The Science of Writing: Experimenting with Peer Review at a STEM University

Taylor Joy Mitchell and Jessica McKee
Embry-Riddle Aeronautical University

Eduardo Arino de la Rubio
Central European University

Teaching composition at the "world's only fully accredited, aviation-oriented university in the world," Embry-Riddle Aeronautical University (ERAU), poses all of the usual problems composition faculty encounter: providing feedback on multiple drafts (Sadler), growing classroom sizes (Jaschik), detecting plagiarism (Rivard, Karon), and instructing students how to be better readers and writers and thinkers all in one semester (Teller, Hesse). Most composition faculty also face student resistance to peer review, even though peer review has been a central tenet of process-oriented, composition classrooms and long championed by theorists Peter Elbow, Wendy Bishop, Diana George, and Mara Holt, to name a few. Like Steven Corbett et al. in "Peer Pressure, Peer Power: Theory and Practice in Peer Review and Response for the Writing Classroom," we define peer review as "the process through which academic writing and communication gets done" (1). We, too, recognize the inextricable nature of peer review, writing process, and effective communication; therefore, we treat undergraduate peer review like all other aspects of academic writing, and we ask students to do the same. Yet, because first-year students don't often view themselves as academics, or realize the importance of the writing

process, implementing peer review continues to be a challenge in the college classroom, especially at an institution like ERAU where STEM students don't often foresee how writing or peer review factors into their future careers.

STEM students' resistance to writing in general and peer review in particular may be under-researched, but anecdotally we (and other professors at STEM institutions, like Theresa MacPhail at Stevens Institute of Technology) have often heard the lament: "We're all science majors so *we don't really need to know how to write*" (emphasis added). And yet, STEM research requires communicating results and conducting peer reviews, a fact that is often lost on first-year college students. Beyond a perceived lack of knowledge, STEM students might be "turned off" by writing due to their mindset (Rupp). As Allison Rupp reminds us in "English Teachers Think Outside the Box to Teach Reading, Writing to STEM Students," STEM students stereotypically don't like to think in the abstract; the subjective nature of writing only heightens the problem and enhances the students' perception that the writing process exists outside of their scientific realm of study. For some students, the writing process is an intellectual, rather than technical pursuit--one without a definitive answer or hypothesis to be proven in one sitting. And since peer review, with the singular goal to improve writing, is only one aspect of the writing process, students' "lingering ambivalence" toward peer review makes sense (Corbett and LaFrance, "Introduction," par. 13).

As composition instructors invested in peer review, we needed to somehow "show" its importance to students who tend to only care about passing this General Education required course, which treats writing as secondary to the courses' original purpose. For instance, in the

only course wholly dedicated to writing, COM 122 (our equivalent to First-Year Composition) assignments focus on argumentation versus paragraphing or writing in modes, and the subsequent course in the writing sequence (HU 140s) includes assignments that focus on textual analysis of humanities artifacts. While these courses remain writing intensive, the writing assignments naturally focus on course content, leaving little room for teaching writing itself. In other words, writing becomes a means for *thinking* about the material rather than *being* the material**.** Because of limited experiences with composition--sometimes students are not required to write at all, in any courses, for a whole year--ERAU students are unaccustomed to writing, compounding their resistance to peer review.

In response to this resistance, we secured a grant from ERAU's Center for Teaching and Learning Excellence to conduct an IRB-approved peer review study, which spanned three semesters (Fall 2015 through Fall 2016) and included 219 students. Student participants signed an IRB-approved standard written consent form. For this study, we incorporated peer review into the syllabus, modelled how to complete reviews with sample essays, assessed reviews with rubrics, assigned pre- and post-project survey reflections, and included questions about the peer review process on final course evaluations. We assigned three peer reviews per writing project (WP), combining two common peer reviews with a third, cross-class review. For traditional, in-class, peer review, students not only faced each other but also participated in a shared discourse, and, by the time they completed the cross-class peer review, students were working asynchronously online, potentially navigating a new class's discourse (see Table 1).

Table 1: Breakdown of Three Peer Review Assignments

Kinds of Peer Review	Aspects of Peer Review
Face-to-Face Peer Review	Traditional peer review; conducted in class; shared via hard copy; selected own peers; completed checklist and templates
Online Peer Review	Online peer review; uploaded to Canvas' Peer Review Feature; completed using Canvas' editing or audio features; assigned to anonymous peer in different section with the same instructor; used oral or typed feedback; completed templates and answered directive questions
Cross-Class Peer Review	Online, asynchronous peer review; uploaded to OneDrive; completed via OneDrive's Microsoft Word features; assigned to peer in a different section with a different instructor; used typed feedback; answered directive questions

With this intensified, three-tier peer review process, we emphasized writing as a science, one that is formulaic and logical, even as it requires creativity. By formulaic, we do not mean the five-paragraph essay or current-traditional models that focus only on grammar. Instead, we refer to the "moves that matter" in academic writing (Graff and Birkenstein), which concern essay elements like thesis structure, topic sentences, and transitions, elements that readers expect and writers typically follow--regardless of genre or purpose. We used these elements, what we call "composition constants" to test the students' application of these terms when participating in, and reflecting on, the peer review process. In terms of logic, we wanted students to offer reasoned, concrete guidance in their peer reviews, a tactic that would remove some of the abstraction that turns STEM students off. As the students worked through the many peer reviews,

we hoped they would become what Muriel Harris refers to as "peer responders." As Harris explains, a peer responder "emphasizes informing" by telling peers to "try this/try that" (377). By encouraging this kind of peer direction, always organized around "composition constants," we hoped our peer reviews would demystify the composing process for students.

Below we discuss the most innovative strategies of our study: our assessment practices, peer review templates, and cross-class strategy.

1. Assessment: We created rubrics for each peer review and required students to grade their peers' feedback, motivating them to give more effective feedback and engage with "composition constants."
2. Templates: We designed templates similar to those in the course textbook *They Say/I Say*, giving students the necessary vocabulary, developing their confidence, and encouraging reflection about form and content.
3. Cross-Class Peer Review: Students conducted a (semi) blind peer review with students enrolled in a different section, under the tutelage of a different instructor, moving them from peer reviewers to peer responders.

Through qualitative and quantitative analysis, we found that thoroughly assessing peer reviews, providing students with templates to complete, and assigning cross-class peer reviews were effective measures that moved students beyond simple, automatic and superficial peer review responses. While based on STEM students, our findings could be useful for any composition professor who has struggled to effectively incorporate peer review.

Peer Review Assessment

Unlike other instructors who might use peer review as a low-stakes writing assignment or instructors who don't assess the activity at all, the frequency and intensity of our peer reviews demanded thorough assessment. Joseph Michaelis' report on STEM student motivation encouraged us to assign a point value to each peer review. He found that "extrinsic motivators such as rewards and grade ...may be necessary to motivate students with very low interest in the activity to engage at all" (17). In addition to heightened engagement, composition theorists Charlotte Brammer and Mary Rees found that "there is a significant correlation between how much faculty value peer review as part of the writing process and how frequently they choose to assess it" (75). Assessing peer reviews thus serves the students and their professors, as both are more likely to recognize its value when it is assessed. Accordingly, we created rubrics with clear point values in order to appeal to our students' extrinsic motivation. Face-to-face reviews were worth 15 points and online and cross-class peer reviews totaled 20 points, making up 5% of the total grade. These points were determined by criteria like Quality of Feedback, Explanation of Suggestions, and Completion of Template Questions. We settled on 5% because our writing program guidelines stipulate that writing projects make up (at least) 80% of the final grades. This 5% was composed of nine graded reviews and completion grades for a pre- and three post-reflection surveys. To determine this grade, we needed to more closely read, listen to, and grade peer reviews.

Not only did we more thoroughly assess the peer reviews, we required students to assess their peers' feedback via reflective surveys. As research on peer assessment has shown, relevant

criteria needs to be communicated to the students in order for peer assessment to "resemble more closely teacher assessments" (Falchikov). To best guide students in assessing peer work--sometimes a daunting task for first-year college students--we created a letter-grade scale rubric; students had to assign an A through F, based on criteria that mimicked the rubric criteria we used for grading. For instance, to assign an "A" for the Online Peer Review, one's peer needed to have "thoughtfully answered many questions in multiple categories, thoughtfully completed the template questions, gave worthwhile feedback, provided context for feedback, and thoroughly explained suggestions." We designed these criteria for students to reflect on the quality of the feedback they received and remove a little bit of the bias, as the "'extraneous influences' might consciously or unconsciously influence the grades" peers face when grading each other, especially for traditional, face-to-face peer review (Weimer).

Assessment Findings

Our assessment strategy enhanced the peer review process for us and elevated reviews beyond mere busy work for students. Creating rubric criteria made us reconsider the kinds of feedback we value, and we were able to share and model examples. Some criteria also cut down on grading time, as we could assign the 5 points for "Comments Written/ Underlined on Draft" based on a cursory glance. For students, awarding points signaled the necessity of the reviews, and the following illustrates effective aspects of our assessment strategy:

- Creating rubric criteria made it easier for students to categorize feedback, as they could quickly determine what kind of feedback deserved an A versus a C.

- Allowing students to have a voice in their peers' grades gave the students a sense of agency. They could reward those deserving peers and be honest about why they assigned specific grades.
- Coupling evaluative (letter grades) with descriptive feedback on the peer review surveys encouraged students to reflect on the peer review process and the kinds of responses that were most useful. Whether it be venting about Canvas' technological glitches or praising their peer for pinpointing a needed improvement, this metacognitive activity reinforced that writing is a process.

More importantly, rubric criteria emphasized "composition constants," and the students applied this language in their descriptive feedback in assigned reflective surveys. The most used terms were "body paragraphs," "introduction," "conclusion," "source engagement," and "transitions" (although students tended to substitute this constant with "flow"). One student gave his peer an A because the review "helped to point out some things that were missing that were very important. It made [him] realize that [he] needed transitions, reasonable and representative voices for sources, a more specific introduction that funneled down into [his] thesis, and a little more information on the controversy." Here, what the student learned from class lectures about "composition constants" was reiterated by his peer and the rubric criteria, and our assessment strategy allowed him to apply these terms to his own writing.

Even if successful in elevating peer review beyond a one-time class assignment, our assessment strategies could be improved. Most particularly,

- Students requested we more heavily weight reviews, something both of us agree with. Even if a student failed to complete all nine peer reviews, she could still easily pass the class.
- Even by the third WP, a handful of students still did not engage in the peer review process, suggesting extrinsic motivation was not enough and a multipronged approach needs to be developed.
- Students who provided lots of feedback were clearly offended by those peers didn't provide as much; they tended to assign Ds or Fs, while those who did not provide lots of feedback gave mediocre reviews As;
    - Peer review surveys revealed that students want more accountability; therefore, they liked the in-class peer review more than the other reviews. Traditional peer review ensured that students would get the feedback that they desired because some peers would forget to complete online reviews, which is why it is important to change the pairs as often as possible.

Also, the rubrics did not prove an effective measure for students to grade in-class reviewers. As seen in Figure 1, which compares the A through F grades peers assigned in our Fall 2015 courses, peers more consistently gave higher grades to in-class peers than their cross-class peers.

Figure 1: In-Class vs. Cross-Class Peer Assessment Results

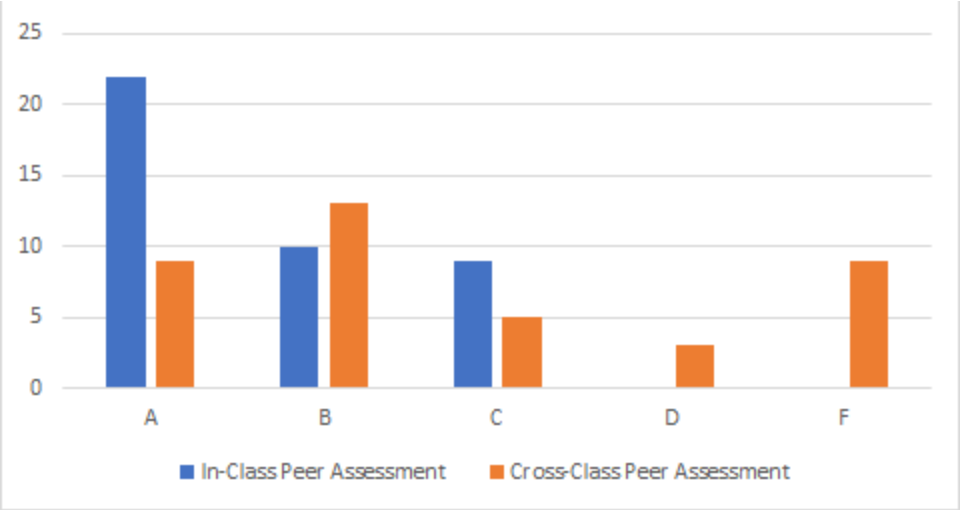


Figure 1 shows that students were more likely to assign higher grades when the review took place in a shared classroom space. Conversely, students sharing a classroom were disinclined to assign failing grades to their peer reviewers. In the feedback for the 22 students who assigned their peer an "A," many described in-class review experiences as "comfortable," and their peer reviewers as "truthful" and "honest." Two students even named their peers in their positive descriptive feedback. These comments reveal that despite the clarity of rubric criteria, students gave preference to their face-to-face reviews.

Ultimately, creating rubrics and asking students to complete peer assessments engaged them in the writing process; as they thought "about achieving outcomes to certain agreed standards," they realized that completing peer reviews and "giving marks or grades is only part of that process" (Liu and Carless). Just like giving and receiving grades is only one part of the academic process, peer review is only aspect of writing. The rubrics also gave students another opportunity to use and apply "composition constant" words, as evidenced by many descriptive

evaluations mimicking the language on the rubric. Similar to our template approach, which we discuss below, our two-fold assessment strategy reiterated the need for our STEM students to participate in a communicative dialogue and recognize the importance of their peers' feedback.

Peer Review Templates

Students tend to prioritize their professors' feedback, because they feel peers are unable to identify, or articulate, ways to revise, perhaps because they lack the necessary language to participate in academic discourse (Topping; MacArthur). Hence, students conducting peer review often produce never-effective comments: "I liked it" or "it's good;" or, as one professor recently witnessed, "it's boring." Most troubling about this superficial peer feedback is the rejection of writing as a process, something students must continually engage in, and if students don't feel like they have the skills necessary to practice this part of the process, then peer review really is busy work for them.

To facilitate the giving of effective feedback, we developed peer review templates that mirror those of the course textbook: Gerald Graff and Cathy Birkenstein's *They Say/I Say*. The templates function as a first step in avoiding the trap that Mark Hall aptly warns about: "We assign peer response, but we don't teach it" (3). The structure of the templates teaches peer response techniques as the student must complete a sentence that the instructor started. For instance, one template asks students to complete the following sentence: "The place where you need more evidence from the original editorial is _____." Here, we make the students aware that their peer should include quotes from the original editorial, and then the responder is given

free rein to explain where more evidence is needed. We hoped that these templates would provide a foundation on which students create their own structured reviews, so they may enter a discourse that extends beyond their individual essay and into the academic conversation--what Kathleen Yancey refers to as “common dialogue.”

By “common dialogue,” Yancey means that students can regain the power and control over their writing as they are no longer “faced with what they interpret as an authoritative "comment monologue" that the teacher provides. Therefore, the templates were meant to present students with two perspectives: the authoritative voice and the communicative dialogue that happens when “students can learn from their educators how to become expert evaluators of their own writing and gradually improve their writing skills as they experiment with this role” (Yancey 113, 118). In this way, students take on the added role of not merely providing a “peer review” but are given the task of literally picking up where the instructor left off. In doing so, students gain more authority as peer responders capable of giving effective, and directive, feedback.

Thus, the templates serve two purposes: require students to think about the function of each part of the essay and give them the language to critique their peers. Some templates were traditional, fill-in-the-blank format while others directed students to answer questions that they might not know to pose. For example, we ask students to “underline concluding sentences in body paragraphs” and evaluate whether they return to the overall thesis. Other template questions ask students to consider the “composition constants,” so, for a section on body paragraphs, students are given a series of templates about paragraph strength, length, and order.

More importantly, these templates supplemented in-class instruction and helped students "learn to talk in the discourses of the communities they wish to join, and thus become members of those communities of practice" (Hall 3).

Template Findings

While we found creating a shared discourse allowed many students to act as writing authorities, not all students provided in-depth feedback when attempting to fill in the blanks. For example, one template asks student to make an evaluative statement about an entire essay, but most students filled in the "My first reaction to your draft" template with "it's a good start;" "it's very well written;" "it seemed rushed;" or "it's very difficult to read." Even though these responses technically answer the provided prompt and appropriately fill in the template, they don't offer any in-depth responses or illustrate students' knowledge of the "composition constants."

There were many instances, however, where students went beyond completing the minimum requirements and engaged in shared discourse to assist their peers. Compare, for instance, one of those earlier responses to these similarly short responses that include composition constant words: "My first reaction to your draft" is "that all of your paragraphs are unified and well organized;" "Well organized. Has a nice flow, and body paragraphs support thesis;" or "that your introduction is solid, however your thesis and analysis need more refining." Even though these responses are concise, they represent more effective feedback because

students use the "composition constants" to pinpoint the positive and negative aspects of the essay, and peers can immediately note what might need revision.

Quite a few students used the templates exactly as intended--as a jumping off point to provide quality, effective commentary. Relying on knowledge about unified body paragraphs, one student filled in the template on "weakest body paragraph" with:

> Your second body paragraph is not aligned under one complete conclusion. At the start you are telling me about how Trump wants to deport 'groups of people', which first of all is not what you have in the introduction and appears biased that you are changing it to make an appeal to the reader, but you are also claiming that Trump seems like a dictator by the end of the paragraph. This is completely off topic and needs to be entirely redone and have much more thought put into it.

Note how this student uses the templates to express how all the parts of the essay – from the introduction to concluding body paragraph sentences – need to be in the service of one overall thesis.

Beyond reminding the students about the importance of "composition constants," the templates were helpful because of their formulaic structure. For instance, when 142 students completed their final peer review reflection survey, all but one student claimed the "peer review guidelines, templates, and checklists were helpful." This surprisingly high result was bolstered by students' descriptive evaluations. When asked what was "the best part about WP 3 peer review guidelines, templates, and guidelines," dozens of students commented on the clear expectations and specificity of the templates, while others mentioned that completing the peer

review templates made them reconsider their own essays. The students enjoyed how the "narrow and specific" templates "guided [them] on how to say things" and stated that "those templates to go by really improves (if followed) the information that is given back." Our flight students, in particular, enjoyed the templates: "[They] really helped the flow of the paper and like you said it sets up a formula" and "Loved the templates!! being a pilot a checklist is really helpful, you just do what it says." Rather than getting abstract feedback from peers, students claimed they had clear expectations that "put everyone on the same page and ensured that everyone provided useful information," which increased their buy-in for the peer review process and increased their confidence to give and receive feedback.

Just like Graff and Birkenstein suggest, the templates provided students the opportunity to engage in a shared discourse, making their essays "more professional" and, even "made" one student's "intro awesome in [her] opinion." As intended, the templates helped them use the "composition constants"; as one student remarked, the peer reviews "directed [them] on what to provide feedback on, which parts of the essay in other words" and caused her to "think about whether intros and topic sentences and conclusions were ok and sounded ok which was very helpful." One student's confidence encouraged her to offer her own templates: "My first reaction to your draft was one of astonishment. I was surprised at how much of your opinion was in it. Remember that in writing this summary, you must remain as objective as possible. Try using phrases such as "The board claims" or "Evidence shows that." Here, the peer doesn't stop at a basic reaction, but follows through to explain the "why" of her reaction. The peer also offered specific strategies that would make a summary as objective as possible. Most importantly, the

student moved from peer reviewer to peer responder, as she gave clear directives, and templates of her own, to help her peer improve.

Overall, the templates served their purpose, offering ways for students "to continue with the review if [they] ever got stuck with what to say." In the students' words, they

- "were easy to follow and integrate" and "almost natural" to "includ[e] them in my work"
- "pinpointed what we were supposed to be looking for and it helped with what was missing from the paper," leaving "no confusion on what I was supposed to be reviewing"
- proved to be "very adaptable and allowed the peer to say what was needed" and "not only read off of a checklist"
- "helped format the paper for the best grade possible"
- "made writing this paper actually make sense. Without them I wasn't sure what I was doing."

Overall, the templates enhanced the students' confidence as they become more accustomed to identifying the parts and purposes of an essay. By the end of the first semester of our study, 87% of students reported they felt "more confident about their peers' ability to offer feedback." Therefore, while time consuming to create and model in class, the templates simplified the writing (and review) process while simultaneously developing a more complex understanding of effective, academic conversation.

Cross-Class Peer Review

Students expanded this complex understanding through cross-class peer reviews, which required them to provide specific answers rather than complete templates. We implemented this third more open-ended, review because we agree with Starr Sackstein, that templates are a good starting point for novice writers, "but [they] CAN'T be the end point." Using Microsoft's OneDrive as a mock-up writing center, students were responsible for providing feedback on papers written by students enrolled in another class, under the guidance of a different instructor. Because each group of students was enrolled in different sections and the reviews were completed online, the peer review process lost the familiarity of a shared classroom environment; moreover, this structure required students to be self-motivated, as there was no face-to-face accountability. It was also a platform for testing their knowledge, just as a science lab requires students to collaborate with peers, who may be enrolled in a different section, on a designated task.

The cross-class peer review proved to be the most innovative of the three strategies used because it is rarely (if ever) theorized about. As Corbett and LaFrance lament, "While peer response is one of the most ubiquitous pedagogical activities in postsecondary writing classrooms, it remains one of the least studied" ("Introduction," par. 2). Hence, finding cross-class peer review theory proved especially difficult. We found plenty of pedagogical approaches, but nothing that directly matched our proposed strategy. Cross-class peer review cannot be considered a hybrid learning experience or online learning because we only ask students to complete one task online, not a day's lecture or an entire course. And, while we—as

professors—co-created a peer review schedule, we did not teach the same lessons or share a classroom, so it could not be considered co-teaching. It's not a breakout session or a workshop, but instead seems to be a blend of these. Cross-class peer reviews require a willing colleague, one who shares an equal belief in the positive aspects of peer review and one who is able to abide by the same curriculum schedule and assign the same writing prompts. From a pedagogical perspective, the cross-class peer review was as new to us as it was to the students. From an academic perspective, however, it is common for scholars, and scientists, to test the strengths of their research with blind peer review. We wanted students to locate themselves within a larger, academic community--one that extends beyond their assigned classrooms.

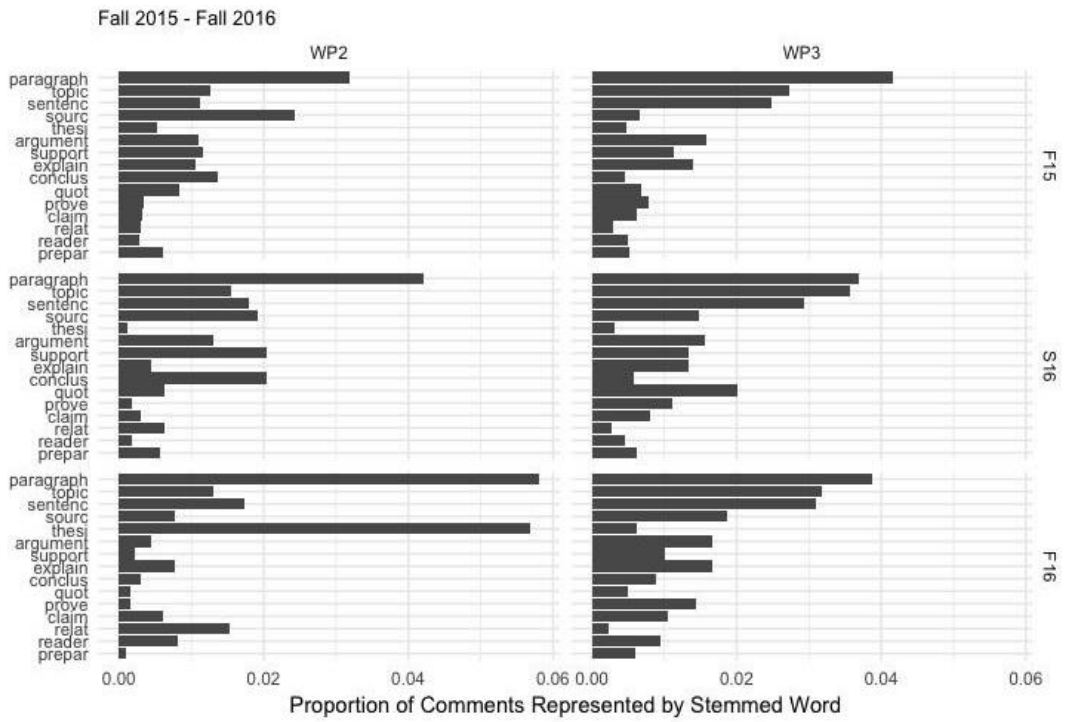
This cross-class strategy was our final test to see how, and if, a continued focus on peer review would help students move from peer reviewers to peer responders: to apply the shared discourse, and, thus, gain enough confidence about the form and function of an essay to give directive feedback. Of course, testing confidence levels is nearly impossible to prove, especially from a qualitative standpoint, which as humanities professors is our strength. We could, however, test word usage (e.g. a specific reference to a composition constant) changes over the course of a 16-week semester. Using a docxtractr software package, we extracted metadata from student peer review comments, which allowed us to identify key words that students repeated. We selected fifteen of these key words for our study: "paragraph, topic sentence, sentence, source, thesis statement, argument, support, explain, conclusion, quote, prove, claim, relate, reader, and prepare." After word selection, we normalized them, giving us a dataset, by semester, by assignment, of the words that had been used by the students in WP 2 and WP 3 cross-class

peer reviews. The repository contains 346 Word Documents written by 149 students and consists of 3,844 unique words and 28,509 total words. From there, we cross tabulated this list of words and frequencies with our "composition constants." This allowed us to visualize, per student and per paper and per session, whether word usage was changing.

Cross-Class Findings

This simple exploratory analysis shows an increasing trend in the usage of "composition constants" between the 2nd and 3rd assignment. Figure 2 demonstrates that the overall proportion of students referencing "composition constant" words, when aggregated across all students by session and prompt, is increased across all sections.

Figure 2: Common Word Usage in Subsequent Writing Projects



As seen above, students in each semester ended repeating more key words in their final peer reviews. They moved from repeating words like thesis and paragraph to repeating more specific key words like source, explanation, support, and claim in their peer reviews. Of course, an increase in language use doesn't necessarily imply a greater understanding of the terms. However, the consistent upward trend across three semesters suggests that the students had, at the very least, become comfortable with this terminology. These results suggest that students internalized the language of the course, the templates and the rubrics, and, when given (relatively) free reign, they applied that language in their responses. For example, in response to questions, such as, "How well did your peer treat the original source? Was it a fair and accurate representation?," students commented on source integration on their own accord; they were not given a specific template to complete. The data also implies that, after completing two rounds of peer reviews, the students had established their own hierarchical value system with "paragraph" dominating the discussion, something that we were not expecting considering our classroom focus is usually on thesis. According to this dataset, we can infer that students moved from peer reviewers to peer responders, as their feedback included robust, direct use of "composition constants" when advising their peers.

The students' comments from the reflection surveys suggest an equal increase in the familiarity and confidence with the writing process. For example, one student remarked that the cross-class peer review "gave me insight into how students from another class were taught to revise and allowed [me] to implement some of those ideas into my paper." Another student made a similar remark: "It gave me an entirely new perspective on how to write my response. It was

more expansive and more constructive." These comments suggest that asking students to conduct a (semi) blind peer review influenced their perception of the writing process. Moreover, students distinguished new material from what they had been taught, and they were able to discern the good from the bad advice as one less-positive comment reveals: "It became clear when I reviewed the other student's paper, they had absolutely no idea what the project was even supposed to look like. Therefore, I did not bother to consider any comments they had." While this student had a negative experience, her refusal to take bad advice suggests a deeper understanding of the writing process, which can include rejecting the feedback of others or wishing for even more feedback. As one student remarked, "People were honest but they were too nice in my peer review, and I like brutal advice that could have made my essay better." The overall consensus seemed to be that assigning nine peer reviews was too much work; however, having a "peer reviewer from another class creates a nice variety to the reviewing process.." . Based on these qualititativecomments, students actually measured the quality of their peers' responses according to their understanding of writing conventions and expectations.

Final Findings

Ironically, and perhaps serendipitously, our attempts to simplify the writing process and remove the abstract, allowed students to do some complex, critical thinking. Students not only gave and received more feedback, did more work, and engaged with more peer writing than they ever had before, they also recognized themselves within a larger, academic community where challenging and re-evaluating beliefs are par for the course. We found, like Kristi Lundstrom and

Wendy Baker, that by giving all of this feedback, our students received more: more models, more sentences, more rhetorical appeals, more ways of knowing, etc. They encountered conflicting perspectives, and they changed their own perspective when faced with persuasive evidence in peers' essays. As one student remarked, "I now have a better understanding of your argument and can agree with you." Another "felt very persuaded and informed of [his peer's] views" and the "concluding paragraph made [him] feel clear and left wondering about [his] own thoughts on the issue." These remarks suggest that the benefits of peer review extend beyond the written word, as students are exposed to multiple, sometimes challenging perspectives. Our peer review process required students to separate their personal opinions from their analysis of essay components; they could engage with challenging content because they only had to focus on the medium, not the message. Thus, focusing on "composition constants"--something so specific and technical--made the students more open to receiving contradictory views, whether they be ideological or rhetorical.

As a whole, our peer review study revealed that

- Students need to be taught how to give proper feedback, and templates and clear guidelines on what to comment on can guide students to giving in-depth, effective feedback;
- Students still need to receive professor feedback, but reminding students about the consistency of the feedback increases students' confidence in their own and peers' abilities.
    - For instance, even though one student still "worr[ies] that the info from the peer reviews aren't accurate and would rather wait for the professor's

comments," 75% of 140 survey respondents claimed that the feedback they received was mainly or very consistent with the feedback from their professor.

- STEM students are not as technologically savvy as assumed
    - Many students couldn't figure out how to upload essays to OneDrive or use the built-in editing interface. Surprisingly, some students preferred old-school, hand-written comments over digital feedback. One student even declared, "I also like handwritten comments on my original paper."
- Professors need ample time to develop coherent peer review strategies, particular guidelines and templates, and assessment criteria
    - While we no longer assign the cross-class peer reviews after the study's completion, we still heavily rely on the guidelines, templates, and rubrics, sharing them with colleagues and improving them every semester.

As all teachers do, we tried to meet our STEM students where they are, and as composition instructors, we attempted to demystify the writing process, specifically peer review. Out of 73.81% students that completed the final course evaluation, 65.48% were satisfied with the overall peer review process, and 63.27% claimed the peer review process improved their drafts. Assessment and templates helped students grasp the conventions of an essay, but to fully appreciate the effectiveness of cross-class peer review, further study is needed. For now, however, we are confident that our peer review experiment facilitated a deeper understanding of the writing process in general and of peer review in particular.

Appendix: Peer Reviews

WP2: Print Advertisement Analysis
In-Class Peer Review

FIRST REACTIONS

What is one thing your peer's draft does well?

List two things that could use improvement.

1.
2.

REACTIONS AFTER READING ACTIVELY

"composition constants"

Introduction

- ☐ Begins "Big"
- ☐ Funnels down into thesis
- ☐ Includes a brief description of print advertisement
- ☐ Includes demographic information of the audience of the publication (magazine/newspaper)
- ☐ Includes publication information for ad (title of magazine/newspaper)
- ☐ Includes arguable thesis statement: claim-based—not descriptive
- ☐ Includes narrow thesis statement
- ☐ Includes thesis statement with two parts: rhetorical appeal and "what else" the ad sells
- ☐ Answers the question: "How does this ad use a rhetorical technique to sell more than the product" Or "How does this ad use a rhetorical technique to say something about the target audience"
  List the rhetorical appeal your peer analyzes_____
  List the "what else" peer analyzes_____

Body Paragraphs

- ☐ Begin with a clear topic sentence: claim-based—not descriptive
  (ex. Although the ad appeals to _____ by _____, the ad most effectively _____)
- ☐ Organized in a logical structure
- ☐ Unified around 1 idea that supports the overall thesis
  List purpose of body paragraph 1 in 5 words or less _____
  List purpose of body paragraph 2 in 5 words or less _____
  List purpose of body paragraph 3 in 5 words or less _____
  List purpose of body paragraph 4 in 5 words or less _____

- ☐ Includes evidence from the advertisement to support to argument\
- ☐ Includes specific details from the ad that illustrate *how* the ad uses this technique?
- ☐ Includes specific details to show *how* the ad sells more than the product?
  List one example of how your peer uses evidence from the ad really well_____
- ☐ Includes evidence from secondary sources (scholars) to support argument about "what else" the ad is selling
- ☐ Introduces FULLY secondary sources with full name and appositive and explanation about why this source is credible
- ☐ Uses quotes sparingly and effectively to support (or advance) the author's main point
- ☐ Avoids under quoting
- ☐ Avoids block quoting
- ☐ Uses sources and quotes relevant to the peer's topic sentence
- ☐ Includes metacommentary to explain ALL quotes/sources
  List one example of your peer using metacommentary to explain a quote
  _____
- ☐ Includes effective incorporation of evidence
  List one appositive peer uses to introduce a source_____
- ☐ Avoids dropped or orphan quotes
- ☐ Explains the significance of the secondary source and how it supports the topic sentence/thesis
- ☐ Uses the best, most credible source to support points
- ☐ Ends paragraphs by returning to the overall thesis

Logic

- ☐ Includes clear transitions between points\paragraphs
- ☐ Presents only relevant ideas
- ☐ Effectively explains the relationship between ideas before moving on

Conclusion

- ☐ Concludes with a paragraph that explains the significance of the observations made

Basics

- ☐ Fulfills assignment requirements
- ☐ Contains at least 1200 words
- ☐ Is in MLA format
- ☐ Analyzes a print advertisement
- ☐ Discusses the use of an appeal
- ☐ Explains how the ad seems to sell more than the product/says something significant about culture
- ☐ Includes clear and grammatically/mechanically correct sentences

WP2: Print Advertisement Analysis
Online Peer Review

FIRST REACTION AFTER READING

After you have read your peer's paper, complete the following sentences either in a comment box or using the microphone.

1. My first reaction to your draft is _____.
2. It seems like you are arguing_____ about your ad.

"COMPOSITION CONSTANTS": PARTS OF THE ESSAY

After you finish the general reaction, comment on all the ""composition constants"" that should be in your peer's essay. Record or type your answers to the following questions using the Canvas comment or audio features. You must answer at least one suggested question and complete all of the numbered statements.

Introduction: Did you feel prepared for the essay? Can you visualize the ad? Were you engaged? Did you want to keep reading? Did you notice any big, obvious statements that should be more specific (ex. ads try to sell things)? Does the introduction prepare you for the thesis statement? Do you feel like you were given all the information you needed for the argument? Did you feel like your peer defined or explained any necessary terms? Did you feel like your peer has a clear sense of purpose?

1. I think the strongest part of your introduction was _____.
2. I think that you can improve it by _____.

Thesis: Does the thesis contain both "parts" (rhetorical appeal and comment on audience/culture)? Is it significant; in other words, it is worth arguing (For example, "Advertisers use pathos to sell sex" is not arguable---no "They say" would argue with you. But arguing that "This ad's use of pathos objectifies women" is better.)? Is the thesis specific enough—focused on the ad? Is it narrow enough to actually prove in such a short paper? Can you find the thesis statement?

1. I think the strongest part of your thesis is _____.
2. I think that you can improve it by _____ .

Body Paragraphs: Is the topic sentence an arguable claim (not a descriptive one)? Are the topic sentences like mini-thesis statements? Do you feel prepared to read the body of the paragraph? Are the paragraphs unified around one idea? Are the body paragraphs in the right

order? Does one idea seem to follow the other? Do they all support the thesis statement? Do they contain enough details to prove the topic sentence? Is there enough evidence from the ad to prove the topic sentence? Is there enough other kinds of evidence to prove the topic sentence? Are the sources properly introduced? Is the evidence explained? Is there a concluding sentence?

1. I think the strongest body paragraph is _____.
2. I think that because _____.
3. The place where you need more evidence from the ad is _____.
4. The place where you need more evidence from other sources is_____.
5. The place where the paragraphs are out of order is _____.
6. The place where the information in the paragraphs is out of order is_____.

Conclusion: Does the conclusion answer the "So What" question? Does it punch the reader in the nose? Does it explain the overall big purpose for writing this essay (besides the fact that you had to)? Why did you pick this ad? How might the children be affected? Does it simply repeat what was written about? Does it go beyond summarizing the essay?

1. I think the strongest part of your conclusion is _____.
2. I think that you can improve it by _____ .

SENTENCE LEVEL CONCERNS

Record or type the following

1. Record or type at least two sentences that are confusing (no more than five).
2. Record or type at least one sentence that you liked (no more than five).

FINAL THOUGHTS

Record or type the following

1. My main suggestion for improving your paper is_____.
2. My favorite thing about your paper is_____.

WP2: Print Advertisement Analysis
Cross-Class Peer Review

Part One: The Thesis Statement

1. Insert a comment. In the comment, type out what you think the overall thesis statement is. Note that this might not be the last sentence in the first paragraph. It can be multiple sentences, or even implied. Remember that the thesis statement is the controlling idea of the entire paper, and sometimes authors say their thesis is X but the paper really argues for Y.
2. Insert another comment. In that comment, evaluate the thesis statement. You MUST COMMENT on the following things: the scope, the focus, the purpose, and the assignment requirements. Use the following information--and templates below—to help you evaluate the quality of the thesis statement.

Scope of the thesis: Is the thesis too simple or too big? (Ads try to sell things—too simple.) (Ad uses seven different appeals to do this thing—too big.)

Focus of the thesis: Is the thesis focused enough on one specific print ad? Does the thesis avoid mentioning advertising in general or the company or the product?

Purpose of the thesis: How well does the thesis answer these questions: how does this ad use a rhetorical appeal to sell something other than the product? Is the thesis actually arguable? (This ad is selling something—not arguable b/c all ads sell things.) (This ad uses pathos to sell the idea of the "perfect body"—arguable. If this was your peer's thesis than you would want to confirm that s/he has explained how the ad "defines" the "perfect body.")

Fulfills assignment requirements: Recall that the essay should explain how the ad uses a rhetorical technique to sell something other than the product. The goal is to discuss how the ad functions as a microcosm of the larger culture/the target audience. What does the ad "say" about this culture/group/target audience? Or, how does the ad create this culture? How does the ad define the target audience of the publication? (Note that an essay arguing that the "Ad uses logos to convince people to have clean teeth" is not sufficient because it is focused on the consumer/product.) Make sure the thesis explains what assumptions the ad makes about the group of people in the ad, the target audience, or the group of people the ad appeals to. In other words, if the ad targets young men, how does the ad seem to define manhood or masculinity? Or, if the same ad targeting young men, shows pilots, how does the ad seem to define pilots? Or, if the ad is selling a sense of adventure, how does the ad define adventure--or love, or violence, or sexuality, or freedom, or equality, etc.?

Selling Itself: This essay should avoid selling the product or the ad itself (This product is awesome, or this ad is awesome are not appropriate observations because they are not offering analysis of the ad.)

Part Two: Create a Reverse Outline.

A reverse outline identifies the main points of the essay. Creating a reverse outline will help determine if the content of the paper matches the thesis statement, discover areas that need more evidence or analysis, and identify problems with organization.

1. At the end of each body paragraph, insert a comment. In that comment, type the purpose of each paragraph in 10 words or less (note that if you are unable to do that, the paragraph might be trying to do too much. If this happens, write "Too many ideas" and then pick which idea you think is most relevant in relation to the overall thesis. For example, you could write, "Too many ideas. Try to focus on _____, which relates to your thesis because _____."
2. Insert another comment at the end of each body paragraph. In that comment, type up a brief response to the following questions:
    1. Does every paragraph relate back to the thesis? Identify any that do not and suggest a revision strategy.
    2. Does the order of ideas make sense to you, the reader? If not, suggest a revision strategy.
    3. Do several paragraphs repeat the same ideas? Is there a way to put repeated ideas together in one paragraph?
    4. Do all of the paragraphs begin with an arguable (not descriptive) claims? Identify any paragraph that begins with a descriptive statement, rather than an arguable claim.

Part Three: Final Comments

Review the rubric that you've been assigned (posted on Canvas) and identify two areas or categories that your peer should focus on when revising and editing the draft. Pick one big, global thing to suggest for revision, like organization and/or transitions. Then pick one small thing your peer should edit, like sentence structure or a pattern of grammatical errors you notice (such as random capitalization). When making these suggestions, feel free to use the language of the rubric to help your peer move from an average paper to an "A" essay.

Finally identify one thing your peer does really well in the essay (analysis, description, voice, etc.)

At the end of the essay, insert a comment and type your final thoughts. Be sure to focus on one thing your peer did well and two things s/he needs to improve--one global and one local.

Rubrics

Traditional, In-Class Peer Review: 15 pts

Criteria	Ratings				
Use of checklist 5 pts.	5.0 pts Thoughtfully and thoroughly	4.0 pts Thoroughly	3.0 pts Completely	1.0 pts Barely	0.0 pts Not at all
Suggestion for Revision 5pts	5.0 pts Worthwhile and significant suggestion	4.0 pts Significant suggestion	3.0 pts Somewhat significant	2.0 pts Hardly significant and/or local suggestion	0.0 pts No suggestion
Comments Written/ Underlined on Draft 5 pts	5.0 pts Worthwhile and many marks on draft	4.0 pts Multiple marks on drafts	3.0 pts Some marks on drafts	2.0 pts Barely any marks on draft	0 pts No Marks

Online, Anonymous Audio Peer Review: 20 pts

Criteria	Ratings				
Address of Category Questions 4 pts.	4.0 pts Thoughtfully and thoroughly addressed multiple questions	3.0 pts Thoroughly addressed a few questions	2.0 pts Thoroughly addressed at least one question	1.0 pts Barely addressed one question	0.0 pts Did not address any questions

Quality of Feedback 4 pts/	4.0 pts Worthwhile and significant	3.0 pts Significant	2.0 pts Somewhat significant	1.0 pts Basic and/or local feedback	0.0 pts No feedback
Contextualized Feedback 4 pts.	4.0 pts Fully and very appropriate	3.0 pts Thoroughly	2.0 pts Somewhat	1.0 pts Hardly	0.0 pts Not at all
Explanation of suggestions 4 pts.	4.0 pts Thoughtfully and thoroughly	3.0 pts Thoroughly	2.0 pts Kind of	1.0 pts Barely	0.0 pts None at all
Completion of Template Questions 4 pts.	4.0 pts Thoughtfully and thoroughly	3.0 pts Thoroughly	2.0 pts Somewhat	1.0 pts Barely completed	0.0 pts Not at all

Cross-Class Peer Review: 20 pts.

Criteria	Ratings				
Address of Thesis Questions 4 pts.	4.0 pts Thoughtfully and thoroughly addressed multiple questions	3.0 pts Thoroughly addressed a few questions	2.0 pts Thoroughly addressed at least one question	1.0 pts Barely addressed one question	0.0 pts Did not address any questions

Quality of Final Comments Feedback 4 pts.	4.0 pts Worthwhile and significant	3.0 pts Significant	2.0 pts Somewhat significant	1.0 pts Basic and/or local feedback	0.0 pts No feedback
Address of Organization/ Body Paragraphs 4 pts.	4.0 pts Fully and very appropriate	3.0 pts Thoroughly	2.0 pts Somewhat	1.0 pts Hardly	0.0 pts Not at all
Explanation of suggestions 4 pts.	4.0 pts Thoughtfully and thoroughly	3.0 pts Thoroughly	2.0 pts Kind of	1.0 pts Barely	0.0 pts None at all
Outcome Completion of Template Questions 4 pts.	4.0 pts Thoughtfully and thoroughly	3.0 pts Thoroughly	2.0 pts Somewhat	1.0 pts Barely completed	0.0 pts Not at all

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