The Impact of Process vs. Outcome Feedback on Student Performance and Perceptions

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ABSTRACT

Much has been written in higher education assessing the value of feedback. This article seeks to explore how altering the feedback message might influence student learning and perceptions of learning. Feedback was provided on in-class quizzes in either the process portion or outcome portion of the quiz. Not only did process-oriented feedback have a more positive impact on student performance on quizzes than outcome-oriented feedback, it also was perceived more favorably by students both in terms of its usefulness and its impact on their learning in the class. However, the quiz feedback students received did not seem to generalize to a similar type of analysis question on other types of assessment instruments. This exploratory study suggests further research is warranted regarding the types of feedback provided, the type of assignment/assessment and the type of thinking required.

Introduction

Feedback is an essential component of learning, growth and development. Feedback provides individuals with information about their behavior or performance so they know what needs to be changed in order to improve. In cybernetics systems theory (Frandsen & Millis, 1993), feedback facilitates self-regulation because it identifies a gap between current performance and desired performance. Once the gap is identified, the individual can take action to close or reduce the gap. Thus, whether the feedback is used by employees, students, athletes, or artists, it is a mechanism to enhance learning and/or performance.

The role of feedback in traditional educational contexts has been studied extensively. Despite all that has been learned about the feedback process in general (e.g., Taylor, Fisher & Ilgen, 1984; Ilgen, Fisher & Taylor, 1979; Ilgen & Davis, 2000; Kluger & DeNisi, 1996) and the evidence that feedback enhances student learning in particular (Black & Wiliam, 1998; Hattie & Timperley, 2007), educators still struggle with how to most effectively use feedback to enhance student learning. Potential obstacles include the substantial time requirements associated with providing detailed feedback, uncertainty about what type of feedback will have the most value, and a lack of control over whether the feedback is utilized, either effectively or at all, by the student. In this paper, we will describe a feedback intervention used in teaching fundamental critical-thinking skills in an upper-level college economics class. Although the results are exploratory in nature, they suggest that feedback focusing on the student’s thought process may have a more positive impact on learning than feedback focused on the final answer (e.g., Brookhart 2008).

Literature Review

Factors Influencing Feedback Effectiveness

Ilgen, Fisher and Taylor (1979) conceptualized the feedback process as a special case of the more general communication process. Looking at feedback from this per-
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found that providing students with a tentative grade along with elaborate feedback than basic feedback. Black and Wiliam (1998) distinguished between descriptive and formative feedback in educational contexts. Pokorny and Pickford (2010) hypothesized that students would perform better on the assignment at the end of the course if they were receiving feedback. This is because the feedback process is more under the student's control than the outcome and because ultimately, changes in the process are necessary in order to have a better product for the grade. Percept-oriented feedback according to Sadler (1983) is beneficial because it focuses on "growth rather than grading" as a way to enhance learning (p.60). The recommendation to focus feedback on the process is also consistent with a substantial body of research which finds that feedback showing students how to reach the answer is more effective than feedback about whether the answer provided is correct or incorrect (Kluger & DeNisi, 1996). Our research examines this recommendation empirically.

In an educational context, one way to provide process-oriented feedback is to give students feedback on the thinking process they use in reaching their final answer. This contrasts with outcome-oriented feedback which is directed toward the answer provided by the student. Our research extends the feedback literature by developing an intervention that compares the typical method of providing feedback and comments in addition to the grade. Their research demonstrated that making feedback easier on the process results in a higher cumulative GPA than the students who received feedback on the outcome alone.

The Feedback Message
The feedback message focuses primarily on the content of the information provided to students about their performance. Some of the prior research investigating the feedback message has examined the nature of the feedback comments provided to students. For example, in a descriptive study, Mutch (2003) content analyzed the feedback comments provided to students. For example, in a descriptive study, Mutch (2003) content analyzed the feedback comments provided to students. For example, in a descriptive study, Mutch (2003) content analyzed the feedback comments provided to students.

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Nevertheless, the prior research makes it clear that when evaluating the effectiveness of any feedback intervention, student perceptions of the feedback should be considered. If students don't understand the feedback, they are unlikely to use the feedback to make changes, which will reduce the impact of the feedback on their performance. Consequently, in addition to looking at the effect of process vs. outcome feedback on student classroom performance, this study seeks to explore and compare student perceptions of these two types of feedback. Specifically, we examine student perceptions of the usefulness of process versus outcome feedback as well as their perceptions that learning occurred as a result of the feedback. Hence the final two research questions are:

R1: Will providing feedback to students about the thinking process they used in developing their answer on an assessment improve classroom performance more so than providing feedback to students on the outcome or answer portion of the assessment?

R2: Will providing feedback to students about the thinking process they used in developing their answer on an assessment enhance student perception of the usefulness of the feedback more so than providing feedback to students on the outcome or answer portion of the assessment?

The Feedback Recipient: Student Perceptions of Feedback
As noted above, when investigating the impact of feedback on student performance and learning it is also important to consider the feedback recipient, in this case, the student. Their perception of the feedback they receive will have a significant impact on if and how they respond to the feedback (e.g. Pokorny & Pickford, 2010; Weaver, 2006). Perhaps not surprisingly, research finds that students often do not actually use the feedback they receive (e.g. Glover & Brown, 2006; MacLellan, 2003; Sinclair & Cleland, 2007). This may be partially due to student perceptions that the feedback is not useful (Jonsson, 2002) or that it doesn’t enhance their learning. Poulos and Mahony (2008) also emphasize the importance of considering student perceptions when assessing feedback effectiveness. They conducted student focus groups and then did a thematic analysis of the resulting transcripts. Their analysis identified a number of different themes which influence student perceptions of feedback effectiveness. These themes included the timeliness and delivery of the feedback, the significance of the feedback in terms of being useful and contributing to learning, and the student’s perceptions of basing feedback on grading criteria and of receiving comments in addition to the grade. Their research demonstrates that determining what makes feedback effective is very complex and not necessarily uniform across all students.

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Table 1
Descriptive Statistics: Academic Experience

<table>
<thead>
<tr>
<th></th>
<th>Section 1</th>
<th>Section 2</th>
<th>Difference in Means (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=25</td>
<td>N=23</td>
<td></td>
</tr>
<tr>
<td>Cumulative GPA–Prior Semesters (4.0 scale)</td>
<td>3.085</td>
<td>3.117</td>
<td>-0.032 (0.134)</td>
</tr>
<tr>
<td>GPA–Semester of Study (4.0 scale)</td>
<td>3.898</td>
<td>3.800</td>
<td>0.098 (0.429)</td>
</tr>
<tr>
<td>Cumulative Number of Credits–Prior Semesters</td>
<td>101.792</td>
<td>95.478</td>
<td>-6.314 (0.355)</td>
</tr>
<tr>
<td>Number of Credits–Semester of Study</td>
<td>18.750</td>
<td>15.609</td>
<td>-3.141 (0.557)</td>
</tr>
</tbody>
</table>

*Significant at 1%.* **Significant at 5%.* ***Significant at 10%**
economic analysis to a wide range of strategic person-
nel problems encountered in the workplace. Emphasis
was placed on using this analysis to draw logical conclu-
sions and develop specific managerial recommendations.
In other words, the focus was on developing students' critical-thinking skills instead of memorization of cer-
tain facts and figures. For each topic studied, the general
methodology followed in this course was as follows: (1)
introduce the relevant microeconomic theory in class and
derive general principles; (2) apply these general principles
to current human resource practices using recent news-
paper, magazine, and journal articles; and (3) illustrate
these general principles using real-world situations from
full-length cases. Since this course was also designated as
a writing-intensive course, a second objective of the course
was to improve students' written communication skills.

Intervention Description
A significant component of the course was a series of nine
assigned cases. Combining grades received on case quiz-
zes, participation in case discussions, and case reports,
these cases represented 50% of a student's course grade.
Thus, students had a strong incentive to carefully read and
analyze these cases. Prior to each case discussion, students
were given a one-question, essay-based quiz in class. Stu-
dents in both sections were given similar questions, al-
though not identical in order to prevent the later section
from having an advantage over the earlier section. In both
sections, students were instructed to spend five minutes
brainstorming and organizing their thoughts in the box
located at the top of the quiz. During this time, students
were not allowed to write in the answer box located at the
bottom of the quiz. After five minutes of brainstorming,
students were directed by the instructor to write their an-
swer. They were reminded that their score would be based
not only on the content and organization of their answer
but also on grammar and punctuation. Students were giv-
en five minutes to write their answer. Before the quiz was
turned in, students were required to proofread it for ac-
curacy and completeness. See Appendix for a sample quiz.

One of the goals associated with the quizzes was to
develop students' ability to identify both the positive and
negative economic repercussions of pursuing a particular
managerial strategy. Doing so would help them to provide
a more balanced view of a situation and take into account
different points of view. With this goal in mind, the quiz-
zes were divided into three groups:

1. Group I: Quiz 1–Quiz 3
2. Group II: Quiz 4–Quiz 6
3. Group III: Quiz 7–Quiz 9

Group I and Group III quizzes required students to
take notes on the content of the lecture, while Group II
quizzes required students to write the presentation on a
3-point scale. However, to assess whether the the type of feedback improved outcome, the instructor varied
the written comments on the students' quizzes (R1). In
particular, students in Section 1 received feedback solely
on their answer (i.e. outcome feedback treatment), while
students in Section 2 received feedback solely on their
brainstorming process (i.e. process feedback treatment).

Measures
The primary dependent variable for R1 was student per-
formance on the nine quizzes as well as their overall per-
formance. Overall performance was assessed by perfor-
mance on the midterm, performance on the final exam as
well as final grade in the class. To examine R2 and R3, at
the end of the semester, students were asked to assess the
usefulness of the feedback received during the semester
(R2) as well as the impact of the quiz feedback on their
perceived learning in the class (R3). Note that both feed-
back usefulness and perceived learning were assessed by
3 items (see Table 4). All items were measured using a
5-point rating scale, with the "1" being "strongly disagree"
and "5" being "strongly agree." Additionally, students' perceived effort was measured in order to determine if
there were differences in effort or motivation between the
two sections. Perceived effort was measured with 3 items,
using a 5-point rating scale with "1" being "no/none" and
"5" being "a lot." Finally, students were asked for their perception of the main focus of the feedback on the
quizzes. This measure was included to determine if students
understood the nature of the feedback they received and
did such a manipulation check.

Results

**MANIPULATION CHECK**
To determine if our feedback manipulation was successful, students were asked to indicate their extent of agreement
with the following statement: "The feedback I received on
my in-class quizzes was focused on how I analyzed/pro-
cessed the information I read." If our manipulation was
successful, students who received process feedback should
agree with this statement to a greater extent than students
who received outcome feedback. As shown in Table 4, this
is exactly what we found.

**Research Question 1**
The first research question examined the impact of pro-
cess vs. outcome feedback on student learning. We first
examined learning as measured by overall performance.
T-tests comparing the two sections on performance on
the midterm exam, final exam and course grade revealed
that despite differences in quiz-related feedback, both sec-
tions performed similarly on these instruments (see Table
2).

Given that the difference in feedback between the
two sections was confined to the case quizzes, we also ex-
amined student performance on the quizzes themselves.
These results are summarized in Table 3. For quizzes in

<table>
<thead>
<tr>
<th>Table 2 Performance on Exams and Overall Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1 Outcome-oriented Feedback</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Mid-term Exam Analysis Question</td>
</tr>
<tr>
<td>Mid-term Exam</td>
</tr>
<tr>
<td>Final Exam</td>
</tr>
<tr>
<td>Overall Course Average</td>
</tr>
</tbody>
</table>

**Significant at 1%, ** Significant at 5%, * Significant at 10%**

<table>
<thead>
<tr>
<th>Table 3 Mean Performance on Quizzes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1 (Outcome-oriented Feedback)</td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Group I Quiz 1</td>
</tr>
<tr>
<td>Quiz 2</td>
</tr>
<tr>
<td>Quiz 3</td>
</tr>
<tr>
<td>Difference: Quiz 3-Quiz 1</td>
</tr>
<tr>
<td>Group II Quiz 4</td>
</tr>
<tr>
<td>Quiz 5</td>
</tr>
<tr>
<td>Quiz 6</td>
</tr>
<tr>
<td>Difference: Quiz 6-Quiz 4</td>
</tr>
<tr>
<td>Group III Quiz 7</td>
</tr>
<tr>
<td>Quiz 8</td>
</tr>
<tr>
<td>Quiz 9</td>
</tr>
<tr>
<td>Difference: Quiz 9-Quiz 7</td>
</tr>
<tr>
<td>ALL Difference: Quiz 9-Quiz 1</td>
</tr>
</tbody>
</table>

**Significant at 1%, ** Significant at 5%, * Significant at 10%**

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Group I and Group III, we found that the section receiving process feedback performed better than the section receiving outcome feedback on all quizzes except Quiz 1. This difference was statistically significant for Quiz 3 and Quiz 9.

Additional insight into the impact of process vs. outcome feedback on performance can be gained by examining the pattern of mean quiz scores over the course of the semester. As described above, the quizzes were divided into three groups, with Group I and Group III quizzes containing an analysis-based question and Group 2 containing a description-based question. Figure 1 depicts mean quiz scores for Group I (Quiz 1 – Quiz 3), Group II (Quiz 4 – Quiz 6), and Group III (Quiz 7 – Quiz 9).

When we look at the change in quiz scores within Group I, we see that students receiving process feedback improved significantly more than students receiving outcome feedback. More specifically, within Group I, although students in both sections improved between Quiz 1 and Quiz 2, the rate of improvement was greater in the section receiving process feedback. Students receiving process-oriented feedback did not experience the same sharp decline; in fact, after a slight decline on Quiz 7, their performance continued to increase. Looking at the difference in performance between Quiz 7 and Quiz 9, we find that again students receiving process-oriented feedback improved significantly more than students receiving outcome-oriented feedback. Further, looking at the change in quiz scores across the entire semester (i.e., comparing performance on Quiz 1 and Quiz 9), we find that the section receiving process-oriented feedback improved significantly more than the section receiving outcome feedback.

Although we cannot rule out the possibility that these performance differences were due to pre-existing differences between the two sections, the fact that the two sections did not differ in reported effort or motivation (see Table 4), in their cumulative or semester GPA or in the number of credits completed prior to taking the course suggests that the performance differences on the quizzes is more likely due to the nature of the feedback received rather than to other factors.

Research Questions 2 and 3

The second and third research questions focused on student perceptions of how useful the feedback was and its impact on their learning. T-tests comparing the two sections provided some evidence that students who received process-oriented feedback on quizzes perceived that feedback to be more useful in terms of improving their performance in the class than students receiving outcome-oriented feedback on quizzes. The lack of differences between the two sections in terms of perceived usefulness of feedback received on other assessment instruments is consistent with the fact that feedback manipulation only occurred on the quizzes. Students receiving process-oriented feedback also perceived that the quiz feedback had a greater impact on their learning in the class than students who received outcome-oriented feedback (see Table 4). Specifically, although there was no difference between the two sections in terms of perceived impact of the course on writing skills, the section receiving process-oriented feedback reported a greater improvement in their ability to analyze or process what they had read as well as a greater awareness of how to use feedback to improve their answers compared to students in the section receiving outcome-oriented feedback.

### Table 4

<table>
<thead>
<tr>
<th>Perception of Feedback Usefulness</th>
<th>Section 1 - Outcome-oriented Feedback</th>
<th>Section 2 - Process-oriented Feedback</th>
<th>Difference in Means (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The feedback I received on my in-class quizzes positively impacted my performance in this class.</td>
<td>3.667</td>
<td>4.350</td>
<td>0.683** (0.023)</td>
</tr>
<tr>
<td>The feedback I received on my case reports positively impacted my performance on this class.</td>
<td>4.333</td>
<td>4.180</td>
<td>-0.233 (0.352)</td>
</tr>
<tr>
<td>The feedback I received on my mid-term exam positively impacted my performance in this class.</td>
<td>3.524</td>
<td>3.750</td>
<td>0.226 (0.462)</td>
</tr>
</tbody>
</table>

### Perception of Learning

<table>
<thead>
<tr>
<th>Perception of Learning</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>After taking this course, I am better at analyzing/processing what I read.</td>
<td>4.048</td>
<td>4.450</td>
<td>0.402** (0.025)</td>
</tr>
<tr>
<td>After taking this course, I am better at explaining my thoughts in a written format.</td>
<td>4.095</td>
<td>4.263</td>
<td>0.168 (0.341)</td>
</tr>
<tr>
<td>After taking this course, I am more aware of how I use feedback to improve my answers to questions.</td>
<td>3.810</td>
<td>4.368</td>
<td>0.558*** (0.003)</td>
</tr>
</tbody>
</table>

### Perception of Effort

<table>
<thead>
<tr>
<th>Perception of Effort</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I made ______ effort to improve my writing capabilities in this class.</td>
<td>4.095</td>
<td>4.300</td>
<td>0.205 (0.2448)</td>
</tr>
<tr>
<td>I made ______ effort to improve my understanding of theory in this class.</td>
<td>3.762</td>
<td>4.180</td>
<td>0.338 (0.135)</td>
</tr>
<tr>
<td>I made ______ effort to improve my understanding of personnel applications in this class.</td>
<td>4.048</td>
<td>4.200</td>
<td>0.152 (0.555)</td>
</tr>
</tbody>
</table>

### Perception of Type of Feedback

<table>
<thead>
<tr>
<th>Perception of Type of Feedback</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The feedback I received on my in-class quizzes was focused on how I analyzed/processed the information I read.</td>
<td>3.333</td>
<td>4.200</td>
<td>0.867*** (0.005)</td>
</tr>
</tbody>
</table>

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*** Significant at 1%, ** Significant at 5%, * Significant at 10%
The purpose of this study was to compare the effectiveness of two different types of feedback – feedback focused on the student’s thinking process prior to generating an answer (process-oriented feedback) and feedback focused on the student’s answer (outcome-oriented feedback). We compared the impact of these two types of feedback on student performance as well as their perception of the usefulness of the feedback and its impact on their learning in the class. Although this was an exploratory study, our results suggest that process feedback may be more beneficial than outcome feedback for more complex analysis-based assignments. Specifically, we found that while both types of feedback resulted in performance improvement on quizzes, students receiving process-oriented feedback had significantly greater improvement than students receiving outcome-oriented feedback. They improved more within both types of assignments, (Group I and Group III) as well as across the entire semester when comparing performance on the first quiz with performance on the ninth quiz. Process-oriented feedback focusing on the student’s brainstorming/thinking process may be more beneficial than outcome-oriented feedback because it addresses the more fundamental steps a student needs to take in order to produce a better outcome. Students may more easily perceive the value of this feedback, which would increase the likelihood that they will apply it to subsequent quizzes. When students receive feedback only on the outcome (their answer), they may not be able to translate that information into what they need to change in order to improve their answers on a subsequent quiz, and thus, perceive it as having less value in improving their performance. Furthermore, feedback addressing their answer may have resulted in students focusing only on their grade and not attempting to understand and apply the feedback to the next quiz.

It is noteworthy that the quiz feedback students received did not seem to generalize to a similar type of analysis question on the midterm exam or to the case reports which also required this type of analysis. It is possible that students did not apply their learning from the quizzes to other forms of case reports. It is not clear why students were unable to significantly, on the parallel question on the midterm feedback and actually performed less well, although not necessarily identical, assignments. Also important is helping students to recognize the opportunities to utilize the methods of analysis presented for academic materials to non-academic situations. These skills and methods of analysis should enhance effectiveness in work-related contexts but if students do not apply them to these contexts, their value is lost.

Because this study was exploratory in nature and had a small sample, it is not clear if the findings will generalize to other samples and settings. However, our results suggest that further study is warranted. If we better understand what type of feedback is most appropriate for what types of assignments and for what purposes (e.g., for improving what types of thinking skills), we can provide students with feedback that will have more value – both as perceived by students and in terms of impact on student performance and learning.

**References**


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**Appendix**

**Sample Case Quiz**

Stephen Connor, research director at RSH, is faced with the challenge of replacing a star semiconductor analyst, Peter Thompson. Each of the five potential candidates possesses certain critical skills, experiences and relationships and lacks others.

- Would you recommend hiring Sonia Meetha? Why or why not?
- Brainstorm and Organize Thoughts (must fit in the box below):
- Answer (must fit in the box below):

▶ Would you recommend hiring Sonia Meetha? Why or why not?
▶ Brainstorm and Organize Thoughts (must fit in the box below):
▶ Answer (must fit in the box below):