statistically different in the treatment group.

Another interesting finding involves the semesters in which the second chance assignment was used after exam 1 but not after exam 2. Exam 3 was the hardest exam, and the scores are statistically lower than exam 2. Comparing the exam 3 scores of the students who used the assignment after exam 1 and exam 2, these students performed better than the students who only completed the assignment.
after exam 1. This result would suggest that the assignment has benefits each time it is used, not just as a model for students to use when doing their own post-exam review.

### Table 2: Performance on future exams

<table>
<thead>
<tr>
<th>Exam 3 – Exam 2</th>
<th>Treatment Group (Assignment after exam 1 and exam 2)</th>
<th>Treatment Group (Assignment after exam 1 only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-2.089**</td>
<td>-6.896</td>
</tr>
<tr>
<td>Variance</td>
<td>87.097</td>
<td>96.612</td>
</tr>
<tr>
<td>Observations</td>
<td>135</td>
<td>100</td>
</tr>
</tbody>
</table>

**Significantly different using a T-test at the 1% level.

The drop off in exam 3 scores is not as sharp for those students who completed the second chance assignment after both exam 1 and 2. The difference in means is significant at the 1% level.

### 5. Additional Observed Benefits

In addition to improving exam scores, the second chance assignment provided multiple pedagogical benefits. First, the summative nature of the exams is maintained. Second, students learn the skill of reflecting on the exam feedback and their preparation, which translates into increased responsibility for performance. Third, students engage with the content again after the exam in a less stressful environment. Last, the instructor receives feedback about exam design and how students interpreted the questions.

Formative assessment is valuable for learning, but exams seem to be the only incentive to get students to seriously think about the topics and applications. Ultimately, the instructor needs to know if the students have met the learning objectives of the course. The assignment keeps the deadline pressure that exams bring but allows for reflection and feedback to help with future performance.

One of the assignment questions asks students to determine why they missed the exam question. The goal is to have students find the error in their knowledge that led them to the incorrect answer. This is an important step in formative assessment as referenced by Black and Wiliam (1998) because it allows students to determine the gap between what they know and their goal. The assignment encourages students to take responsibility for their performance and their choice of exam preparation strategy. It also allows them the opportunity to match the content they studied with the content on the exam and the learning objectives. For some students, the principles of economics course is their first exposure to the concept of opportunity cost and using their scarce time to maximize grades in all classes. In addition, the assignment allows early detection and follow-up for any student who may need a referral or recommendation to seek help from one of our student support services for test anxiety, stress management, or study skills.

In reference to the third benefit listed above, the assignment increases students’ active connection with the content on the exam. In most economic courses, students spend class time practicing the application of economics either individually or in groups. However, many times students haven’t thought about the problem long enough to know what they don’t understand. They believe they understand, and they convince others of it. Misunderstanding can be disguised as understanding (Wiggins & McTighe, 2006). By reviewing the exam with their notes and classmates, students can reinforce concepts they know and refine their knowledge of the content.
If the final exam is cumulative, it is especially important that students know how to answer the exam questions. Students often feel the exam is the end of that section of content and do not expect to study or learn the material further. The point is made clearly in Klemm (2007) on page 64: “Teachers are most interested in having students remember their lessons long after the time they are first presented. Yet most students study from test to test. Occasional rehearsal of old-test material is needed for longer-term memory. That is why final exams are so difficult for students.”

The last benefit comes in the form of teaching feedback. The assignment generates feedback about which questions were particularly difficult and why. For the multiple choice questions, descriptive statistics can yield information on performance but do not tell the instructor why the student chose the wrong answer. The assignment allows a distinction between whether the student does not know the content or the question is poorly written. From their review of the exam, students indicate what they were thinking when answering the question. For example, they may have just read the question wrong. If many of them indicate they read the question wrong, it likely needs to be reworded. Unlike multiple choice questions, short-answer/calculation questions do not have the benefit of any descriptive analysis. The assignment gives insight as to why the student thought the question was difficult.

The gains to students from this assignment include achieving higher exam scores, addressing any grading questions, knowing the correct way to answer all of the exam questions, getting feedback on study habits, and developing a strategy to improve performance. The first question on the assignment gives them a formal, easy, and non-confrontational way to approach any grading concerns they have. In the use of this assignment for the past six years, most students do not end up getting points back from the concerns raised about grading, but they do feel validated and respected by allowing the conversation between instructor and student to occur.

6. Conclusion

In economics, instructors spend a considerable amount of time discussing incentives. The assignment presented here is a way to structure the incentives so that students retain more of the material and take ownership for their performance in class while also increasing their exam scores. Klemm sums up the motivation nicely on page 70: “No teacher should be satisfied to have students learn only for the next test, yet too often testing is not based on a philosophy that learning is to be permanent” (Klemm, 2007). To put it another way, often students have an incentive to learn the material only long enough to take the summative assessment that will contribute to the grade. The assignment keeps the deadline incentives of an exam but encourages continued contact with the content and develops skills of self-reflection that will aid students in the study of all subjects.
References


Appendix

Assignment Narrative
Review your graded exam and complete each of the following steps. You may attach additional sheets of paper if needed.

Turn in this assignment and your exam copy before you leave class. In order to receive points on this assignment, you must have correct answers for #2 and complete answers for questions #3, 4, and 5.

1. Review your score on the exam and make sure you understand how it was graded. If you have a question about grading, write your question and indicate the question number. If you do not have any grading questions, please write none.
2. Review the exam questions. Identify the correct or "best" answer to each question. For each question where you did not receive full credit, give the correct or revised answer in the space below. Make sure to indicate the question number.
3. Review your answers and identify why you did not give the correct or "best" answer in each case. Summarize your findings in writing for each question and indicate the question number. For example, you misread the question, you didn't study that material or you didn't understand a concept. [Optional modification: Review your answers and summarize two topics that were particularly difficult for you. Consider both the short answer and multiple choice questions to determine the two concepts.]
4. Describe your study strategy for this exam. For example, did you read all of the chapters in the book? Did you study individually or with a group? When did you start studying?
5. Determine (and summarize in writing) what you can do, in general, to improve your performance on future exams.

If you have problems completing any of these steps or would like to go over your exam follow-up assignment, please see me during office hours or schedule an appointment. We can discuss your exam as well as strategies for improving your performance on future exams.

Logistics
Grade the exams but do not include feedback that would point them to the correct answer. The activity takes the least amount of time if you indicate on their exam which questions they missed. Tell the class beforehand to bring their book, notes, and calculator to class on the day of the activity. Distribute the assignment when you hand back the graded exam copies. Allow 15-20 minutes in class for the activity. Ask students to complete the assignment and return the assignment copy and exam copy to you. It is your choice if you want to have them work together with others who had the same exam version. Be prepared to walk around the room answering questions or guiding them as they tackle the questions again. If any grading concerns arise, have them use question 1 to raise their concern and you will address it when you read the assignment. Review the assignments with their exam copy to determine if they now have the correct answers. If not, provide constructive feedback. Return the graded assignments (and the exams if you desire) so that students can reference their plan for improvement.