AC 2012-5308: USING WIKIS TO FACILITATE WRITING RESEARCH ABSTRACTS IN A CIVIL ENGINEERING GRADUATE COURSE

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Using Wikis to Facilitate Writing Research Abstracts in a Civil Engineering Graduate Course

Abstract

The objective of this study is to assess the impact of student performance and quality of writing research abstracts when using wikis to effectively engage students in a graduate course. Students will use wikis that are integrated within Blackboard to write an abstract for their project focused on structural dynamics. When writing their abstracts, students are expected to demonstrate knowledge of their topic and explain their research objective, methodology, results and conclusions in a clear and concise manner. The abstract is written as a wiki to share this information for peer learning and to gain feedback on the clarity and quality of their technical writing. Assessment and evaluation of the impact of this effort includes peer review and feedback from the instructor directly using the wikis. Comments to the wiki are made alongside the abstract as to not completely change the original composition but rather to enhance it for inclusion in their final paper. Results include student perceptions about their writing experience with the wikis compared to a more traditional review methodology. Lessons learned from this study are also shared, where the use of wikis for writing research abstracts can promote a shared learning environment with the opportunity for students to improve their technical writing skills and remove any inhibitions, if any, about having their writing reviewed and ultimately edited for improvement. As such, the range of applicability and accessibility for using wikis is vast, and can be cleverly incorporated into most courses.

Background

Improving students' writing and critical thinking skills are very important and necessary for career preparation. In recent years, increasing attention has been devoted towards improving the writing skills of students in science and engineering fields.[1] While science and engineering students may be more concerned with gaining technical competency than writing, technical writing is just as important for effectively communicating ideas and technical matters for that regard both orally and in writing. In fact, studies at the University of Washington have focused on specific outcomes for assessment of student writing to meet expectations of the workplace.[2] Published in 2000, the Industry, University, Government Roundtable for Enhancing Engineering Education (IUGREEE) conducted a survey to gain the industry perspective on the importance of the eleven program outcomes and assessment criteria in The Accreditation Board for Engineering and Technology (ABET) 2000.[3,4] The top three factors did not include issues with technical competency but rather emphasis on 1) understanding of professional and ethical responsibility, 2) recognition of the need for lifelong learning, and 3) effective communication. These results are just some examples that unveil the need for technical writing assessments coupled with instruction for technical competency to better prepare students.

Just as writing is important on the undergraduate level, it is also important at the graduate level for the same reasons. Students must continue to improve their technical writing skills to support the need to explain and communicate more complex concepts learned at the graduate level. The context of this study was shaped by this need to challenge students' technical writing skills through a contextual project, and conducted on a small group (n=3) of civil engineering

graduate students in a graduate course on structural dynamics at Morgan State University, a historically black college or university (HBCU). All 3 students in the class worked full-time in addition to being full-time graduate students. The immediate goal was to enhance the communication (written and oral) skills of the graduate students by having them 1) to write a technical paper about the engineering process that they used to analyze a "real-world" problem, and 2) to present their findings via a PowerPoint presentation to the class at the end of the semester. The results of this study are intended to inform instructors on how wikis, which several students are familiar with, can be used as an interactive tool to provide feedback on technical writing as well as a platform for sharing and learning. Results include student perceptions about their writing experience with the wikis compared to a more traditional review methodology. As such, the range of applicability and accessibility for using wikis is vast, and can be cleverly incorporated into most courses to increase the amount of opportunities students have to write and get feedback on their writing.

Writing Perceptions and Methodology of Study

This experiment was designed to document the process in which wikis can be used to facilitate student writing, peer evaluations, and classroom sharing. Before the writing process began, students were asked via a short survey administered via Blackboard about their perceptions about writing. (More tips on developing surveys via Blackboard can be learned via video found at http://ondemand.blackboard.com/r91/movies/bb91_tests_surveys_reading_survey_submissions.htm). The first survey question was an opinion question using a Likert scale shown in Table 1. The second survey question was a series of questions that required short responses, but were more open-ended. Only 2 of the 3 students responded, where the responses were mixed but did not reveal major horrors, fear or reservations about writing:

Table 1: Writing Perceptions Likert Scale Question

Survey Question #1:	I like to write.	
		Percent Answered
	Strongly Agree	66.667%
	Agree	0%
	Neither Agree nor Disagree	33.333%
	Disagree	0%
	Strongly Disagree	0%
	Not Applicable	0%
	Unanswered	0%

Table 2: Writing Perceptions Short Answer Question

Survey Question #2:	Are you good at writing? When did you write our last paper? Do you do a lot of writing on your job?
Student Response #1:	I am a great writer. I write important information. I like writing. I do not write fiction or any types of leisure writing at this time. I wrote a paper last for school Senior Project Design. I do a lot of writing at my job and it is helping me to make my great writing perfect writing.
Student Response #2:	I do not really like to write, but it is a part of college so I have to do it. The last paper I wrote was last semester; I had to write a few papers for that course. My grades were good for those papers.

After the survey results were received, there was a discussion about how to select a topic and begin the writing process. To achieve the goals as outlined previously for this structural dynamics project, students were first expected to be able to answer the following questions when deciding on a topic for their structural dynamics project before writing their draft abstract:

- What is the problem and why is it problematic?
- What will be my approach to solve the problem?
- How will I idealize and model the structure?
- What structural dynamics topics will be emphasized when solving this problem?
- What are the anticipated results and/or findings?

Answering these questions before writing a draft abstract is critical in helping students to organize their thought process, have better clarity about what they are hoping to accomplish, and provide a context for writing in a logical and clear manner.

Managing the Wikis and Results

Once the students answered these questions, they composed their draft abstracts and submitted them under the wiki link that the instructor created for them via Blackboard. Note: only students registered for the course had permission to view and make comments about the wikis, which eliminates "outsiders" from making comments. As such, this helped with managing the wiki and providing control as to who would make comments to the wikis. Comments to the wiki were made alongside the abstract as to not completely change the original composition but rather to enhance it for inclusion in their final paper. Students were expected to post their abstract to communicate their ideas. Their peers were expected to make comments and raise questions to help clarify the writing. The instructor posted comments too, where both the student author and other students could see the comments and make it a shared learning process for the entire class. Figure 1 shows a sample of a graduate student's wiki abstract along with select comments posted about the wiki contents. As such, writing the abstracts was a major step in helping students articulate their specific research question, clearly convey their methodology and modeling approach, and share their ideas with their peers in a shared learning environment where all students shared the same risks.

The next step involved having students to update their draft abstract and resubmit their wiki. During the next class period, each student read his abstract, which was projected on a screen, while another student had to go to the board to try to model what was being described in the abstract. Doing this exercise really helped the students to see how being specific was very

important and how they have to use words to make their work "come to life" in a "write it do it" format. Having the students to see where there were knowledge gaps in their writing from their peers was more illuminating than having written comments from the instructor alone. The titles of the 3 students' projects were as follows:

- The Gravity Dynamic Dam
- Seismic Isolation on Bridges
- Dynamic Analysis of an Irregular Building

Figure 1: Sample student wiki using Blackboard

Following this exercise, students revisited and updated their wikis using a new thread for their peers to re-review and see what was changed from the first draft. (Information on assessment is presented in the next section). Furthermore, making this a shared learning experience helped increase everyone's writing quality in the end, where the entire class learned from each other's ideas, mistakes and input. It was discovered that the students valued each other's opinions, and did apply corrections based on their peer's comments. In the end, students felt more confident about their final writing product given this review process and continuous feedback provided via the wikis.

Assessment and Evaluation

Formative assessment and evaluation of the impact of this study consisted of feedback through a peer review process using the wikis and in-class discussions followed by constructive feedback

from the instructor regarding their wiki contents. Students were also asked to submit Microsoft Word files of their first and second draft abstracts. During this time, the instructor was able to directly evaluate the student writing and provide feedback using "track changes" for editorial corrections and "new comment" to make personal notes to the student. Table 3 shows the resulting grades of the 3 students' writing samples, and how their grade (and thusly writing) improved with the second draft as a pre- and post-assessment. Both writing content and clarity improved by more than 11% in all cases. Some of the writing deficiencies evident in the first draft of the abstract included lack of specific details, poor connectivity between what they are trying to do and explaining it, and incorrect grammar and syntax.

Table 3: Pre- and Post-Assessment of Wiki Abstract

	First draft	Second draft	% difference
Student A	85	98	15.3
Student B	88	98	11.4
Student C	83	97	16.9

Additionally, the instructor evaluated their final technical paper, which included the final draft of their abstract, which was also submitted via a Microsoft Word document. Students were evaluated based on grammar and syntax, application of the scientific method evident in their research approach, technical content (i.e., how well they idealized, modeled and analyzed their structure), and rationale for their findings. A writing rubric was provided to all students to aid in understanding how they would be evaluated on their writing. All students' writing improved significantly, where their final abstract submission set the tone and direction for the technical paper by providing them with a clear, logical progression for the technical paper.

Wiki Technology vs. Traditional Review Approach

The use of the wiki technology is compared to a more traditional review approach in a bridge (civil) engineering graduate course of 30 students at a predominantly white institution, where students were expected to write a technical (synthesis) paper that included an abstract for the paper, and present their findings to the class via a PowerPoint presentation. The methodology for the traditional review approach was based on having the students bring 2 hard copies of their draft abstracts for an in-class peer review process, where they discussed their draft abstracts and provided feedback face-to-face. However, this review process for the abstracts was not an iterative one nor was student data recorded so a direct comparison could be made to show any improvement between drafts when using the traditional review approach compared with the wiki technology, unfortunately. But given the convenience of the wikis and having everything in an electronic format that students can access at any time, students using the wikis were able to review their peer's work on multiple occasions. Moreover, students could track the evolution of their peer's (and their own!) writing, and learn from each other's successes, mistakes and input in a shared learning environment via Blackboard. Having a small (n=3) class size to pilot the use of wikis to facilitate writing provided a controlled environment, where future studies can include using the wiki technology to facilitate writing for a larger class size for comparative purposes.

Conclusions

While an initial time investment for instructors to setup and determine the appropriateness, using wikis to provide more intermediate feedback to graduate students proved to produce better final written documents for their technical paper abstracts. Students were provided a rubric on how they would be evaluated on their writing and oral presentation, which also helped to demystify the expectations and reveal how their writing will be evaluated. As such, providing grading rubrics as a rule of thumb helps to provide a level of expectation for the writing content, and how they will be evaluated.

Lessons learned from this study are presented, where the use of wikis for writing research abstracts can promote a shared learning environment with the opportunity for students to improve their technical writing skills and remove any inhibitions, if any, about having their writing reviewed and ultimately edited for improvement. From this process, the 2 most outstanding writing deficiencies were revealed and corrected based on peer and instructor feedback using the wikis:

- Lack of specificity with technical content
- Improper syntax and grammar issues

However, consistent feedback via the wikis from their peers and instructor provided students with valuable comments to clarify these issues once noted.

This study was also compared to a more traditional review methodology where hard copies were used to facilitate the peer review. However, the amount of feedback was limited to only 2 peer reviews compared to having the potential for multiple reviews when using wikis. As such, the wikis provided the opportunity for an entire graduate class and instructor to make comments and provide feedback in a shared learning environment – a place where students can work and learn together. As such, the range of applicability and accessibility for using wikis is vast, and can be cleverly incorporated into most courses and even research groups, where wikis can be used as a tool to provide feedback on writing. Results suggest that critical feedback can be provided to enhance the quality of student writing, which in turn, can aid in better preparing students to communicate effectively, which is a program outcome and assessment criterion established by The Accreditation Board for Engineering and Technology (ABET). As such, the range of applicability and accessibility for using wikis is vast, and can be cleverly incorporated into courses. A future paper in which a large class can be assessed for comparative results using wikis is planned.

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