Why Can't Johnny Write?

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Abstract

Graduating engineers continue to demonstrate poor technical writing skills and frequently must have extended assistance to improve those skills to a satisfactory level as they move into their new careers in industry. Most national accreditation organizations require learned skills in oral and written communications to accredit a college or university engineering program. An additional requirement is the existence and *active* participation of an Industrial Advisory Board in curriculum development. Why then does this problem persist? Can the problem be placed at the door of the university, or are the expectations of industry set too high? Perhaps there is some blame to be placed on the university and industry, a problem not being adequately addressed by both. This paper explores a number of possible causes behind the problem, and suggests changes that could help move toward a long-term correction.

Introduction

A number of years ago, I wrote an article for the Professional Communications Society newsletter. The title of the article was "...but Johnny can't write!" (1).   The article looked at a problem experienced by undergraduate engineers entering their new careers in industry. Simply put, they couldn't write to the level expected of college graduates. One would expect to see a marked improvement over the intervening years, but that is not what is happening. There is no discernable improvement in the writing skills of the new engineer. Is the reason as simple as engineers can't write, so the result is what it is, or is there a deeper, more pervasive problem that is not being addressed by industry and academia? Having seen a number of examples over fifty years in industry and twenty years in accreditation visits to universities, I believe the problem best fits the second question.

In the United States, one of the better known accreditation organizations is ABET, Inc. ABET provides a number of program criteria that a school will be judged against in order to have a particular program accredited. According to ABET accreditation Criteria 3 – Student Outcomes (2), the student must demonstrate an ability to apply written, oral and graphical communication in both technical and non-technical environments as one requirement for accreditation for STEM appropriate programs (p 3). Even with that requirement, college degree programs continue to produce STEM-oriented graduates who cannot write simple technical reports or other technically oriented documentation, such as system requirements, system specifications, development plans, test plans, test results, or even simple trip reports. Why does this shortcoming persist given the emphasis placed on it by the accreditation criteria, and why does the problem continue to show in industry (4)? In one report, it was noted that in a survey of employers, poor communications

represented 44% of the problems impacting an individual's career enhancement, far in excess of the lack of technical skills at a value of 22% (5).

Discussion

To begin with, it is understood that degree programs cannot possibly teach the student all the nuances or report templates used in an industry or company. In most courses, the level of detail is at a cursory level, generally oriented to sentence structure, grammar, or resume' writing. Seldom do students encounter more specific structures or the language of any particular industry segment. A typical course description for a course titled "Technical Writing" may state the course content as:

"...designed to familiarize students with job-related writing, emphasizing the roles of audience and environment play in successful communication. Includes correspondence, document design, and report writing."

The course will most often be taught within the English Department or Business Department, not by the Engineering Department. This is not intended to disparage the efforts by those teaching the writing courses; rather it points to the simple insight that most would not be qualified to judge the technical content of a report. While the professor can identify grammatical and syntactical correctness as well as appropriate structure, the technical content may be wrong. In addition, it is more often true that there is little interaction between the English and Engineering Departments, specifically on the question of the technical writing content of the course.

There are a limited number of hours available for schools to complete their degree programs. For ABET accreditation, a typical STEM program will have no fewer than 1/3 nor more than 2/3 of the hours related to technical course content, with the remaining hours dedicated to general education content such as mathematics, social science courses, and other optional course material for a total of 129 to 132 hours of course work. Considering the rising costs of each program, simply adding hours to accommodate additional emphasis on technical writing is not a workable solution. Given this problem, are there solutions? In simple terms, yes there are, but are the schools, professors, and students willing to undertake them? That is a more difficult question.

From my experience as a program evaluator for program accreditation for the past twenty plus years, one of the most frequent items noted is in the use of multiple choice or fill-in-the-blank reports being used in technical laboratory courses. While it reduces the time required to grade a paper, it also robs the student of an opportunity to practice technical writing.

- What was the purpose of the lab?

- What equipment was needed to complete the lab?

- What were the results of the experiment?

- Did the experiment produce the desired result?

- If not, why not?

If the student has to understand and explain any experiment result, then they have been provided an opportunity to write those findings in a manner similar to that expected in industry. Looking at the number of technical courses that have a companion lab, it would appear that there are many opportunities to practice technical writing.

One downside is that it takes more time on the part of the student to write a report, and for the professor (or graduate assistant) to grade it. A second downside, and one that would have to be seriously considered, is that over time, lab reports would become available through those unofficial channels, enabling students to simply copy results. To reduce that possibility, I change the format and/or content of my labs each semester. While there may be some commonality, i.e., equipment, formats, and so forth, the lab is sufficiently different that old lab reports are of limited value. I believe it is important for the student to not only be able to complete the lab assignment, but that they also understand the results and can communicate that understanding in a comprehensive lab report. It is imperative to their career success in industry.

Writing opportunities should not be limited to labs. There are many opportunities in engineering classes to have students complete research papers with the companion opportunity to do technical writing. Again, it puts more burden on the professor; however, it is a burden that needs to be undertaken.

As a teacher in both undergraduate and graduate courses, I have continued to emphasize the need for good technical writing from my students. In some classes, I have lost a number of students, as they couldn't grasp the fact that there was no list of formulas to memorize or facts to learn. The objective of understanding and documenting their understanding seemed simply foreign to their experience – they weren't able to grasp the importance of truly understanding the subject material rather than just getting the answer. In one class, the entire class worked around an automation project (which required a term paper). Each night at the beginning of class, I would start by saying, "Oh, by the way..." which was my way of introducing a change in the project. The change might be a requirements change, a manufacturing resource change, or some other item that would cause the students to have to react and implement a change to the project. As I explained to the students, such perturbations were not unusual in industry, and they could expect to encounter similar events in their future. Over the course of the term, the students began to anticipate the impending change, and it became a point of enjoyment for them to prepare for the next adjustment. Such changes were also reflected in their term papers, as some portions required re-writes due to the revisions in the assignment.

Solutions

There a number of actions that could help address the problem. First, inter-department communications on content and structure of technical writing would help students understanding of the difference between writing and technical writing. The Engineering Department could provide specific research-like projects that could be undertaken by the pre-engineering students

completing the technical writing course. Such an approach was implemented at Northwest College with very positive results for the pre-engineering students' writing skills (3).

Secondly, all lab reports should require some level of discussion rather than simply filling in blanks, building tables, etc. This would not only ensure that the student recognizes when a lab experiment has been completed successfully, and correctly, but would also force them to recognize when an experiment was not completed successfully and explain why it had failed.

Finally, again referring to ABET criteria for accreditation; "Criterion 5 - Curriculum requires an active Industrial Advisory Board for a program accreditation ..." (page 4). This board is to be comprised of local industry representatives and meet with the department staff on a regular basis to discuss curricular improvements. During such meetings, discussions on technical writing competence should be included. Is the program meeting the expectations of the local industries? If not, what suggestions might be offered to make the program better?

Conclusion

I look forward to the time I visit a campus and find that Johnny can write because the school program is placing greater emphasis on the student's ability to communicate in writing farther than just knowing the right equation or correct solution. It may be a dream, but I continue to hope that some inroads can be made.

References

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(3)   Floyd, R. E. (2017). "*Inter-Department Communication Can Spell Success",* IEEE Pro Comm 2017, July 2017.

(4)   Hammond, Kelley (2013). "*Why Johnny Can't Write and why employers are mad",* CNBC, www.cnbc.com/2013/11/08/why-johnny-cant-write.html

(5) *"Jobs skill gap: the basics become a problem"* (2013), CNBC, www.cnbc.com/id/101012437.

(6) Linville, C. (2013). *"Real World Writing: What Employers Expect".* www.csus.edu/wac/wac/students/real_world_writing.html

About the Author

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