

The Use of Peer-Review in the Undergraduate Laboratory

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Introduction

The value of peer review in developing both critical thinking and student writing skills is well-documented (1-4). The first drafts tend to be improved because the students' realize that their peers will be reading their writing (5). Additionally, the student is provided with a formalized to revise the original report in response to the review. The reviewer benefits by being forced to consider the elements that lead to an effective report. However, the instructor must provide sufficient structure and guidance to prevent students from giving entirely negative or hierarchial evaluations (5). Thus, providing a structured report sheet, similar to a referee report, is advantageous.

At the University of North Dakota, peer review has been added into the undergraduate research lab, as part of an ongoing systematic effort to develop the oral and written communication skills of chemical engineering undergraduates (6,7). A student submits a copy of a technical journal article based on his or her lab experiment. This journal article is similar in scope to an extended abstract. An additional copy of this report is given to a different student in the class who has not run the same experiment. This student must then learn the details of the experiment, evaluate the technical report, make specific suggestions for revision, and identify both strengths and weaknesses of the report. The peer review does not affect the grade of the original journal author, but the review itself is graded. Finally, the original writer receives the peer review and a faculty review. He or she is then given an opportunity to return to the lab to gather any additional data that is required, and then resubmit a revised report in response to the reviews. This revised report is graded separately from the original report. Each student writes one technical journal article, one peer-review, one operations manual, one oral presentation, and one revised final report during the course. The next three pages show the handout given to students and the referee report that they are asked to use with their review.

ChE 331 - Chemical Engineering Lab II - The Peer Review

Objective:

Almost no journal articles are published in their original form. External readers often can offer new insights and perspectives, detect areas of weak or faulty reasoning, and address ambiguous or incorrect writing issues. Thus, when an editor of a technical journal receives a submission from a researcher, the editor sends the article to another expert in the researcher's field. This peer reviewer identifies strengths and weaknesses of a paper, locates inconsistencies in reasoning or argument, evaluates the technical merit of the paper, and makes two specific recommendations that change the paper. First, the reviewer makes a general assessment of the paper and recommends one of four courses of action. Specifically,

1. Publish the paper as is (This seldom happens)
2. Publish the paper after minor revisions are made
3. Have the author make the suggested major revisions and I'll review it again
4. Do not publish this paper

Next, the reviewer makes a detailed series of recommendations for improving the paper. These may include, but are not limited to, suggesting additional experiments, requesting additional explanation or analysis, challenging conclusions or premises, and providing proofreading and flow suggestions. The peer reviewer is the guardian of quality for technical journals and his or her role is every bit as important as that of the article's author.

Format:

The peer reviewer will submit three copies of the attached form along with the original journal article and a letter to the journal editor (Dr. Newell). Grammatical and typographical errors should be marked directly on the original manuscript. The letter to the editor should include a brief greeting, a statement of purpose (Why are you writing this letter?), a short summary of your publication recommendation (Publish it or not) and a brief justification of your recommendation.

Regardless of which recommendation you make, you will not be asked to perform a second review of the paper.

The first page of the review provides an area for overall evaluation and specific criticisms and suggestions. Direct questions are asked and explanations for your answers should be included in the comment section, which comprises the rest of the review. The comments should be specific and informative with direct questions, observations, or recommendations being made. Your grade will be based on the following issues:

1. Depth of analysis, including recommendations (50%)
2. Demonstration of technical understanding (25%)
3. Clarity of expression (25%)

Note: Your Peer Review will **not** affect the grade of the technical journal's author.

Miscellaneous Observations:

1. Criticisms of articles should be constructive in nature. Comments like "This is Awful" will not lead to a better paper (or a better grade).
2. In addition to criticizing the article, your review should point out what was good about it.
3. It is not enough to say what is wrong, you must also suggest what can be done about it.
4. Look for areas that are unclear. Often the author will present useful information, but it will be lost in rhetoric or hyperbole.
5. Your suggestions must be reasonable. You could recommend running more trials, but you cannot

tell them to run 30 more or to buy more sophisticated equipment.

6. While critiquing the paper, consider the things that make a journal article stronger or weaker. Look for these strengths and weaknesses in your own writing.

Reviewer Report

Reviewer Name (1 copy only): _____

Title: _____

Author: _____

1. Does this article warrant publication in this journal?

_____ Acceptable in present form

_____ Acceptable with minor revision, no further review necessary

_____ Major revision and a second review is required

_____ Not acceptable (provide detailed explanation under comments)

2. Is the Title Satisfactory? _____

3. Does the abstract adequately summarize the paper? _____

Could it be more complete or concise _____

Indicate suggested revision on the manuscript or under comments

4. Are sufficient references provided? _____

Are they appropriate and free from obvious omissions? _____ If not, Explain.

5. Does the paper present material efficiently? Indicate suggested changes on the manuscript or

under comments.

- a) Could the clarity or efficiency be improved by changes in the order of the paper? _____
- b) Should the language or grammar be improved? _____
- c) Are there portions of the text that could be omitted? _____

6. Are there errors in factual information, logic, statistical analysis or mathematics? _____

Address these issues in detail in the comments. Suggest improvements.

7. Mechanical Errors (address on manuscript)

- _____ Figures or Tables improperly or incompletely labeled or titled or not cited
- _____ Misuse of References (Failure to cite, reference needed and not provided)
- _____ Other: _____

8. Comments: (Attach additional pages as necessary)

Summary

Peer review was used for the first time in the undergraduate laboratory in the fall semester of 1996. A noticeable increase in the quality of writing was immediately apparent. Students almost uniformly took the reviewing task seriously. The final revised reports were substantially better than technical journals from previous years. Additionally, student feedback about the peer reviews has been uniformly popular. The students have indicated that writing the review made them recognize weaknesses in their own writing. Overall, the use of peer reviews appears to be successful in the undergraduate laboratory.

References

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