

Engineering Graduate Students as Evaluators of Communication Skill

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Over the past 10 years, the communication program within the Department of Mechanical Engineering has utilized graduate students within the department to function as the principal graders for approximately 1100 lab reports produced by the undergraduate population in Fluid Mechanics, Heat Transfer, Vibrations, and Controls laboratories. These graduate students read the draft reports, make appropriate comments and return the reports for final production. The graduate students critique, comment, and grade in both the technical and communication areas while also teaching the above laboratories. The reports are then read again and a grade is assigned. The issues regarding faculty support for the plan, preparation of the graduate students, and orientation for the undergraduates who will be impacted by the plan will be addressed. The ultimate goal involves leading engineering students to the realization that communication is important because it is being evaluated by fellow engineers and that those evaluators will also improve their own skills because of their need to focus on how they communicate.

Introduction

Communication skill, even after EC 2000, continues to be one of the first things that are considered when deficiencies within engineering programs are evaluated. Over the past years, many strategies have been undertaken to address these concerns. The Writing Across the Curriculum movement has focused on making writing a part of every classroom. Writing Centers have taken the role of guides to writers who need additional audiences for their text. Freshman composition courses have tried to get students involved with writing as they enter colleges and universities. And lastly, writing intensive courses have been designated by departments to handle the writing experience for the department's students. With these strategies in place, another idea was generated that provides additional support for engineering students, both undergraduate and graduate alike. The Department of Mechanical Engineering at Michigan State University implemented a plan in 1993 that focused on communication needs by having the majority of the on average 25 teaching assistants employed by the department become the principal readers for text produced in the Fluid Mechanics, Heat Transfer, Vibrations, and Controls laboratories. These graduate students critique, comment, and grade in both the technical and communication areas while also teaching the above laboratories. Over the years this method has had an impact on the quality of the reports produced and the concentration that is shown by students toward the written production has been greatly improved.

It is highly unlikely that anyone can be found who doesn't have something to say about communication. It can be broad generalizations about speech patterns or highly specialized notions of exactly what word to use in a technical document. Communication is part of our existence. From our first cries when we are born to the movements we make as we leave the world, we are communicating either to ourselves or to the world around us. Because this activity is so much a part of our lives, we cannot separate it from any of the other activities that we perform. Communication is not an entity unto itself. A number of years ago Ronald L. Miller and Barbara Olds in "A Model Curriculum for A Capstone Course in Multidisciplinary Engineering Design", Journal of Engineering Education reported that at Harvey Mudd College, engineers enrolled in design classes must, as part of their design experience, "interact with their client in a professional manner and communicate with a variety of audiences (peers, faculty members, clients, etc.) orally and in writing." It is embroiled in all the activities of existence. It is, therefore, vitally important that engineers continue to realize the place of communication in their lives. This realization appears to be awakening in students because in the above article a survey done by The Colorado School of Mines showed that 95.3% of students in multidisciplinary Senior Courses felt " Good communication skills are an essential attribute of a professional design engineer." Without communication there is no engineering. The two must work in concert to provide the world with the expertise that engineering offers. A study done at Michigan State University in 2003 also reported that senior design students felt that communication was absolutely necessary to being a good engineer. Hand in hand, engineering and communication cannot be separated. Engineering students reported that they were beginning to be highly aware of the importance of being able to communicate at a level of quality that they had previously ignored. Conversations with an increased number of industrial contacts were having an effect on this attitude, and communication was definitely benefiting from the change.

It is important, therefore, that engineers constantly monitor their own written and spoken output. On a simple level this means looking at what is written or going to be spoken and deciding if it is correct, professional, and appropriate. Using whatever tools are available to the writers, text can be investigated for how well it fits into those categories. On a higher level, outside help can be approached to provide greater expertise in making changes in text and spoken words. This pattern seems to be fairly prevalent in most schools: you write the text; you edit and proofread; and (if there is time) you get someone who can correct all the grammatical mistakes. The text is then handed in to sink or swim. In this process the art of communication seems to be an afterthought. It involves correcting the periods and commas, making subjects agree with their verbs, and a myriad of seemingly non-related items. When the text fails to receive a suitable grade, it is always the fault of the misused colon or the dangling participle. Technical knowledge in these cases does not in any way shape or form exist equally with communication. The need has always been to provide a mechanism in which there is no discernible delineation of power: technical knowledge and communication skills are used in concert to improve the overall presentation of the text. It is also important to realize that it is much more effective to somehow provide readers for technical text from a readership that is close to the knowledge base. This has been the professor in the past, but many professors do not want to venture outside the technical areas. They are uncomfortable with the issue of becoming the "English Teacher." Therefore, some mechanism needs to put in place to

create a greater awareness of communication, provide readership in the engineering area, and obtain feedback that will be valuable to the writer. It is with these ideas in mind that graduate students in mechanical engineering were chosen to provide the means by which to accomplish the above tasks.

Rationale

Graduate students in MSU's Department of Mechanical Engineering have for many years been evaluating the technical content of reports in a variety of courses. Using their own expertise they read text, make appropriate comments on technical content, and suggest ways to improve the content material. The act of critiquing and correcting as a process is an integral part of the system. It became apparent that a connective way was needed to bring the communication skill evaluation into line with the technical evaluation and have the engineering graduate students take responsibility for doing both evaluations. For some of the 25 mechanical engineering graduate teaching assistants who act as mentors in the department, there is no question as to their reaction to the request. "I already do it and have done it since the time that I started as a TA." "I can't stop myself from commenting. I can't let something slide when it sounds bad or makes no sense." "I'm carrying on what others have told me." Perhaps graduate students are not usually asked to provide the critiquing on communication issues because they are "engineers", and everyone knows that engineers can't communicate [sic!]. The reality is that our graduate students are highly competent individuals who have reached the graduate ranks because of their skills, both in the technical areas and in the ways that they communicate the technical material. They write, they speak, they teach, and they provide an enormous body of information through their very existence as graduate students. It would be foolish indeed not to tap this source of valuable expertise and use it to improve communication skills at the undergraduate level. It is important, though, to make suitable plans to place graduate students into the role of communication mentors.

Implementation

This method in the Department of Mechanical Engineering at MSU gives graduate students who act as teaching assistants in the department the chance to not only grade the technical abilities of undergraduates but also the methods that these students use to present that information completely, clearly, and competently to a selected audience. Four laboratory courses in Heat Transfer, Vibrations, Controls, and Fluid Mechanics are targeted in the communication effort. 25 teaching assistants grade both technical and composition areas. The reasoning behind the move is three-fold: graduate students interact with undergraduates on a much greater scale than faculty, undergraduate engineers have a tendency to listen to the comments of fellow engineers who have gone through the system, and graduate students benefit from the added focus on communication skill. Since most of the graduate students are working on either a thesis or a dissertation, the responsibility of making comments on undergraduate text should help the graduate students to more intently look at what they produce.

All of this commentary and grading cannot be done without a fair amount of preparation and careful monitoring. Faculty must be comfortable with the role being taken by graduate students, undergraduates must be clear as to what is being asked of them on any text that they produce, and graduate students must receive enough training and support to make the process viable for both

them and the undergraduates to whom they are responsible. Faculty members give ample suggestions to the number of assignments, the way in which reports would be handled, and the amount of preparation and support needed by their graduate students. Training sessions are carried out each semester to acquaint graduate students with the added responsibilities that they would encounter.

These training sessions give all participants a chance to look at both acceptable and unacceptable text production. The goals of the training are the following:

To acquaint teaching assistants with the idea that the subject is the first and foremost item to be addressed

To give the teaching assistant direction in the types of comments to make on undergraduate papers.

To provide examples of text with types of comments to make.

To give ideas on general grammatical mistakes made by undergraduates

To prepare teaching assistants for the role of flow master through effective paragraph construction
topic sentence or idea
supporting information

The graduate students learn how to serve as readers by looking at the big picture: the total look and feel of the paper, remembering that the subject matter is most important. Secondly they look at the grammatical elements that are evident or questioned. The readers are encouraged to ask numerous questions of the writer as to why the text was produced as it was or what might be missing in the writing. The primary purpose of getting the writer to talk to the reader builds a rapport between the two and eliminates the reader as simply being an answer giver. The writer starts to function as a colleague of the reader and not simply a drone.

The graduate students learn to be specific, avoiding vague praise or blame. If they are unsure about correctness, they continue the questioning technique. Forcing the continued conversation requires the writer to truly think about what they have written and explain the reasons. On the part of the graduate students, this requires tact. They must remember that the writer really may not know any better and the job of the reader is to get them to think along lines that will improve their ability to communicate. Here the positive takes over. "You are an idiot and this paper is atrocious!" will probably not come across as well as "Page 3 repeats the same points that were made on pages 1 and 2. Is the repetition necessary?"

The graduate students are mainly concerned with the technical information and its evaluation. Their primary responsibility is to make sure that they react to the information given. The issue of

communication skill reinforcement comes in the form of their reading of the text and telling the writer what they as simple readers of the text feel about its production. The simple things that I have reported in the text above are what they look for and report back to the writers. This is not meant to be a massive “English” project. The graduate students are predominantly international so I am more interested in their role as fellow mechanical engineers who are giving their comments to colleagues. I have found little problem if any in the evaluation of domestic students by internationals. In actuality, part of this work involves learning to take comments from non-native speakers of English, which is much more likely in the working world.

Lastly, undergraduates are not excluded. The overall plan involving the graduate students as primary readers and graders is presented before it is ever implemented in the course. The semester begins with all parties cognizant of their role in the process. The preliminary session takes place the first class of the semester. It allows the students to voice any issues that they may see in the process. One such issue might revolve around the number of international students who may serve as readers. Because this can be seen as a concern for domestic students, there is careful explanation of how the process is to be handled. Within the structure, mechanisms are in place to allow a variety of readers for an individual’s text to ensure that the reader feels totally comfortable with the process. Instead of these assignments being handed down from above with no real sense of vested interest, all parties involved are apprised of the benefits of the plan.

Constant monitoring of the program, detailed instructions, support materials that include guides to areas of common concern, and an enormous amount of one-on-one contact hours for discussion give a positive outlook to the future of utilizing ME graduate assistants in a new position of responsibility.

Conclusions

Within the educational system today, any methods that can be used to aid in the competence and experiences level of engineers must be undertaken. With all the forms of constraints on time, money, and resources it is necessary to utilize whatever means can be found that provide the best return for the time and money expended. The utilization of graduate assistants in an engineering major to become the principal sources of comment and graders of technical reports from both a technical and presentation perspective is a means to more efficiently use an existing resource. Careful planning to provide a clear perspective of how the program works to faculty, graduate students, and undergraduates will generate a valuable experience for all involved.

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