

# Student peer review in the classroom: A teaching and grading tool

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## ABSTRACT

It is helpful for instructors to provide students with critique, not only upon completion of a writing assignment but also during the writing process. However, due to time constraints, instructors may not be able to read writing assignments more than once during a particular course, especially in large classes. Students may gain only limited feedback from a single source (the instructor). This paper discusses the use of student peer review to provide students with feedback early in the process of writing a term paper, and to give students experience in reviewing scientific material. Students were assigned a term paper that was then reviewed by classmates. The term paper consisted of the student's laboratory report summarizing the experiments performed during the course, and integrating both lecture and laboratory materials. The review process was double-blind to provide anonymity for both authors and reviewers, but was otherwise handled in a fashion similar to that used by scientific journals. Students were accountable for the quality of their reviews as well as their term papers. Peer review provided students with feedback early in the writing process, and required little additional time investment by the instructor. It also gave students important experience in critical thinking. The quality of the final product (the finished term paper) was improved as a result of the experiences of reviewing classmates' work, and receiving and implementing comments from peers. Peer review may be a valuable teaching and grading tool for the instructor who wishes to focus course activities on writing, but has limited resources or time for reviewing writing assignments.

WRITING ASSIGNMENTS are among the most important components of the educational experience. They are useful not only for developing students' writing skill, but also for teaching subject matter (Berkenkotter, 1982; Brumback et al., 1985; Emig, 1981; Fulwiler, 1982; Parrish et al., 1985; Rubin, 1988). Writing assignments may take many forms, and require various degrees of effort for students to write them and for instructors to administer and grade them. Often, in order to maximize effectiveness of a particular writing assignment, instructors must invest heavily in grading and reviewing students' work. For example, it is usually helpful to give students feedback early in the writing process, as well as during various stages of completion. This obviously requires the instructor to read the assignment more than once, which consumes the instructor's time, and may also interfere with timely processing of other paperwork, such as exams and homework. Also, the instructor has only his/her own point of view to offer, regardless of how many times the writing assignment is reviewed.

A possible alternative to traditional approaches for handling term papers is to ask students to review their classmates' work. There are several advantages associated with giving students responsibility for at least one

stage of the review process. Student reviews add additional perspective to the review. When feedback is provided only by the instructor, students are passively involved in the evaluation process. Student passivity has been linked to ineffective learning in classroom teaching situations (Kraft, 1985). External judgement or review of creative writing provides an environment in which two minds may assume adversarial roles, a situation that facilitates critical thinking (Furedy and Furedy, 1979). Peer-initiated suggestions may be perceived as less authoritative in some ways than those offered by the instructor, thus encouraging students to challenge comments they disagree with. The peer-reviewed term paper may not only accomplish teaching objectives, such as delivery of subject matter, practice in critical thinking, and polishing writing skills, but also provides the student author with feedback he/she might not get otherwise. If managed carefully, the peer-reviewed term paper may provide these advantages with a reasonable commitment of faculty time. The use of a term paper combined with peer review as a tool for both teaching and grading is described here.

The author teaches an introductory course in soil microbiology, which has a laboratory component and is open to advanced seniors and graduate students. Because Ohio State University is on a quarter system, the course has a fast pace, and timing of assignments and presentation of materials is critical. The lecture and laboratory sections of the course meet for 3 and 6 h per wk, respectively, for a period of 10 wk. Because of the short, intensive period of study, it is necessary to choose activities carefully, not only to give the students appropriate experiences within the time available, but also to allow time for lecture preparation and laboratory set-up. In this course, lectures are of traditional format, with one mid-term exam, a final, and several homework problems. The laboratory consists of a series of related experiments following a central theme. These experiments include measurements of the effects of a xenobiotic organic amendment upon N cycling and microbial population ecology, kinetics of degradation of the xenobiotic, and the effects of inocula on degradation kinetics. The product of the laboratory is a manuscript in which the students are expected to integrate the information obtained from their experiments to test hypotheses about the fate of the test compound, and offer some speculation relative to the central theme. The laboratory manuscript is used to link the lectures and laboratories,

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and is therefore the central activity of the course. It is this laboratory manuscript that was peer reviewed by our class.

## APPROACH

The term paper was handled in much the same fashion as a manuscript submitted to a scientific journal. Students were not given a specific journal format, but were expected to choose a journal appropriate to their subject matter and adhere to the rules of style set forth by that journal. Student authors were also expected to adhere to guidelines listed in Table 1. In this effort, they were instructed how to choose a journal and how to find instructions for authors for the journal. A length of 20 to 25 pages (double-spaced, standard pitch) was suggested as a target. After a student selected a specific journal and drafted a manuscript in the appropriate format, two copies of the draft (one bearing no identification of the student) were submitted. Students were required to attach a cover letter to the editor of the journal and a copy of the instructions to authors provided by the journal.

Each student received a manuscript (bearing no identification of the author) written by one of their peers and a copy of the instructions to authors. Reviewers were instructed not to duplicate the manuscript or identify themselves when reviewing the manuscript. They returned their recommendations on a form letter to the editor, along with two copies of a separate review and the original manuscript. Guidelines used for reviewing manuscripts are detailed in Table 2. One copy of the review was graded, the other was returned with the marked manuscript to the author. Authors then revised and resubmitted their manuscripts, along with the reviewer's comments and a cover letter in which the author carefully accounted for his/her dispensation of each of the reviewer's remarks. The manuscripts were then reviewed by the instructor for the assignment of grades. Criteria for evaluation of both the final drafts of the manuscripts and the review of manuscripts is described below.

Reviews were graded largely according to compliance of the reviewer to guidelines listed in Table 2. Particular attention was devoted to the reviewers' evaluation of the author's understanding of the science involved in the manuscript. Reviewers were expected to give attention to details, such as adherence to journal style or errors in grammar or spelling. The reviewers were also expected to evaluate the appropriateness of the manuscript for the

**Table 1. Guidelines for writing a manuscript.**

The manuscript is to be based upon the laboratory experiment as it was performed and should be written as if for publication in a specific journal, which must be clearly identified.  
The manuscript must be typed, double-spaced.  
The submitted manuscript must include:  
Two complete copies† of the manuscript with a cover letter to the editor and a cover page containing the following information:  
(i) title, (ii) author†, (iii) running title, (iv) address, and (v) footnotes.  
Copy of instructions to authors. The manuscript should be prepared in compliance with instructions to authors.

† One copy of the manuscript should not bear the authors name or any other specific information that could positively identify the author.

particular journal chosen. Contributions by the reviewer to the substance of the manuscript were praised, particularly when such contributions materially improved the quality of scientific interpretation or the organization of the manuscript.

The manuscript itself was graded only in the final draft form. Evaluation was based largely upon scientific content and the nature of the author's response to reviewer comments. Authors were expected to respond to their reviewers, whether or not the reviewers' comments were perceived as valid. The authors were also graded on adherence to guidelines in Table 1, as well as conformity to the instructions to authors they provided with the manuscripts.

## RESULTS AND DISCUSSION

Student reviewers were remarkably thorough. This might be expected because each reviewer had also prepared a manuscript describing the same experiment. Most major grammatical and spelling errors were found by student reviewers. Most reviewers were able to identify substantial weaknesses of logic structure, although criticism of grammar, style, and spelling was more often the focus of student reviews than was scientific content. Reviewers were supportive of authors for the most part, and usually suggested alternative choices of wording when necessary. The ability of college students to analyze both strengths and weaknesses of their peers' writing has also been observed in writing courses (Hvitfeldt, 1986). Representative reviewer comments are found in Table 3.

The peer review process demonstrated clear preferences among students for particular types of data presentation. Student reviewers often requested graphical presentation of data submitted in tabular form, or vice versa, whereas authors generally defended their choices of presentation format when criticized (see Table 4 for examples).

The experience of reviewing a classmate's manuscript probably provided students with several intangible benefits. The students gained a rare opportunity to observe how another student interpreted the nature and purpose of the experiments and the meaning of the data. Also, students were able to read how others presented concepts similar or identical to their own. Students may also have been more comfortable with challenging the

**Table 2. Guidelines for reviewing manuscripts.**

The reviewer must provide:  
Recommendation to the editor on forms provided.  
Two copies of a separate review in which the reviewer has listed comments and specific examples to support the recommendations submitted to the editor.  
If a manuscript is relatively free from errors, the reviewer should provide specific examples of particularly good writing, thinking, etc.  
The reviewer should give close attention to the following qualities of the manuscript:  
Scientific content  
Organization  
Grammar, spelling  
Adherence to the course format; inclusion of cover letter, cover page, body of manuscript, copy of instructions to authors.  
Adherence to journal format according to Instructions to Authors.

work of their peers than published works or other seemingly authoritative sources of material for review.

As one might expect, students often appeared to borrow concepts, organizational strategies, and presentation styles from the authors of the manuscripts they reviewed. For example, one reviewer incorporated a table summarizing various treatments after having reviewed a manuscript with such a table. Another greatly expanded the Methods section to more closely approach the level of detail included in his assigned manuscript. Other students included greater discussion of particular treatment effects after reviewing more thorough documents. The resulting product was almost always more complete than the original draft. This improvement was not only noted by the instructor, but also the students. When asked to respond as to whether the term paper "was improved by the experience of reviewing a classmate's term paper," 11 of 12 students responded that they strongly agreed (9) or agreed (2) with the statement. Some of the improvement may have been attributed to reviewer comments, as described above, and some may have resulted from the experience of reading another person's perspective on the experiment.

The peer-review exercise was particularly useful as a grading tool. Student reviewers provided attention to details, such as grammar and spelling, which might otherwise have been overlooked by faculty or teaching assistants in the process of grading numerous papers on a tight time schedule. It is likely that peer review would be especially useful in larger classes, where attention to detail may become otherwise impossible. Student reviewers were less restrained or forgiving than the instructor. As a result, one student pointed out that the contrast between the student reviewer and the instructor (who possessed sole authority for issuing grades) solidified a perception of fairness on the part of the instructor.

**Table 3. Examples of reviewer comments to authors.**

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- "The author did an excellent job discussing the data and analyzing the limitations of the techniques employed in the research."
  - "I feel that the author needs to address the definition of water potential specifically from the viewpoint of a microbiologist. His/her own explanation of the water potential concept would be more useful to the reader than that offered by Salisbury and Ross. . ."
  - "You need to define the purpose of your study and why it relates to xenobiotic compounds."
  - "The summary should be revised. The author needs to leave the reader with a clear idea of why being able to control water potential is an important research method. . ."
  - "Second paragraph of introduction should be deleted since it doesn't belong to this section. The introduction is supposed to provide the rationale for the study. Refer to the Instructions to Authors."
  - "The author's English is very, very poor. If the author's native language is not English, the author should have had the paper reviewed before submitting it to the journal. Line 8, for example, does not make sense because the verb tense and grammar are wrong."
  - "It seems to me that the second paragraph does not belong to this section. . ."
  - "Incubation temperature needs to be indicated because of its importance to microbial activity."
  - "This paper was not submitted according to the Notes to Authors for this journal."
  - "This paper needs a lot of help, but it shouldn't be trashed. . ."
  - "The last sentence should have been the topic sentence and been placed at the beginning of the paragraph."
  - "You need a wrap up at the end. What does all this experimental evidence mean. . .?"
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For the author's application, there appeared to be some limitations to the use of peer review in term paper assignments. Drafts were, by necessity, submitted fairly early during the course to allow sufficient time for thorough reviews and for major revisions to be made prior to submission of the final draft. For this reason, it was important that essential topics needed for manuscript preparation were covered in time for incorporation into the final draft of the term paper. The review process required careful coordination for distribution of papers and had very little flexibility for those students who could not meet deadlines. It was therefore important that all deadlines, as well as consequences of not meeting deadlines, were clearly stated. Because anonymity of the author and reviewer were preserved, the instructor used measures to insure that identities were not revealed inadvertently during the review process. This included clipping names or other forms of identification from manuscripts or letters attached to them, a process which did require additional time from the instructor.

One philosophical issue (which became an opportunity for discussion) arose as a result of the review process: What kinds of "borrowing" of ideas constitutes good authorship, and what is scientific misconduct? Though it was easy for students to conclude that verbatim transfer of text from one document to another could be construed as plagiarism, the ethics of more subtle forms of opportunism were very unclear. This issue provided the instructor with both a philosophical problem in grading and an opportunity to engage students in critical thinking about a timely topic in ethics.

In summary, peer review of term papers was successful as a teaching and grading tool. The student authors were able to receive extra feedback early in the writing process because part of the labor was provided by their classmates, labor that would otherwise have represented a significant loss of time needed by the instructor for class preparation and grading. The addition of the review

**Table 4. Examples of responses of authors to reviewers.**

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- "I agree with most points made regarding the original manuscript. I must disagree slightly with regard to discussion of the figures. . ."
  - "Procedures for dilutions and MPN were shortened and referenced. . ."
  - "As the four weeks of MPN and plate counts showed a steady and unfluctuating trend towards the final counts, it was assumed that the final counts were adequate to demonstrate the differences between the treated and untreated soil."
  - "The entire discussion section for mineralization/immobilization was expanded."
  - "I feel the first paragraph is appropriate because it serves as a transition into the results. . ."
  - "In the MPN discussion, the first sentence does not contradict the second sentence. The treated and nontreated followed the same trend, although the numbers themselves were different."
  - "The following includes reviewer's comments I could not agree with: 1. The question on whether I am sure that such an organism can be found in soil. *Klebsiella* can be found in soil."
  - "I disagree with the reviewers statement that the bugs used this compound for proliferation. The carbon would have to have been labeled for actual proof."
  - "The reviewers assessment that denitrification was possible was valid."
  - "I agree that treatment descriptions for biological cycling could have been placed in tabular form with the results; however, I prefer to represent my data in graph form, since I believe it is easier to comprehend."
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process gave an extra dimension to the overall learning experience, while improving the efficiency and thoroughness of the grading process.

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