# A Brief Guide to Writing in Engineering
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## Abstract

This research paper contains information on the various forms of writing that goes on within the field of engineering. With the main type being reports, whether it be in the academic research field or workplace setting, there is an outline of how to properly structure and format technical writing reports. In this paper is also an analysis of a report taken from the engineering workplace, as well as a short interview with an engineering professor from UC Davis. The report analysis touches on how to structure a report, the purpose/audience, transitions, language, and use of visuals in an engineering report. The interview gives some knowledge on a tenured engineering professor's first-hand experience with writing in engineering.

## Introduction

When I was younger, I quickly decided which subjects in school I liked and which ones I disliked, with the ones I enjoyed being science and math and the ones I disliked being English and history. Throughout my twelve years of schooling, this thought of which subjects were fun and which subjects were not never changed and to this this day I still dislike the humanities and tend to fall more in line with enjoying STEM classes, which stands for science, technology, engineering, and math. In addition to this predisposition to liking STEM class, sometime throughout high school I learned that careers in these types of fields tend to receive a higher annual salary than those in other careers. After putting two and two together, I came to the conclusion that I was going to major in engineering. Unfortunately, it wasn't until I got into college that I found out that engineering and writing actually go hand in hand.

Often high school teachers don't stress the importance of writing in the workplace of engineering. Many times, STEM teachers simply brush it off saying that it isn't what the major's focus is on and deem writing as unimportant to teach in classes that aren't labeled as humanities. Not only are high school teachers guilty of this, there are even cases of college professors that don't stress the importance of writing in engineering. The article "Faculty Views on the Importance of Writing, the Nature of Academic Writing, and Teaching and Responding to Writing in the Disciplines" shows how some college professors will attempt to integrate writing into their course work but only as a small part of the class by simply assigning only a few short essays. The article also states how writing skills are essential in the field of engineering because engineers need to be able to sell their ideas through writing reports for clients and upper management (Wei Zhu, 2004).

Some of the most common types of writing in engineering include reports, case studies, business letters, and memos. There are many different types of reports ranging from proposals, progress reports, and lab reports. Proposals are often written to land jobs or projects and are an essential part of an engineer's job. Progress reports often contain information on how the project or job is going. Lab reports, similar to progress reports, present the data found in the project. As for case studies, they are written to understand the situation being faced and analyze how to solve this problem (Faculty of Applied Science & Engineering, 2018). Memos tend to be similar to reports. They often give a summary of an experience an employ had, such as what was seen in the field or a job site (Environmental Resources Engineering).

Contributors from both the University of Nevada, Reno and Purdue University believe that a common form of writing in engineering, also referred to as technical writing, is a report. The

general outline for a technical writing report is as follows: abstract, introduction or background, literature review, method or procedure, results, discussion, and conclusion. An abstract, as explained by the University Writing Center of UNR, is a brief outline of the report that includes its methods and results. The introduction part of the report, as opposed to the abstract, goes more in depth with describing the paper's purpose and gives further background on the topic at hand. Literature review contains a sort of annotation of the documents used in the report by examining the source and relative need. The method or procedure section is similar to something a student might write in a lab report for a chemistry or biology class. It contains the steps and procedures the engineer has done. The results section of the report simply focuses on the findings of the study and the question at hand. In the discussion, one can often find an explanation of the findings and/or how it relates to the problem the writer is confronting or even a broader problem. Lastly, the conclusion, which arguably has the most open-ended guidelines, can include anything from a summary of what was learned to a discussion on what still needs to be found out. However, the only real guideline is that it states why the research is important and how it can be applied (Elizabeth Cember, 2013; Nathaniel George, 2016).

Although the format of a technical writing report is important, other important factors to consider are the purpose/audience, transitions, language used, and visual design. Often the audience and purpose of a technical writing report directly relate to one another. In engineering, according to the Engineering Communication Program of the University of Toronto, the purpose and audience is usually very specific such as it being directed to an architect about a specific design and why the design is good or not. Often in engineering reports, headings and subheadings are used to signify the transition of ideas or main points. These headings should be specific and

directly inform the readers of what is going to be said in the text. The language used should also be straightforward and concise. The Engineering Communication Program also recommends writing to your audience; if you are writing to other engineers in your field, it is acceptable to use jargon that regular people might not be familiar with. If you are unsure, it is best to keep the language simple and easy to understand. Lastly, in engineering it is common for writers to take advantage of tables and graphs to convey their results or information. However, you need to be careful to ensure all figures are properly titled and explained thoroughly in the text (Faculty of Applied Science & Engineering, 2018; Nathaniel George, 2016). This is just some of the technical report writing advice this paper holds, more advice is to come in the subsequent sections.

### Methods

For this study, I have performed primary research by analyzing an engineering report. The report I chose is a final report of a model based estimating system for civil concrete structures from the company CRC Construction Innovation. The report was written by Robin Drogemuller et al. in 2007 ( http://mams.rmit.edu.au/ugxcw72jkfip1.pdf ). When analyzing this report, I chose to focus on its structure, purpose/audience, transitions, language, and use of visuals. I first skimmed over the paper taking note of its outline and structure, then I delved in further by closely examining and annotating the report's contents.

Another form of primary research I preformed was an interview. I interviewed a professor that works at University of California, Davis. Professor Jeannie Darby has experience in both the engineering workplace and research setting. Before her job at UC Davis, Professor Darby worked as an engineer for six years before taking up teaching and research. She gladly agreed to sit down

and meet with me to answer a few questions about her experiences as an engineer and more specifically the writing she has done in this field.

## Discussion of Findings

The first thing I chose to examine from the report by Robin Drogemuller et al. was its format. The document started off with a cover page that highlighted the company's name, the title, and all the researchers involved in composing the report. The cover page was followed by a table of contents. Because this was such a large document, 65 pages, the table of contents was added for greater ease on the reader. Next in the report was the executive summary, which is simply another word for abstract. The abstract was two pages long and included a brief overview of the report as a whole, so the reader knows what the article is about without having to take the time to read the whole thing. The executive summary is then followed by the introduction which is the same as most other reports. The introduction, however, was fairly short, only being one page long. Next was a section titled "Context and Scope" which initially I believed to be the literature review. However, after closer examination I found this section to have more components that align with being part of the introduction because this section describes the system that they are studying for possible use. Although many engineering reports contain a literature review, this report is a good example by showing that there is some leniency in the format of this types of reports.

Succeeding this section are two sections, the first one titled "Methodology" and the second one titled "The As-Is Process." The section titled "Methodology" is quite obviously the methods part of this report as well as the results section. In addition, I also believe "The As-Is Process" to also be part of the methods and results section. Both sections include information on

the methods used and what resulted from the study. As for the discussion section, the sections titled "Value of Framework for Civil Works" and "Proposed Process and Functional Components of an Automatic Estimator" fall under this category. The next component is the conclusion and findings, which is fairly self-explanatory. Lastly, the report is ended with the references section which is relatively short, only half a page, due to the fact much of the information in the report is primary research and things they found through the study.

After analyzing the structure of the report, I moved onto the purpose and audience. The purpose of the report was to "evaluate the benefits and costs of developing an automatic estimator for concrete civil engineering works." From the purpose, I deduced the audience of this report to be a pitch to upper management or some form of superior. The author of this report used transitions in the form of numbered headings (i.e. "4. The As-Is Process Described") as well as numbered subheadings (i.e. "4.1 Planning and Design Framework"). This format is very convenient for readers to see exactly which section they are on. The language used is extremely professional and filled with scientific jargon such as the sentence that includes the phrase "broad scope of model-based planning" (p. 8). The text also is void of slang and improper grammar. Lastly, the author of this article takes full advantage of the use of visuals, including 19 figures and 3 tables. Each visual has adequate titling that describes what the reader is viewing, as well as containing a detailed description in the text.

### Conclusion

I chose to interview a tenured engineering professor from UC Davis, Professor Jeannie Darby, to get more of an insight on what to expect in the field of engineering in terms of writing and to get some tips to possibly improve your writing skills. When asked, Professor Darby stated

she didn't feel as though her undergraduate education prepared her for the amount of writing a career in engineering required. She found this out during her first job, where she was required to write many proposals, memos, and reports. Professor Darby also found that those who weren't good at writing often didn't move up in their careers as often as those who were good at writing did. This is due to the fact that you often have to write proposals in order to receive funding, and the workers who brought in more money were seen as a greater asset to the company.

The first tip Professor Darby suggested is to read often. Often times reading can help improve your writing by broadening your word and sentence structure knowledge. Another suggestion she had was to think of writing as no different than math. Your paper or article needs to be logical and make sense, such as a computing a math problem needs to be. Lastly, Professor Darby stated that editing was the most crucial part of writing a paper. The first time you write something, it isn't going to be perfect. Peer reviews can be extremely helpful only if you don't get defensive when they critique your work. You need to attentively listen to their suggestions and not take them personally.

Although many teachers, both in high school and college, may not stress the importance of writing in the field of engineering, it is a crucial skill to have in this career. There are many different genres of technical writing that an engineer may come across throughout their career. Some of these genres include case studies, business letters, memos, and arguably the most common, reports. Knowing the common formats and expectations of each of these genres can ultimately give you a leg up in your career as an engineer.

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