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Peer review as a strategy for improving students' writing process

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Abstract

Peer review is an established strategy for improving the quality of students' writing. This study moves beyond the focus on outcomes to assess the peer-review process. In particular, this study focuses on the timing of the peer review, a highly structured feedback form, and student writers' revisions after engaging in peer review. This study draws from a peer-review assignment conducted over 3 years in upper-division, discipline-specific courses. The data reveal these strategies force students to begin writing earlier in the semester, help the students offer formative feedback to their peers, and encourage students to substantially revise their drafts before submitting the final paper. This study reveals the importance of assessing the peer-review process.

Keywords

feedback, formative feedback, peer review, student writing, teaching writing, writing-intensive course

As instructors, we want to teach our students good writing habits. According to best practices, long writing assignments should be broken down into smaller components and students should receive feedback throughout the process (Bean, 2011; Gibbs and Simpson, 2004; Grauerholz, 1999; Kamali, 1991; Kolb et al., 2013). These strategies encourage students to begin writing earlier, to plan thoughtfully, and to embrace revision. Providing feedback, however, can be laborious. Instructors commit time to commenting on technical writing issues like sentence structure, word choice, and organization, and this kind of detail work is time-consuming (Bean, 2011; Herrington and Cadman, 1991). Moreover, students do not consistently respond to feedback and often express a sense of discouragement in receiving comments (Jonsson, 2013; Sommers, 1982). The mutual frustration can leave even committed instructors to believe that providing feedback on multiple drafts is not worth the effort. Student peer review can be an appealing alternative to instructor feedback, and indeed, a substantial body of literature recommends peer review as part of the feedback process

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(Althauser and Darnall, 2001; Bostock, 2000; Herrington and Cadman, 1991; Jensen and Fischer, 2005; Liu and Carless, 2006; Raaheim, 2006; Topping, 1998).

Research consistently demonstrates that engaging students in the feedback process improves the quality of students' final submissions (Althauser and Darnall, 2001; Jensen and Fischer, 2005; Liu and Carless, 2006; McGourty et al., 1998; Reiber, 2006; Sims, 1989; Topping et al., 2000). Some of this effect comes from student writers integrating the feedback into their revisions (Cho and Schunn, 2007). Additionally, student writers may put more effort into early drafts because they are aware that others will view their work (Brindley and Scoffield, 1998; Cho and Schunn, 2007; Gielen et al., 2010; Schriver, 1990). There is also substantial evidence that peer review provides significant benefits to the student reviewers (Bostock, 2000; Brown et al., 1994; Dominick et al., 1997; Li et al., 2010; Liu and Carless, 2006; Topping, 1998). Lundstrom and Baker (2009) compare the final papers of a group of student reviewers who give feedback with a group of student writers who receive feedback and find that those who give feedback experience higher gains than those who just receive it. Li et al. (2010) find that the quality of the feedback the student reviewers provide to fellow student writers is associated with better performance on the reviewers' final projects, while the quality of the feedback the student writers receive does not have an effect on their final grades. Thus, student reviewers who give good feedback can benefit from the peer-review process regardless of the quality of the feedback they receive.

Peer review appears to produce benefits for students beyond improvements in the quality of writing on a particular assignment. Engaging in peer review helps students develop self-assessment skills (Boud, 1995; Bostock, 2000; Brown et al., 1994; DeGrez et al., 2012; Dochy et al., 1999; Falchikov, 1986; Liu and Carless, 2006). As student writers begin to develop independence and autonomy, it is important for students to learn to step outside of themselves and critically view their own work. Peer review helps encourage this kind of self-regulation as students learn to view their work from the perspectives of others (Nicol and Macfarlane-Dick, 2006). In addition, peer review can encourage students to become more sophisticated thinkers and writers. Through peer review, students become actively involved in their own learning (Boud and Falchikov, 2006; Li et al., 2010). Students as reviewers practice skills of identifying errors or problems in others' writing while also practicing evaluation and justification of their own assessments (Bostock, 2000; Liu and Carless, 2006; Topping, 1998). Additionally, providing feedback requires that students engage with disciplinary content, logics, and interpretations (Cartney, 2010; Falchikov, 2001; Herrington and Cadman, 1991). Thus, engaging in peer review can promote learning and critical-thinking skills (Boud, 1990).

In spite of the recognized value of peer review in improving students' writing, self-assessment, and learning, there is substantially less research available on the process of structuring the peer review to maximize these benefits. The focus on outcomes has resulted in a limited exploration of the process of peer review in its own terms. In particular, the available literature provides little guidance on when to schedule the peer review, how to guide students in providing high-quality feedback, and how students revise their papers after engaging in a peer-review exercise.

Timing of the peer review

The question of when to schedule the peer review relative to the final due date of the assignment is an issue that has not been systematically investigated. This lack of attention to timing is significant because the scheduling of the peer-review activity has implications for both when student writers will begin writing their papers and the kinds of revisions that they can make after receiving feedback. Procrastination is common, particularly on long writing assignments (Solomon and Rothblum, 1984). Students often begin writing these assignments close to the due date and engage in binge

writing which can decrease both productivity and quality of writing (Boice, 1997; Fritzsche et al., 2003). To counter this problem, scheduling the peer review earlier in the semester can require student writers to begin first drafts earlier in the semester. Additionally, the types of revisions that are possible differ depending on how long student writers have to make changes. In studies where multiple peer reviews are conducted, revisions early in the process tend to focus on substantial, content-based changes, while revisions near the due date favor polishing edits focused on grammar, word substitution, and spelling (Cho and MacArthur, 2010). Practically, as the due date nears, student writers have less time to focus on substantive issues like content, argument, and analysis.

In spite of the significance of timing, many reporting on an evaluation of a single peer-review activity do not specify the time frame in their studies (Bauer et al., 2009; Jensen and Fischer, 2005; Li et al., 2010; Marcoulides and Simkin, 1991; Reiber, 2006; Sims, 1989). Where a time frame is provided, the majority of studies schedule the peer review only 1 week before the due date of the assignment (Althauser and Darnall, 2001; Crossman and Kite, 2012; Covill, 2010; Min, 2006; Raaheim, 2006; Ting and Qian, 2010). Many of these studies find that students' revisions tend to focus on cleaning up the final draft by editing grammar, spelling, and punctuation but not altering the substantial meaning of the text (Covill, 2010; Min, 2006; Ting and Qian, 2010). One exception to this pattern is Hagga's (1993) use of peer review. Hagga schedules the peer review 5 weeks before the final paper due date, reasoning that substantial revisions take time to complete. Additionally, Hagga expects that the extended period of time allows student writers to step away from their papers and carefully consider feedback before engaging in revisions. While Hagga's course is designed for graduate students, his findings suggest that undergraduates could also benefit from scheduling the peer review early so that they begin writing earlier and have time to make substantial revisions.

Peer feedback

One of the most consistent concerns faculty raise about relying on peer review is whether students are capable of providing high-quality feedback (Brown et al., 1994; Cheng and Warren, 1999; Cho and Schunn, 2007). In addition, grading is emotionally fraught for students and can disrupt their abilities to provide useful feedback (Liu and Carless, 2006; Nilson, 2003; Sluijsmans et al., 2002; Topping et al., 2000). There are some basic strategies available to manage these problems such as blinding the process (Cho and Cho, 2011; Hagga, 1993), not asking students to provide grades (Nilson, 2003), and using a structured evaluation form (Marcoulides and Simkin, 1995). When the process is structured in these ways, students do indeed provide reliable and useful feedback (Topping, 1998).

Formative feedback that focuses on meaning, disciplinary knowledge, and overall development of the paper appears to be most helpful to student writers (Boud, 1990; Liu and Carless, 2006; Topping, 1998). This kind of feedback encourages student writers to engage with the meaning of the text in their revisions (McGarrell and Verbeem, 2007). In spite of the consensus that student reviewers should be directed to provide formative feedback, there is little guidance available in how to elicit formative feedback from student reviewers. Marcoulides and Simkin (1991, 1995), for example, rely on a highly structured 10-point form in which students are able to select only from pre-set ratings of "good," "fair," or "poor." Similarly, Li et al. (2010) provided student reviewers with a 13-item rubric in which each reviewer rated performance on scale of "beginning," "developing," or "accomplished." This assessment went a step further than the previous example by offering student reviewers space at the end of the form to provide formative comments. Guidance in how to provide formative feedback, however, is limited to instructing reviewers "to provide constructive forward-looking feedback" (p. 529). In these examples, the rubrics that student reviewers received intend to direct reviewers to focus on the strengths and weaknesses of a draft on issues like subject matter, organization, and depth. The feedback itself is nonspecific about

where issues had occurred or how the student writer should approach revisions. Thus, even where researchers are intentionally assessing the impact of formative feedback, the studies provide only a limited vision of formative feedback.

Revisions after peer review

The research on peer review primarily focuses on evaluating the outcomes, assessing in some way whether the final product is improved after revision (Althauser and Darnall, 2001; Jensen and Fischer, 2005; McGourty et al., 1998; Reiber, 2006; Sims, 1989). Less is available about how student writers revise their papers after they receive feedback from peers. Sommers (1980) compares the revision processes of freshmen college students and experienced adult writers. Sommers finds that student writers view revision as a process of "cleaning up" the original draft . They revise their drafts in a linear manner, starting at the opening paragraph and working their way to the end. They make changes in words or phrases but leave the original meaning intact. By contrast, Sommers finds that experienced writers use revision as a way to find the form and shape of the argument as they revise. Experienced writers begin with messy drafts, and they make substantial changes in the meaning of text as they add and delete material and move material around. These differences suggest that undergraduate students receiving feedback from peers may use that feedback to make primarily polishing changes.

Building on Sommers' (1980) work, it is argued that revisions can be divided into two general categories: surface-level and meaning-level changes (Faigley and Witte, 1981). Surface-level changes are those that preserve the original meaning of the text but modify or clarify the writing, including spelling and grammar corrections, additions and deletions of words and phrases, and word substitutions. Meaning-level changes are those that alter the meaning of the text in substantial ways. They include adding nuance or new direction to the analysis, adding new subpoints or elaborations to arguments, and revising subpoints or the overall argument of the paper. Both kinds of changes are important to facilitating good writing. Surface-level changes constitute a kind of polishing of the final draft in order to develop technically better writing, while meaning-level changes demonstrate a thoughtful engagement with the substance of the text in light of added research, considerations of audience, and self-reflection on the author's intentions. In regard to Sommers' (1980) comparison, it appears that freshman college students made primarily surface-level changes, while experienced writers focus on meaning-level changes.

Researchers using Faigley and Witte's (1981) taxonomy generally conclude that college students do make mostly surface-level changes (Coit, 2004; Min, 2006; Paulus, 1999; Ting and Qian, 2010; Williams, 2004). Most of the literature, however, focuses on second-language learners. We know little about how students in advanced, discipline-specific courses revise their papers after peer review. It is possible that more advanced students make more sophisticated meaning-level changes with their more advanced writing experience and disciplinary knowledge. While numerous studies have investigated peer review, these studies have focused primarily on outcomes rather than process. As this discussion has demonstrated, we know little about the significance of timing, how to guide students in giving formative feedback, and how these strategies affect student writers' revision processes in upper-division, discipline-specific courses. This study aims to answer three questions:

1. Do student writers submit substantial drafts when the peer review is scheduled 4 weeks before the final submission deadline?
2. When students are given a structured feedback form requiring comments, are student reviewers able to offer formative feedback?
3. What kinds of revisions do student writers make after engaging in this peer-review process in which they were allowed 4 weeks to revise and receive formative feedback?

The final paper must include each of the following sections in the proscribed order:

1. Introduction to the Policy: A detailed discussion of the policy
2. Social History of the Policy: Describe the context of the policy. What policies preceded this one? What problem was the policy designed to solve?
3. Supporters of the policy: Who supports the policy (identify key figures and organizations)? What are their 2-3 most compelling arguments and supporting evidence?
4. Opponents to the policy: Who opposes the policy (identify key figures and organizations)? What are their 2-3 most compelling arguments and supporting evidence?
5. Implementation and Impact of the policy: How has the policy been carried out? Is it working as expected? Are there any unintended consequences? Who was targeted by the policy? Are there any clear patterns regarding the impact on marginal or dominant groups?
6. Your position: Based on your analysis of the policy, where do you stand and why? NOTE: The best discussions will address both the strengths and weaknesses of your own position.

Figure 1. Paper requirement for *Drugs and Society*.

Methods

Participants

This study was conducted at a small, private comprehensive college in the Northeastern United States. The data for this study were collected between fall 2009 and fall 2012 from junior-level Sociology courses designed primarily for majors and minors. The courses included three offerings of *Drugs & Society*, two offerings of *Sociology of Violence*, and one offering of *Research Methods I*. In all of these courses, students were required to write a final term paper based on a set of course-specific guidelines. While the course topics and term paper instructions were distinct, the basic peer-review assignment was similar across all six courses. In all of these courses, the final paper was broken into multiple stages, including a topic selection essay, a draft of the paper, a peer review of another student's paper, and the final paper. In addition, the final paper instructions specified a set of sections that were required (see Figure 1 for an example from *Drugs and Society*). Finally, all papers had to be at least eight double-spaced pages in length (with no specified maximum), and papers had to cite at least eight scholarly sources. Full instructions for the term paper assignment were handed out at the start of the semester and final papers were due sometime in the last 2 weeks of the course.

Course enrollment ranged from 15 to 25 students. All students who completed the peer review and a final paper in these six courses were included in the study (n = 91). The student-level data comprised their own submitted drafts, the peer-review feedback forms completed for other students, and their final graded papers.

Design and procedures

The peer-review assignment in these courses was designed to include three distinct practices. First, students were required to submit a complete draft of their papers 4 weeks before the final paper due date. Although students were instructed to submit complete drafts, incomplete drafts were accepted so that all students could participate in this process. This decision was made because "high procrastinators," those who procrastinate across many tasks, benefit the most from receiving feedback on their work (Klassen et al., 2008). Accepting incomplete drafts ensured that even students who began writing late could participate in and benefit from the peer-review process.

In the rubric, select the evaluation level that is appropriate based on your reading of each section. Then offer specific feedback that (1) explains the grade that you believe is appropriate and (2) tells the author how they can go about improving their score and the quality of their work.
Helpful comments can include statements like:

- There is some good information here, but I have trouble following your argument. I think that you need to work on developing a stronger organizational structure that will give your paper more flow.
- There were numerous editing problems. In particular, I noticed a problem with comma usage and excessively long sentences. The author needs work on basic grammar and style.
- On some occasions, the author uses awkward language. It seems like the author is trying to "sound" academic, but is not necessarily using words appropriately. I think that the author should seek help in refining her/his language.
- The author makes claims about how common smoking marijuana is, but does not provide any evidence. The author needs to work to demonstrate that claims are true with evidence from research.

Comments that are not helpful:

- Good.
- I don't understand what the author is saying.
- This paper needs work.

Notice, that helpful comments are specific and give some indication of how the paper can be improved. Unhelpful comments are vague and give no clear sense of direction.

Figure 2. Instructions to student reviewers on writing helpful comments.

Second, the peer-review process was carefully structured in several ways. To begin, students were required to submit the draft online 24 hours before the in-class peer review was scheduled. This requirement allowed the instructor to blind each student's drafts and also to match writers with reviewers based on relative completion of their papers. As a result, students with full drafts would offer comments on drafts that were also complete while students who submitted very brief or incomplete papers commented on papers that were similarly developed.

On the day of the in-class peer review, blinded drafts were given to the assigned reviewer. In addition to their assigned drafts, students also received an instruction packet and a rubric. According to the instruction packet, the purpose of the peer-review process was to offer formative feedback to fellow student writers (Figure 2). In addition, the instructor conducted a 20-minute lesson on the day of the peer review in how to give formative feedback.

Student reviewers were given a rubric to complete based on their reading of the draft. According the assignment, student reviewers were instructed to organize their paper around a set of required sections (Figure 1), and therefore, the rubric was similarly divided so that reviewers made comments on each of the required sections. For each required section, student reviewers were first instructed to select from a set of qualitative statements (Figure 3). These qualitative statements were designed to help students assess writing quality while minimizing the feeling that students were grading each other. In addition to selecting a qualitative assessment statement, students were instructed to write detailed formative comments for each section. At minimum, students were instructed to write formative comments that identified a weakness in the section and offered a suggestion on how to address the problem.

Student reviewers typed their comments into the rubric provided by the instructor. Student reviewers were required to submit the completed form through the college's online course

1. Introduction to the Policy (Author should provide a detailed discussion of the policy at the beginning of the paper.)

_____Well done! All of the required elements are here. Now you just need to work on refining your writing.
_____You have most of the required elements included, but some points need more development.
_____I find some of this discussion confusing or hard to follow.
_____This section is underdeveloped and needs quite a bit more work.
_____This section of the paper is not included in this draft.
_____Other
Additional Comments:
_____

Figure 3. Rubric section from *Drugs and Society*.[a]
[a]Each of the six sections of the paper was evaluated separately. The qualitative statements were the same for each section.

management system within 48 hours. Student reviewers were told that they could write on the draft all they wanted but that they would not hand the original draft back to the original writer. Instead, only the rubric would be given to the original author. As a result, students were encouraged to think about identifying general writing issues in the paper (e.g. frequent misuse of commas) rather than focusing on specific errors like spelling and punctuation in a particular sentence.

Third, students were graded based on their performance on the peer review rather than on the quality of their submitted draft. This decision was based on the finding that feedback quality improved when student reviewers were held accountable for the quality of their feedback (Li et al., 2010). The instructor told students that if they tried to offer formative comments and were successful for the majority of sections, they would receive full credit for the assignment. If, however, they did not offer comments, offered only vague comments like "good" or "unclear," or did not otherwise meet the criteria of identifying a problem and suggesting a revision, the student reviewer would receive significant grade reductions.

After the peer-review rubrics were graded, the rubrics were returned to student writers. This process typically occurred within about 1 day of the completion of the peer review. In total, the peer-review exercise took about 4 days from the time student writers submitted their drafts until they received the feedback form from their reviewer. The final papers were then submitted about 3½ half weeks later.

Data analysis

The data for this study were drawn from a content analysis of the peer-review comments and of the revisions students made in their final papers. Elaborating on Faigley and Witte's (1981) taxonomy of revisions, Paulus (1999) created an extensive list of the kinds of changes that qualify as surface-level and meaning-level changes, and this list was used as the coding guide for these data.

The written peer-review comments for each section were coded based on whether the comment as a whole suggested surface-level changes or meaning-level changes. A third category for comments was created for comments that were unhelpful because they did not follow the instructions outlined in the peer-review packet (e.g. the student did not identify a problem or the student did not suggest a way to address the problem). Occasionally, a student suggested both kinds of changes, and in those cases, the whole comment was coded based on the dominant theme of the comment. The following comment is an example of one that suggested both types of revisions:

> The author in this section uses a lot of contractions, such as the words "don't" and "can't." The author also talks about how the findings with marijuana are different than findings with hard drugs. I was just curious as to how the findings are different. What did they base this information off of?

This comment included both a suggestion of a surface-level change (eliminate contractions) and a meaning-level change (provide evidence to support the author's claim). The reviewer's discussion of the meaning-level revision was more elaborate and addressed a central issue raised in the author's paper, while the surface-level suggestion was a fairly minor point. Therefore, this comment as a whole was coded as a meaning-level suggestion for revision. All but eight comments that included both surface-level and meaning-level changes were coded as meaning-level changes because the surface-level suggestions were usually small add-ons and less substantive than the meaning-level changes.

The "Compare Documents" feature in Microsoft Word was used to produce a single comparison document for each student writer. The comparison document explicitly identified each change made between the draft and final paper. This document showed what pieces of the original draft stayed in the final paper and what pieces were altered or deleted. The comparison document distinctly noted minor changes (e.g. spelling, capitalization, and punctuation), text moves (i.e. pieces of text that are moved to another place in the document), and added or deleted text ranging from individual words to entire paragraphs.

All revisions were coded at the sentence level following the observation that novice writers tend to substitute words, while experienced writers tend to revise the sentence as a whole (Sommers, 1980). At this level, it was possible to distinguish between instances where students made surface-level changes that attempted to improve the quality of the sentence but left the initial meaning intact and instances where students made changes to a sentence that altered the meaning of that sentence, the paragraph, or the paper as a whole. The following passage from a student's paper illustrates the coding process for revised sentences. The changes to the original text have been italicized:

> It is important to again look at the demographics of the mothers *and children* in Chasnoff's research [on cocaine-using mothers]—they were all poor and black. Therefore, *not only were the effects of poverty mistaken for those of drug use, but also* the most extreme cases were represented as the "typical," and as a result in the mind of the public the image of a crack-addicted mother was automatically a *poor* woman of color.

The first sentence is an example of a surface-level change with the addition of the words "and children." This addition made the student's argument clearer but did not substantially change the meaning of the text. By contrast, the second sentence included several additional pieces of text that indicated a shift in the student's analysis between the draft and the final paper. In her draft, the student focused almost exclusively on issues of race, but in the final paper, the student used a more complex analytic frame that included race and class. This second sentence was, therefore, coded as a meaning-level change.

Similar to the coding process for comments, whenever a revised sentence contained multiple types of revision, the overall sentence was coded according to the highest level of change in the sentence. If a student made a small edit (e.g. adding a comma) and also altered the meaning of the sentence (e.g. adding a clarifying clause), the sentence as a whole was coded as a meaning-level change. Additionally, all newly added sentences were coded as meaning-level changes because they added new material to the paper and therefore added or altered meaning.

Findings

Finding 1: students began writing earlier

Scheduling peer review 4 weeks before the final paper was due achieved the goal of forcing students to begin writing earlier. Across the six courses, all but four students submitted a draft by the due date. Additionally, only 16 students (16.6%) submitted a draft that was classified as incomplete, or less than 33% of the final paper length. The remaining 75 students submitted drafts that were at least partially complete and contained writing in multiple sections of the final required paper. Thus, setting the peer-review date 4 weeks before the final due date was an effective strategy to require students to begin planning their papers at least a month before the paper was due.

Finding 2: peers offered formative feedback

On the whole, student reviewers consistently gave appropriate and substantive feedback by following the guidelines of the assignment. On only five occasions were student reviewers penalized because their feedback was graded as inadequate. In only one of those cases was the feedback inappropriate throughout (i.e. the student only gave comments such as "good" or "needs work"). On the whole, student reviewers were able to offer formative feedback that identified a weakness and suggested a solution.

A closer look at the comments revealed that student reviewers' suggested revisions focused on meaningful changes. The vast majority of student reviewers' comments recommended meaning-level changes (n = 402, 81.5%), while relatively few comments recommended only surface-level changes (n = 50, 10.1%) or were coded as unhelpful (n = 41, 8.3%). Student reviewers followed the instructions to focus on substantive, formative feedback rather than polishing edits and were thus able to give meaningful feedback to their peers.

Finding 3: students' revisions were predominantly meaning-level changes

Comparisons of the draft and final paper revealed that all student writers revised their papers after the peer review. Across all semesters and courses, no final paper was identical to the submitted draft. The extent of revisions varied widely. A small number of student writers added less than 25% new material (n = 15, 16.5%), while the majority of student writers added more than 50% new material and overhauled their final papers (n = 53, 58.2%). These findings were consistent with the expectation that student writers submitted drafts that they expected to revise.

The coding of the comparison documents offered insight into the kinds of changes student writers made. Overall, the final drafts contained substantial, meaning-level revisions (Table 1). The majority of changes student writers made to their papers were coded as meaning-level changes (78.9%). By contrast, only about one-fifth (21.1%) of changes were coded as surface-level revisions. On average, student writers made meaning-level revisions in 67 sentences appearing in the final paper, and all student writers revised at least two sentences at the meaning level.

It should be noted that most of the meaning-level changes were in the form of new material rather than revisions of existing material. Moreover, most student writers added text to the end of the paper rather than adding paragraphs in the introduction or the middle of the draft. On the one hand, it appears that in this assignment, it did help student writers to approach their first versions as drafts that still needed work. On the other hand, it appears that their revision process is linear with their efforts to add new material occurring at the end of the paper.

Table 1. Student writers' sentence-level revisions by type.

Type of revision	Total number of revised sentences	Average number of revised sentences per paper	Range of revised sentences
Surface-level revisions	1629 (21.1%)	17.0	0–82
Meaning-level revisions	6103 (78.9%)	67.1	2–186

Discussion and conclusion

Studies have established that peer review can help improve students' writing and that students are capable of offering high-quality feedback. Less research has been conducted on the peer-review process and how specific strategies affect the peer-review process. This study aimed to contribute to this knowledge gap in three ways. First, this study examined the drafts student writers submitted when the peer-review date was scheduled 4 weeks before the final paper was due. Second this study evaluated the kinds of feedback student reviewers offered when the structured feedback form required reviewers to write formative comments. Finally, this study analyzed the kinds of changes student writers made in their papers after engaging in this peer-review process.

The first finding from this study was that when the peer-review session was scheduled 4 weeks before the final paper due date, most student writers did submit substantially developed drafts. Only a small number of student writers submitted drafts deemed incomplete or failed to submit a draft at all. Thus, setting the peer-review date 4 weeks before the final due date appeared to be an effective strategy to require most students to begin planning their papers at least a month before the paper was due. Considering the tendency of many students to procrastinate on long writing assignments (Solomon and Rothblum, 1984), it was encouraging that an earlier peer-review date forced student writers to begin work on their papers earlier in the semester.

Second, with a structured feedback form and brief training on how to give formative feedback, the majority of student reviewers were able to offer comments that identified a problem and suggested how this problem could be addressed. The fact that the quality of student feedback was generally quite high and focused on issues of meaning and argument was significant because research has indicated that students benefit as much, if not more, from offering feedback as compared to receiving feedback (Bostock, 2000; Brown et al., 1994; Li et al., 2010; Liu and Carless, 2006; Topping, 1998). Moreover, the quality of feedback given was associated with student performance on the assignment, while the quality of the feedback received was not associated with performance (Li et al., 2010). Thus, students appeared to develop self-assessment skills through giving feedback to others (Bostock, 2000; Brown et al., 1994; Nicol and Macfarlane-Dick, 2006). By structuring the feedback process and evaluating the quality of their feedback, this approach helped student reviewers to offer formative feedback to their peers and may have helped student reviewers to better self-assess their own writing.

Third, this study revealed that students who engaged in this peer-review process made more meaning-level changes to their drafts than surface-level changes. This pattern of revisions showed that students did indeed view their first submission as a draft that they expected to revise. In addition, in contrast to some studies showing that students tended to focus on polishing edits after peer review (Coit, 2004; Flower et al., 1986; Hyland, 2003; McGarrell and Verbeem, 2007; Paulus, 1999; Pope, 2001), student writers in this study made significantly more meaning-level revisions. However, most of these meaning-level changes were in the form of text added at the end of the draft. This pattern signified that while advanced undergraduates may have developed meaning through the revision process, they were still writing and revising in a linear manner. In contrast to

the experienced writers studied by Sommers (1980) who moved text around and redeveloped sections within the bodies of their drafts, undergraduates appeared to construct their papers from the start to the end. This approach meant that many of these students were framing their papers in the early paragraphs before they knew how the end would develop.

There are important limitations to the data presented here. First, this study did not compare specific comments from student reviewers to changes made in the writers' final drafts. Since student writers had 3½ weeks to revise their drafts after receiving their comments, it was not possible to establish a direct relationship between the specific comments received and the final changes in a paper. In the interim period, students may have visited the writing center, received feedback from other peers, or met with the instructor as part of their revision process. In some cases, students may have already planned to make the revision suggested. For example, a student may have already known that they needed to do more research or provide more detail and the peer comments only confirmed that plan. Perhaps more importantly, it was not possible to verify whether students had actually read the comments they received. Some students do not read instructors' comments (Lynch and Klemans, 1978), and therefore, it is possible that some students did not read their feedback from the student reviewer. Fortunately, because students learn from engaging in peer review as reviewers more than they benefit from the comments they receive (Brown et al., 1994; Li et al., 2010; McGourty et al., 1998; Sims, 1989), ensuring that students follow specific comments is not necessarily the most important path for revision.

Second, this study has not focused on paper quality. Certainly, it was hoped that the peer-review process improved final products, and there is ample research available demonstrating that peer review improves the quality of writing across disciplines (Althauser and Darnall, 2001; Jensen and Fischer, 2005; Liu and Carless, 2006; Pope, 2001; Reiber, 2006; Stefani, 1994; Topping, 1998). This project, however, was process-oriented rather than outcome-oriented. Overall final versions were better than drafts, but this direct comparison was exaggerated by the fact that most drafts were incomplete and unpolished and therefore would have earned lower scores than the final version even without peer review. This study, therefore, focused on how peer review could improve students' writing processes. While specific outcomes were not evaluated here, final papers on the whole were successful and indicative of good writing process. Only one student in this 3-year period engaged in peer review and submitted a final paper that earned a failing grade. In addition, all but two students who completed the peer review submitted final papers. While it was likely that peer review helped improve the final product, this study did not specifically evaluate outcomes.

Future research should continue to evaluate both process and outcomes to further elucidate effective peer-review process. It would be useful to better understand whether and how student writers engage with the feedback they receive from their peers. Perhaps one alternative would be to require students to write a statement in which they describe how they used the feedback they received in revising their papers. This letter would be much like the one scholars write to a journal editor after revising a manuscript. Not only would this approach make students' reactions to their comments more visible, it would actually require students to engage with the feedback they received. Additionally, it would also be useful to better understand how specific peer-review strategies affect the final paper quality. Study designs that employ experimental conditions with control and comparison groups could be used to determine which peer-review strategies are most impactful. These kinds of studies would help guide the development of best practices for peer reviews.

At a basic level, peer review helps to improve students' performance on particular assignments. As a strategy that actively engages students, peer review has the capacity to improve students' learning in a course, to help them develop self-assessment skills, and ultimately to move them toward becoming independent thinkers and writers. These potentials can only be captured, however, by establishing best practices. It is important then for researchers to move beyond outcomes

to examine the specific ways that peer review can be implemented. Insight into process requires that researchers evaluate particular strategies to determine how students engage in and utilize peer review. By understanding how students engage in peer review and revise their papers afterwards, we can begin to identify the strategies that will produce the kinds of students we hope to create.

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