

Simulated Conference Submissions: A Technique to Improve Student Attitudes about Writing

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Abstract – While many models have been suggested for improving the writing skills of students in technical fields, we contend that improving attitudes about writing is equally important. We present an approach that seeks to improve both skills and attitudes through the use of Simulated Conference submissions. In this model, students are asked to write and present as if they are submitting to a technical research conference, complete with a review panel. By giving students this audience, we aim to focus their efforts on communication, rather than simply completing assignment requirements. In this paper, we present our results after having implemented this approach twice. The results show that student skills and appreciation of those skills both improve. In particular, student appreciation of the value of a literature review increases over the course of a term.

Index Terms – Communication, Conference submissions, Student attitudes, Writing skills.

PROBLEM STATEMENT AND GOALS

The problem of how to integrate writing and presentation skills into a technology-laden field such as engineering has been an issue for many decades now. Many paradigms have been suggested including case studies [1], group writing [2], and more focused emphasis on communication in the senior capstone course [3]. Norback [4] gives an extensive survey of publications over a 17-year period that focus on the oral and written communication skills of engineering students. And while many of these approaches have improved the communication *skills* of students, the equally-difficult task of improving students' *attitudes* about these skills is no less important to address. Indeed, it is often the case that students in technology-focused fields have an aversion to learning communication skills. As noted by Hendricks and Pappas [5], "the apparent resistance from engineering students to developing English writing skills is more a problem of attitude than of ability and skill." These attitudes also carry over into industry, where students complain that there is "too much emphasis on writing and presentation" [6]. In fact, the efforts at Michigan Tech in employing their successful Writing Across the Curriculum initiative have been most resisted by those within the College of Engineering [5], [7].

While others have attempted to promote the perceived importance of communication skills through the use of high-motivation topics, such as computer games in [8], our

attempt to improve student attitudes seeks to do so by focusing student attention on the practical, pragmatic aspects of communication in scholarly research. We do this by having students practice research, writing, and presenting in the context of a simulated technical conference. These conferences are meant to emulate as closely as possible the scientific and educational conference structure that faculty in technology-based fields routinely submit to as part of their scholarship duties (including forums such as FIE). The goals of this approach are not simply to help students grasp and retain the material better, though there is ample literature showing that it does [9]. Rather, this approach emphasizes the goal of *writing to communicate research and results* [10], as is so often the goal of authors who submit work to scientific conferences. In our experience, students do not believe that the practice of writing helps with learning new material. We contend, however, that students will see the value of *communicating* results. We believe that this pragmatizes the goal into something that students can have a vested interest in, especially engineers who already have a predilection for what is practical.

Having students write for a simulated technical conference is not a new pedagogical approach. As evidenced in [11]-[14], it has been used on numerous occasions in the field of computer science as a way of improving communication skills. The novel aspect of our approach is the way we implement and evaluate this system in order to emphasize our attention on changing student mindsets.

In the remaining sections of this paper, we describe the details of our Simulated Conference approach, including how we use this system to impart both skills and attitudes. We then discuss how we implemented this approach in the context of a sophomore-level research seminar in a liberal arts college setting. We then discuss our means of evaluation of this approach, the results of that evaluation, and then close with future directions.

APPROACH

In the Simulated Conference approach, students are told that the papers they write will be read by an outside "review panel" whose members are knowledgeable in the field in which they are writing. The "panel" may simply be the professor(s) of the course, but the assessment of the writing is done in the mindset of a reviewer, where a submission is judged based on the importance of the research question being studied, the relevance of the claims being made, the

evidence whereby those claims are justified, the discussion of what results actually mean, future directions of the research, and the overall story that is being told. A standardized grading form is used for all students where the grader can write comments that specifically address the points listed above. The grader may also make freeform comments about the paper organization and quality of the writing. Such a form is usually provided to reviewers of scientific conferences, and our grading form seeks to replicate that artifact. In addition, students are required to use a specific template not unlike those that conferences require accepted authors to use. This template requires students to adhere to strict formatting, structure, and page length requirements in what they write.

A similar structure is imposed on oral presentations. Guidelines are given about the format and length of the talk, and students are told that their presentations are being viewed by outside experts in the field. Whenever possible, we implement this realistically by inviting relevant faculty members, and sometimes students, as guests in the audience.

I. Cultivated Skills

We believe that our approach fosters the same good communication skills that are required of successful conference authors. These include:

- **Communicating to a broad audience.** Often, students only write for their professors or present to their fellow classmates. The result is communication that only makes sense to the limited few who have undergone the same classroom experience that the student has, as the following writing example from a student illustrates:

In our first attempt at building a stove prototype, we thought it would be ideal to put a grill on the side of the stove, where we had extra space, and where, as an extra feature, we could keep all cooking in close proximity with each other.

Unless the reader knows why a prototype of a stove was being built and why it is important to describe its features, this paragraph has no context. By requiring students to write for a review committee, they must establish context to people who are not only outside of their classroom, but outside of their college experience.

- **Using familiar ideas upon which to build arguments.** Good introductions are crucial not only to establish context, but to clearly state the problem and motivate the reader to care about finding a solution. Ideally, this is done by starting the reader on familiar ground and then gradually leading the reader into new territory concerning the research at hand. Without this familiarity, the reader quickly loses interest as the example above illustrates, since it also happens to be an introductory paragraph in a paper. Our approach provides an abundance of examples by which students

can learn how explaining their own research must start with the reader and author on common ground.

- **Conducting a literature review.** Since our approach requires the use of a template which includes a “Related Work” section, students are required to practice library research skills in order to make connections between their current work and what has been done before.
- **Crafting a clear research question that is worth studying.** Essential to any peer-reviewed paper, forming a relevant research question is a skill our approach allows students to practice. In the process of learning what it means to conduct research at the college level, they must also contend with articulating the merits of their work as an attempt to answer a sufficiently broad question that has important implications.

While the development of these skills has been encouraged independently in the literature, such as [15], they naturally fall out of our approach as being vital to the task of writing a successful peer-reviewed paper.

II. Cultivated Attitudes

While we wish to promote good communication habits, it is also our intent that our approach promotes positive attitudes about communication both in engineering and other technological fields. We hypothesize that the Simulated Conference approach is able to achieve this due to the following reasons.

- **A standardized format.** By requiring students to use a template when writing, we circumvent common student questions about aspects that are not relevant to communication, such as page limits, bibliography style, margins, and font size. Using such a model frees the student to focus on details relevant to the research instead of the assignment. As a result, we believe that this reduces the amount of “busywork” that the students perceive the assignment to contain. An additional benefit of having a page limit is that it motivates students to articulate their thoughts succinctly and to remove text that does not contribute to the overall story they wish to tell.
- **A standardized structure.** The paper template also provides a predetermined structure that includes the following sections: Introduction, Related Work, Approach, Evaluation, Results and Discussion, Future Work, and Conclusion. Students can readily relate these requirements in their own assignments to example published conference papers. We believe that this gives an additional layer of authenticity to the student writing assignments since what they create, both in look and content, “feels” like genuine research. We believe that this appearance helps to validate the work they do, and in turn encourages students to see communication of results as integral to the activity of research.

- A review panel.** As previously mentioned, the review panel aspect of the writing assignments promotes specific responsibilities for both the student and the grader. We believe that it also helps to improve student attitudes about writing in the following ways. First, an “outside” audience allows the instructor to show examples of actual review committees from actual conferences, since they are often posted on the conference web site. Students get a practical sense of the diversity of people who comprise such a committee, which in turn gives them a reason to establish the appropriate context early on in a paper. Second, it motivates students to strive for a high quality research question, since that is the core of any peer-reviewed research publication. Third, it requires that the grader be in the mindset of a reviewer. In other instances where simulated conferences have been used, such as in [12]-[13], the students themselves acted as both submitters and reviewers. And while reviewing others’ writing has definite benefits, we contend that undergraduates without research experience are not proficient at providing authentic feedback in the way the course instructor(s) would. With our approach, it is more likely that feedback will focus on effective communication, which is what students will have an easier time relating to anyway. Fourth, it can promote student reflection. This is especially true if there is more than one instructor (reviewer) for a course, as was the case during one class where this approach was implemented. In such a case, reviewers assess student work independently and make comments that may, at times, contradict each other (just like in actual peer reviews!) The student must then decide how to address the reviewers’ comments, which in part means deciding which of the contradictory remarks is the most convincing. It is important for the instructors to guide the student in this reflection and to present it as an authentic part of actual research that all experienced authors must contend with. Otherwise, such an experience can easily frustrate a student who is used to being told what to do instead of thinking for herself. In the end, we see this as a way to empower the student instead of frustrating her, and empowerment leads to a more positive mindset.

EVALUATION

As we have stated above, there are two primary goals of our approach of Simulated Conference submissions. One goal is to improve student research communication skills. The second, no less important, goal is to increase student appreciation of those skills. In an effort to evaluate the effectiveness of the approach in achieving these goals, we have implemented Simulated Conference submissions in two offerings of a Sophomore Research Seminar (SRS) on usability science.

The SRS is a relatively new introduction to Union College’s general education program. In their sophomore

years, all students take one such seminar, which has the goal of introducing students to research methods and research writing. The seminars are taught by faculty across the College and they therefore cover a range of different material, and students are encouraged to take a seminar offered outside of their areas of specialty. The common thread that unifies them is a requirement for a large culminating research paper.

As part of this effort, we have begun offering an SRS entitled *Designing as if People Mattered*, in which we introduce techniques students can use to make products usable, including design heuristics. More importantly, we introduce a research methodology including empirical evaluation. So, instead of simply arguing that their products are usable because they follow established norms, the students design and carry out experiments in which they have real people use prototypes of their product designs in carefully controlled environments to carry out carefully prescribed tasks. The students learn about simple and complex mechanisms for recording and evaluating data from such experimental sessions.

In a series of assignments, the students in the course work in interdisciplinary groups to design products, evaluate them with experiments, and report on the results, both in writing and with oral presentations. The course culminates with an open-ended project in which the students must pose a research question and attempt to address the research question using design and evaluation approaches they have learned. For all of these assignments, we used simulated conference submissions to help guide students to write for the correct audience and explain important details of their project for a skeptical outsider.

We have now offered the course twice and we are prepared to evaluate its effectiveness at achieving its twin goals of improving student research skill and increasing student appreciation of those skills. The rest of this paper will focus on the second goal of improving student attitudes about research because we think that is the most interesting result of the course. We note, however, that the quality of the work produced by the students in the class demonstrates that research skill is definitely improved. In each of the offerings, at least one group has produced near-publishable quality results and all of the groups have shown an improved grasp of important research skills over the course of the term.

I. Hypotheses

We expected that our approach would improve student perceptions about the importance of various skills useful to conducting research:

- Collaborating with others in problem solving.** We expected that students would get a lot of experience working with others in the course, because all of the projects were done in groups. We also expected that they would come to appreciate input from others because the groups were balanced by discipline (for

FIGURE 1
QUESTIONNAIRE

Mark a single stroke through the line that runs from “Not important at all” on the left to “Very important” on the right at the point that best indicates how important you think it will be to your college career to develop each skill. Mark the line in only one place. If you make a mistake, put a single X over it and mark your correct response.

Skill	Importance
Working with others	Not important at all _____ Very important
Designing and carrying out experiments	Not important at all _____ Very important
Using related research in my own projects	Not important at all _____ Very important
Conducting literature reviews	Not important at all _____ Very important
Soliciting input from others in solving problems	Not important at all _____ Very important

example, each group had at least one engineering major and at least one social science major).

- **Designing and carrying out experiments.** Because the course projects so heavily relied on experimental evaluation, we expected that students would come to appreciate the skills they were developing in carrying out experiments.
- **Finding and using related research.** By requiring Simulated Conference submissions, the course required students to relate their work to existing research. We expected that students would come to see the value in this, regardless of their eventual area of specialty.

II. Measures

In the first offering of the course, we used a questionnaire, which we administered at the beginning, middle, and end of the term. The questionnaire focused on ascertaining what the students had experienced in the course. For example, we asked if they had ever designed an experiment. The results were unsurprising – at the end of the term, the students reported that they had indeed practiced the skills that the assignments forced them to practice.

So, in the second offering, we re-focused the questionnaire on student attitudes. We asked students for their opinions on the importance of the various research skills mentioned above, both before the term and after the term. We reasoned that any difference in attitudes was likely to be the result of the course, and not some outside factor.

One typical approach for such surveys is to use a Likert scale in which responders give answers to questions on a scale of 1 to 5 (or perhaps on a scale from “Definitely Agree” to “Definitely Disagree”). While such data is often useful for gauging static attitudes, we did not think it would be an effective way to evaluate a *change* in attitudes. Likert scale data is ordinal – we know that “strongly agree” is different from “somewhat agree”, but the magnitude of the difference between the two is not known. Also, a student who would like to say that they “sort of strongly agree” must choose falsely between the two options.

Because of this, we looked for ways to measure student attitudes about these research skills that would result in *interval* data. Instead of a Likert scale, we used a semantic differential scale in which students responded to questions by marking a line indicating how important they thought the skill was. The resulting questionnaire can be seen in Figure 1. After a student marked the line with a slash, we measured the distance from the left end of the line to the point at which the slash intersects with the line. This distance, then, indicates how important the student found that particular skill.

RESULTS AND DISCUSSION

For the second offering of the course, in which there were 16 students, we administered the questionnaire shown in Figure 1 on the first day of class (and before we did anything else in the course). We again administered the questionnaire on the last day of class. Because of the time difference of an entire term, we are confident that our students did not remember their beginning-of-term markings when they were marking the survey at the end of the term. Therefore, we believe that the markings reflect the students’ genuine appraisal, at the end of the term, of their attitudes about the research skills mentioned in the survey.

Table I shows the results for each of the five questions from the questionnaire. The numbers represent the mean distance from the left edge of the line to the crossing point, measured in millimeters. Because the overall line length was the same before and after the term, and because “very important” was at the right end of the line, a larger number at the end of the term than before represents an increase in importance of the skill in question.

As shown in the table, in almost all of the areas, students found the skills more important at the end of the term than at the beginning. The only exception was using related research, even though conducting the literature review that makes this possible was viewed as much more important at the end of the term than at the beginning.

The final column in Table I shows the p-value (using a two-tailed Wilcoxon rank sum test), indicating the statistical significance of the reported differences in importance.

TABLE I
MEAN IMPORTANCE OF DESIGN SKILLS AS REPORTED BY STUDENTS BEFORE AND AFTER COURSE OFFERING

Skill	Mean Importance		Difference	p-value
	Before	After		
Working with others	45.31	48.31	+3.00	0.4065
Designing and carrying out experiments	35.41	38.34	+2.93	0.5976
Using related research in my own projects	38.09	36.47	-1.62	0.7774
Conducting literature reviews	26.31	34.50	+8.19	0.0316
Soliciting input from others in solving problems	43.84	46.12	+2.28	0.4283

While the results suggest that students find most of the skills more important at the end of the term than at the beginning, conducting literature reviews is the only skill for which this difference is statistically significant (at 95% level).

I. Discussion

The data shows that student attitudes about (at least some) research skills are improved during the course. Our contention is that this is in large part because of the importance we placed on research skills during the course. We particularly emphasized library research skills because we know that students often have trouble with them. One clear way that we have emphasized research skills, and focused student attention on those research skills, is by using Simulated Conference submissions.

We believe that if we had asked students to write a "research paper" without giving them the format, structure, and review comments they would expect from a conference submission process, the students would not have taken the library research aspects of the projects nearly so seriously. We believe that students would too easily forget that the audience is not the faculty member, but a member of the research community. They would therefore perceive much less need to place their work in context – after all, the professor knows the context of the work because the professor was involved in helping to shape the project.

However, let us be clear that there are other possible explanations for the data. One possibility is that the improvement in attitude is not a direct result of simulating conference submissions, and is instead simply because the students gain experience with library research during the course. While this seems plausible to us, anecdotal evidence suggests that mere experience does not fully explain it. In both offerings of the course, when assignments were returned, we observed students genuinely reviewing and discussing our review comments. This occurred when there were two reviewers, with often contradictory reviews, as in the first offering, and also in the second offering, where there was just one reviewer. In our past experience, we have found that students do not generally pay much attention to such comments and instead simply focus on the grade. The fact that students seemed more focused on the comments suggests that our approach of framing their papers as conference submissions, and our comments as review comments, has had the effect that the students took the projects more seriously than they otherwise would. Of course, further investigation is needed to determine whether this is truly caused by our approach.

Another possible explanation is that students might have misinterpreted the word "importance" in the questionnaire (see Figure 1). While we meant it as an indicator of the value that the students place on those skills, it is possible that students answered as if we were asking about their proficiency with those skills. This could also explain the discrepancy shown in Table I where students' perception of the importance of finding related work increased while their perception of the importance of incorporating it into their projects decreased. If students indeed interpreted "importance" as "proficiency", this result implies that they thought they had improved at finding literature, but did not improve at using it.

One other possible explanation for the data is that students mature over the course of the term and would have learned to appreciate research skills no matter what approach we used. This seems unlikely to us because the students are sophomores and are not typically involved in research outside of this class.

FUTURE WORK

While the results presented here are promising, future work is needed. The approach can be further developed, but also work is needed to better evaluate it.

I. Development of the Approach

As we have shown above, the approach seems to have some merit. However, there are some difficulties in implementing the approach more widely. For example, in order to provide a realistic conference submission experience to students, it seems important to us that student papers be reviewed by more than one reviewer. This is problematic when the course is taught by only one faculty member. One possible solution is to have fellow students also review the papers, but that would require training those students to act like real reviewers. Perhaps for one assignment, early in the term, the papers could be reviewed by the professor teaching the course along with other members of the department's faculty. Doing so early in the term might help guide students to think of the rest of the assignments as conference submissions.

II. Evaluation of the Approach

While the evaluation methodology, using pre-course and post-course survey instruments, is sound, future work is needed to improve our ability to evaluate new pedagogical approaches. One problem with the methodology presented here is that we do not track student progress on an individual basis. In Table I, the difference column is the difference in

the means of the pre-course and post-course student ratings. Because the questionnaires are anonymous, we don't know the difference in ratings for any one student. So, for those questions where we do not see statistically significant differences, it is still possible that most students, individually, improved over the course of the term. To overcome this, for other classes that we are currently evaluating, we have adopted a strategy of pairing the pre-course data with the post-course data for each individual student. This can be done without introducing experimenter bias by having the students put their student identification numbers on the surveys.

We also need to improve the questionnaire to limit the possibility that students misinterpret it, as was suggested in the Results and Discussion section.

CONCLUSION

We contend that if students are going to improve their research skills outside of the class where they initially learn those skills, it is necessary that they find those skills important. It is therefore incumbent upon us as faculty to help them value those skills. We have presented an approach that shows promise in achieving this goal. While others have shown that the Simulated Conference model improves research and writing skills, we have attempted to show that it improves student attitudes about those skills. To our knowledge, this represents the first attempt to quantify such attitude changes.

The results suggest that the approach makes research *real* for students and therefore motivates them to learn and apply those skills in other contexts. Both skills and attitudes are mutually reinforced.

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