

The Importance of Writing Skill to the Engineering Student

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Abstract

Each year, universities across this country grant thousands of undergraduates their engineering degrees in their chosen discipline. At some point, these talented, intelligent young men and women are expected to move into industry (or higher education) and display the skills and abilities in mathematics and the physical sciences they have worked so long to acquire. Despite numerous papers written and many presentations made throughout their college career, many of these people will not be able to communicate their engineering skill via written communication.

This article seeks to highlight the importance of writing skill in engineering education. Making use of recent literature with regard to the subject, and examples of less-than-adequate writing, the case will be made that some premium should be placed on writing skill as a means of better preparing students to function in today's working world.

Introduction

Industry today wants engineers who are not only technically proficient, but who also can write well. The most common complaint about graduating engineers is their poor writing skills – in 1997, the Society of Manufacturing Engineers (SME), expressed concerns that newly-hired engineers could not communicate well, specifically in the areas of “Specification and Report Writing”^{3,9}. Consider the following excerpt, taken from a student's project report about a process improvement:

I have viewed results that look promising and conclusive to a clean and safer power supply to the sensitive equipment used in the lab. If I can recover the wasted energy from the discharges of these power cells and inject them back into the main grid saving this company enormous revenue yearly. I project a payback interval as short as 4 years to recoup the cost of installation. If this would be implemented plant wide the cost will be blinding but the savings would also be rewarding. This plant wastes so much stored energy every day and I can see such a great benefit to the company and the environment if we just would return this back into the grid. Free energy wasted everyday. What a loss!

Student reports are, as the example above shows, poorly-written, rife with misspellings, grammatical and usage errors. In addition, there are problems with redundancies and improper sentence structure that make the work barely comprehensible. Whereas many universities attempt to instill writing skills through required courses, such as English composition or technical writing, little progress is evidenced, as many seniors graduate writing in the same fashion as when they were freshmen.

With the increased blurring of boundaries among disciplines caused by new technological innovations, it is ever more imperative that engineers be able to communicate their ideas with

other professionals. In engineering students' transition from academia to industry, their communication media shifts from the comfortable language of equations and symbols to that of the written and oratory verbiage used to describe the implications of their calculations.⁴ Often this communication is to an intelligent, yet non-technical audience, which presents quite a challenge.

Background Studies on Writing in the Engineering Curriculum

The engineering academic world has increased its understanding that it must encourage strong language and written communication skills in its curriculum to generate competitive professionals in today's marketplace. Pinelli conducted a study that examined technical communication skills of aerospace engineering students in the eyes of practicing professionals in industry.⁸ The results of this survey reinforced the importance of language and written communication in transition from academic to industrial communities and offered suggestions for facilitating individuals' transition from student to entry-level engineering professionals.

Recognizing the need to improve the language and communication skills of engineers during their academic preparation, Artemeva, et al. aimed at developing a course tailored to engineering's specific communication needs and difficulties.¹ Significantly, these authors immediately identified that "the first challenge is to recognize that these students usually bring with them a resistance to the notion of engineering as a profession that requires literacy."¹ The setting of an engineering class in which the technical writings are of the students' choosing based upon their subject matter was an interesting means to overcome the challenge. Specifically, the course provided the context whereby students could acquire the rhetorical skills and strategies necessary to integrate into a discipline-specific discourse community. The authors argue that such a pedagogical approach can be used to design communication courses tailored to the needs of any discipline provided the following conditions are met: assignments are connected to course subject matter; a dialogic environment – one in which multiple viewpoints are presented and explored – is provided; and the nature of assignments allows students to build on their learning experiences in the course.

These studies, and numerous others, increasingly identify that engineering students need language and written communication skills to succeed in the workplace. However, students' written work products clearly demonstrate that the need has not been internalized by them. Perhaps this is because students have not given the portions of their curriculum that speak to writing the same importance as they would courses integral to their major, even going so far as to think that writing is an exercise that is reserved for composition class alone.⁷ For example, a Mechanical Engineering student would probably find a course in thermodynamics to be more important than a course in technical writing because the former is perceived to be more directly tied to their degree plan and overall aspiration to perform competently as a mechanical engineer.

Further, students may not see the need to hone their language and communication skills because this need has not been communicated to them. Most of engineering curriculum is built around the language of mathematics. Students are taught to explore difficult problems in terms of equations and applicable mathematical principles and operations, with answers expressed numerically. Students participate in laboratory courses, with the requisite at the completion of an experiment that they write a report, but these reports are rarely assessed for the level of writing

skill displayed. Most often these reports are graded by laboratory assistants who are non-native speakers of English.² For many of these talented individuals, mastery of proper English grammar and construction is a secondary or tertiary consideration in light of their achieving the grades necessary to travel abroad in completion of their education. Therefore, because their understanding of English composition is rudimentary, they instead focus on the mathematical substance of laboratory reports, without giving valuable feedback as to the writing style of the work.⁶

Educational Activities to Improve Undergraduate Engineers' Writing Skills

If the charge of engineering educators is to produce tomorrow's population of engineers who are fully competent in an ever-changing workplace, then means must be sought to help our students in this critical area. It is not simply enough to assign a writing assignment (or collection of assignments) to teach students good writing skills. The majority of students have various learning styles; moreover, most students do not have learning styles compatible to such a theoretical task.^{5, 10} Therefore, engineering educators need to focus on teaching writing in manners that can be learned by students.

According to Felder and Silverman, there are eight learning styles: sensing, intuitive, visual, verbal, active, reflective, sequential, and global.⁵ It is important that the teaching material/assignments/activities on a given topic address multiple learning styles such that these exercises have a greater potential to impact the majority of students. A listing of four potential activities, and their learning style targets, designed to enable writing skill development in the engineering curriculum are given below. The following are proposed not as solutions to the problem, but as techniques that will allow educators to incorporate writing into their curriculum, and assess students' writing skill:

1. assign an in-class writing activity about an engineering topic (active);
2. assign students to write an explanation defending their solution approach to a mathematically-intensive problem (reflective, sensing, sequential);
3. give models of writings submitted by previous students (on the current subject matter) and assign the students to critique the work in class (active, visual);
4. assign the students to explain, in writing, how a work process would be performed in the workplace and how the results would be best reported (verbal, intuitive).

It is also important that appropriate feedback be provided to students. One suggestion in this regard is to partner with English departments or writing centers, such that teaching assistants from engineering departments can assess written work (e.g., lab reports) for content, while English teaching assistants can assess the work for style, clarity, and composition. Previous work with this model of feedback has shown grammatical errors in laboratory assignments to decline significantly over the course of the semester while writing styles display marked improvement.⁶

Conclusion

Engineering professors do not need to teach writing as a separate subject, but the same premium that is placed on students' problem-solving abilities should be placed on ensuring they are competent to express their ideas via written communication. The methods offered herein seek to introduce writing into the engineering curriculum; future research will be directed towards understanding the effectiveness of these and other methods in producing wholly competent communicators.

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