INTRODUCTION

Many college instructors want students to make an effort to learn from mistakes on quizzes and exams, but do not think that students typically do this.¹

In a survey of introductory engineering students, only 21% indicated that they would revisit an exam after taking it. Many further stated that this would only be if the final were cumulative.²

In this poster we describe an assignment where students correct errors on their exams as a way to learn from their mistakes.

THEORETICAL UNDERPINNINGS

Formative Assessment: Feedback (and student processing of feedback) is the most important part of learning.

Metacognition: An ability to think about one’s own thinking and monitor one’s current level of understanding is essential for learning.

Personal Epistemology: Student beliefs about knowledge and learning have a significant effect on their approaches to learning and their learning outcomes.

Understanding Students: Effective teachers understand where their students are, what they are thinking, and how they are interpreting information provided in the course.

Variations in the use of assessment corrections

<table>
<thead>
<tr>
<th>What students asked to do</th>
<th>When do students get instructor feedback?</th>
<th>Grading</th>
<th>Incentive</th>
<th>When used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct mistakes and explain why they were made</td>
<td>Before doing quiz corrections</td>
<td>0, 1, 2</td>
<td>Points added to exam score</td>
<td>On all tests, but not final</td>
</tr>
<tr>
<td>Correct mistakes, briefly explain errors</td>
<td>After doing quiz corrections</td>
<td>All, half, or nothing</td>
<td>Counts as a homework assignment</td>
<td>On all tests but final</td>
</tr>
<tr>
<td>Diagnose: identify what went wrong</td>
<td>Before doing quiz corrections</td>
<td>All or nothing</td>
<td>Increase quiz score by 50% of missed points</td>
<td>All weekly quizzes, but not exams</td>
</tr>
<tr>
<td>Generalize: beyond the specific problem</td>
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Bob Brown, Case Western Reserve University:

When you get your exam back, please go through it and briefly correct all of your mistakes: squeeze the corrections right onto the exam answer sheets themselves—use a different colored pencil or pen so we can identify your new remarks. Also, explain in only a few words (again, squeeze them right onto the exam answer sheets) why you made the mistakes you did (e.g., you missed a numerical constant, you made a calculation error, you confused something, etc.). Please don’t just say “you didn’t have a clue;” you very likely can tell us more than that about what stopped you from proceeding correctly. In class we’ll go over the corrected and explained exam with your other homework and we’ll get it back to you when we grade it and give you back that homework after grading. You—and we—will learn from this!

Kathy Harper, Denison University:

Midterm corrections: To assist you in using your graded midterm exams as learning tools, I require that you turn in corrections in any problems that you missed. These will be due at the class meeting after the exams are handed back. While writing these corrections, you may consult with any resources, including the book, classmates, or instructors. You will receive all 10 points for an honest effort. If your score on the midterm is 90% or greater, you do not need to submit the corrections and will receive 10/10 for the assignment.

E-mail

Today you received your graded exams. As you’ve seen in the syllabus and textbook, you are to look over the exam and turn in corrections to anything you missed. You can consult any resources, including the book, other students, the internet, and anyone on the instructional staff. I want you to understand what you did wrong so that you will not make the same mistakes again later! Please write your corrections on separate paper and include a short statement about why what you did originally was wrong. Submit the corrections, along with your original exam, at the beginning of class on Wednesday.

Example of Student Quiz Correction

(Charles Henderson, Western Michigan University:

Quizzes are designed to be a learning experience. Therefore, you can improve your quiz score by carefully reflecting on your performance and learning from it. Completing this assignment appropriately will allow you to increase your quiz score by half of the points that you missed. This is an all-or-nothing assignment. It is intended only for those students who are interested in making a serious effort to improve their understanding. If it is not done well, you will not receive any additional points.

To receive credit for your corrections, you need to address the following two phases for each question or problem that you did not receive full credit on. See detailed description of each in the separate document.

Diagnosis Phase (DP) – Identify what went wrong.

Generalization Phase (GP) – Learn from your mistakes by generalizing beyond the specific problem.

Please type your answers below and use additional pages as necessary. Be sure to attach your quiz paper so I know what you are talking about.

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EFFECTIVENESS

Although we have not conducted experiments to evaluate the effectiveness of assessment corrections (i.e., no control groups were used), we consistently find that:

A) Students have large gains in conceptual understanding in classes where assessment corrections are used.

<table>
<thead>
<tr>
<th>CSEM scores for quiz correction courses (students who took both pre and post CSEM)</th>
<th>Component of Course</th>
<th>% of students rating as ‘extremely helpful’ for their learning of physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>W04 (OSU)</td>
<td>F04 (WMU)</td>
<td>W05 (OSU)</td>
</tr>
<tr>
<td>N = 194</td>
<td>N = 46</td>
<td>N = 210</td>
</tr>
<tr>
<td>CSEM Pre</td>
<td>33.8 ± 1.0%</td>
<td>32.0 ± 1.5%</td>
</tr>
<tr>
<td>CSEM Post</td>
<td>71.0 ± 1.1%</td>
<td>64.2 ± 2.1%</td>
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<tr>
<td>&lt;g&gt;</td>
<td>&lt;g&gt; ± .56</td>
<td>&lt;g&gt; ± .47</td>
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B) Students believe that assessment corrections help them learn.

Student rating of the extent that various course components helped them learn. (From Henderson’s calc-based intro physics course, Fall 2004)

Component of Course

<table>
<thead>
<tr>
<th>Quiz Corrections</th>
<th>Use of Main Ideas</th>
<th>Web site</th>
<th>Group Work</th>
<th>HW Exercises</th>
<th>HW Problems</th>
<th>Lectures</th>
<th>Written HW</th>
<th>Quiz/Exam</th>
<th>Office Hours</th>
<th>Text</th>
<th>Problem Solution Requirements</th>
<th>Reading Question</th>
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<tbody>
<tr>
<td>50</td>
<td>45</td>
<td>33</td>
<td>30</td>
<td>30</td>
<td>23</td>
<td>23</td>
<td>20</td>
<td>18</td>
<td>15</td>
<td>11</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

C) Assessment corrections appear to lead to more meaningful learning for many students, and also more effective use of class time.

- Students ask thoughtful questions about the physics.
- More students visit office hours after exam than before.
- Students take corrections assignment more seriously than general homework.
- Less class time is spent going over exam/quizzes.

REFERENCES