AC 2011-1455: OBSERVATIONS FROM AN ENGINEERING WRITING PROJECT

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Observations from an Engineering Writing Project

Abstract

Written and oral communication skills are highly sought after abilities in engineering graduates. However, outside of an English Composition or a Technical Communication course, these skills are seldom directly addressed. Often the course subject matter, specifically in undergraduate engineering courses, dictate what is covered, and little additional time is available to discuss these topics. Even in graduate school, students may not begin writing until they have finished their course work and have begun working on their thesis or dissertation.

In Spring 2010, a graduate level course was offered and in this course, a writing component comprised a significant portion of their overall grade. Students wrote a state-of-the-art review paper based on one of the course topics. Students also served as peer reviewers, submitted their article to a journal, and presented their paper to their classmates.

The course addressed much more than forming a complete sentence. Topics ranged from figure title placement to a thorough review of a journal's style manual to reading and interpreting author guidelines. Students were also presented with examples of published articles from leading journals.

As with any class, the goal was for the students to learn more about the course subject matter and improve their writing skills. This paper presents observations of the course project from the professor's and the students' perspectives. Recommendations for future writing projects are also presented.

Introduction

When do students learn to write? It is a question that is often asked of employers and of faculty. When surveyed, employers (the department's alumni) frequently list writing skills as one of the most sought after qualities of recent engineering graduates from our institution. Similarly, faculty members express like themes when recruiting graduate students. In an attempt to address these issues, a writing project was introduced in a graduate level civil engineering course. For

the project, students were required to write a "State of Art" report and submit their article to a journal. The project goals were introducing the students to technical writing and hopefully improving their technical writing; familiarizing students with the library and services they offer; and increasing their level of understanding of the course material.

The Class

The project was introduced during the spring semester of 2010 in a graduate level engineering course. The course focused on concrete durability issues such as alkali-aggregate reaction, freezing and thawing durability, and sulfate attack. In Spring 2010, 15 engineering students were enrolled in the class and of the 15 students, eight were graduate students and seven were seniors. Of the eight graduate students, three had co-authored a research article with their advisors and had begun writing their thesis. Beside laboratory reports or class projects, the remaining 12 students had no technical writing experiences. The project accounted for 40 percent of the students' overall grade.

The Project - Article

As previously stated, each graduate student and pair of undergraduates was required to submit a "State of the Art" paper on a concrete durability related topic. There were only two project requirements. These included a bibliography of at least 20 journal articles and adhering to the journal's style guide.

The second day of class, the students were distributed a handout that outlined the project. Five "State of the Art" articles that had been published in peer-reviewed journals were also provided.[1-6] For the undergraduates and for some of the graduate students, this was their first introduction to "State of the Art" articles. The entire second class period was spent discussing the structure or outline of the articles and similarities amongst the articles.

Since a semester is only 16 weeks long, an ambitious scheduled was developed. The schedule is shown below in Table 1. At this time, the majority of the students had not begun working on

their thesis much less written an article; therefore the project began with the basics. The students' first step was to sign up for Interlibrary Loan. For 12 of the 15 students, a literature search involved the internet and the journals to which the University had electronic access. The class was amazed at what a powerful tool Interlibrary Loan was during their literature review.

During the second class period the students were provided a list of potential paper topics that were related to the course content. The students were free to choose their own topic or choose from the list provided by the instructor. The paper topic was reviewed by the instructor to ensure that there was sufficient literature available to write a "State of the Art' article.

Table 1. Project Schedule

Action	**Due Date**
Sign up for Interlibrary Loan	January 20
Select Topic	January 20
Submit Abstract to Peers	January 25
Abstracts Returned	February 1
Submit paper outline	February 15
Submit First Draft to Peers	March 1
First Draft Returned	March 15
Submit Final Draft to Peers	April 12
Final Draft Returned	April 19
Submit to Journal	April 28

After the students selected their topics, each graduate student and undergraduate teams of two students submitted a 300 word abstract to the instructor that outlined their potential paper. Students were also required to submit three abstracts that were peer-reviewed by their classmates. To conduct the peer-review, the class of 15 was divided into three groups of five students. Each of the three groups contained one graduate student who had previously submitted an article and therefore had their work peer reviewed. Each abstract was reviewed by the instructor and three of the students' peers. The reviews were coordinated by the instructor and were "blind – blind" reviews. The students were allowed one week to review the abstracts.

Once the abstracts were returned, an example paper outline and a journal's style guide were provided to the class.[7] This outline was in addition to the five articles that were distributed earlier in the semester. The students' outlines were submitted only to the instructor and not peer-reviewed. Outlines were returned to the students the following class. Of all the assistance

provided to the students, the style guide was the most beneficial to the students (based on student comments). The style guide gave recommendations on word usage, sentence structure, and data presentation.

Two weeks after writing their outline, the first draft of the students' manuscript was due. Because of time constraints, the first draft was generally "rough". Several manuscripts were not finished. During the reviewing process, the reviewers were asked to focus on specific aspects of the paper such as the number of references, organization, formatting, and the overall scope of the paper. Two weeks were allotted for the review. This first review identified many discontinuities in the structure of several papers. For example, papers were too vague (lacked focus on the subject matter) and lacked conclusions or recommendations.

The students had four weeks to address the reviewers' comments. The papers were then peer-reviewed by the same group who provided the first review. After this second peer-review, the papers were returned to the authors. The authors addressed the final comments and the article was submitted to a journal.

The Project – Presentations

Presentations were scheduled for the last two weeks of the semester. The class met three times per week for 50 minutes per lecture. Based on the number of papers, each author(s) had 20 minutes for their presentation and five minutes for questions. Each presentation was critiqued only by the instructor.

Conclusions

Paper

None of the papers were accepted. The reasons for the rejections were related to "little or no contribution to the body of knowledge". One paper was rejected by the editor and was not reviewed. The majority of the reviews lack specific changes or comment regarding

improvements that could be made to the papers. I had hoped that the students could have incorporated the reviewers' comments and resubmitted the papers, but they were not able.

As a teacher and faculty member, I have mixed feelings about the results of the project. As a teacher, I am somewhat disappointed because I know the amount of effort that some of the students put into their paper. I know how proud some of the students were of their work and how excited there were knowing their work may be published. As a faculty member, I am somewhat pleased because I am in a profession in which success is partially based on peer-reviewed publications. Even though I question why some articles I read are published, I am satisfied that the peer-review system did work for this instance.

At the end of the semester, the students were asked to provide comments regarding the project. Many students stated that the work load was too much. Some students had mixed emotions about submitting their article to a journal because of their paper's poor quality. Overall, the students displayed a higher level of understanding during their peers' presentation. This can be attributed to the peer-review process. The students became very familiar with the papers for which they were responsible for reviewing.

Presentations

The student presentations were similar to many conference presentations I have witnessed. Even though the class discussed presentation etiquette prior to the presentations, the majority of the students exceeded the 20 minute time limit, and there were presenters who also read every slide.

Recommendations

There are Universities that require a technical writing course in their graduate engineering curriculum. From conversations will fellow faculty at peer institutions, the course content can vary significantly. However, a course dedicated to technical writing best addresses writing than a graduate subject matter course. Future plans include gathering faculty input regarding the topics of such a course and whether journal submission should be included. After obtaining faculty feedback, a course may be developed and offered.

If a “technical writing” course is not developed there are changes or additions that can be made to our current undergraduate curriculum to at a minimum expose our students to technical writing. The recommendations are listed below.

1. In each of the first discipline specific course that requires a laboratory report, provide students with a style manual from a top journal. The students will then learn at an early stage in their career proper terminology and sentence structure.
2. For classes requiring a report or a research paper, provide students with an “author guidelines” from a journal in their field. Require students to follow the author guidelines when writing their reports.

If a “technical writing” course is developed, changes or additions to the course are listed below.

1. Develop a course with input from the department’s, college, and University faculty. Such a course should not be limited to only one department.
2. Most Universities are home to professors who have won paper awards. The class could read these papers and then invite the professors to class to discuss their papers and field questions from the students.
3. The class can watch presentations online from various conferences. The students can then identify the better presenters and better presentations and spend time discussing what makes those presenters/presentations effective.
4. If possible, the class can attend a local conference to observe presentations. These presentations do not need to be discipline specific. The goal for the students would be to identify good presentation practices and later return to the class to discuss those practices.
5. Share reviewer comments that our faculty have received. Reviewer comments from both accepted and rejected papers can be shared with the class. Not only will this provide students with an idea of the level of technical merit required by most journals, the class can discuss how to incorporate reviewer comments to improve their papers.
6. The class will also discuss plagiarism. Many of our students (and faculty) do not have a good understanding of what plagiarism entails.

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