Typography Too

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Introduction

The ubiquitous application of word processors (as opposed to typewriters) has raised the bar for aesthetically pleasing documents. In response, academia should better equip students to produce pleasing documents by introducing students to the basics of typography.

Some elements of typography are unique to science, math, engineering, and technology (SMET) classes and by contrast, not commonly encountered in the humanities. Examples are the typesetting of equations, numbers in tables, numbers in scientific or engineering formats, and labeling of graphs, schematics, and diagrams. These unique aspects of typography are best introduced to the students in the context of SMET classes. Depending on the freshman English class to introduce students to typography would weaken the English course overall since more basic and general concepts need to be covered in that class.

This paper will explain why typography is important for engineers, that engineering laboratory reports provide a useful forum for teaching typography, and will give examples of some generally accepted principles of typography that engineering undergraduates should know.

Why typography matters

Typography is a matter of aesthetics. A dictionary definition of aesthetics usually cites the study of beauty, creativity, and psychological responses to beauty. What then makes a laboratory report "beautiful?" Nuanced choices of words, thoughtful organization of content, even possibly humor or playfulness, and typography of course, contribute to the aesthetics of a laboratory report, yet we would probably not think of these necessarily as "beautiful." In contrast, a laboratory report can be made so dry and terse while still being technically accurate, complete, and beyond easy criticism, as to detract from the reader's understanding of the value of the work reported on. Yet, we would probably not think of such a report as "ugly." (maybe "difficult" or "complicated") A dictionary definition of aesthetics only scratches the surface.

If there is one concept that helps to clarify the definition of aesthetics, it may be the concept of *allusiveness*. Objects with good aesthetics are especially suggestion-rich. They hint at something more than what they literally are [1]. For example, viewing the Golden Gate Bridge provokes in many people sensations of gracefulness or lightness or of the power of culture or

of modernity, et cetera. Because of these sensations the bridge amplifies and enhances its natural surroundings [2]. The Golden Gate Bridge is aesthetically successful because it *alludes* to more than what it simply is (a bridge).

Aesthetic sensitivity is not something so sophisticated as to be experienced by only a few. We influence others (and are influenced) by aesthetics whether we are aware of it or not. "Aesthetic life is as integral to being human as building sandcastles at the beach and giving your children names." [3] Since engineering is about solving technical problems in a cultural context, aesthetic sensitivity is important for engineers.

Typography is most certainly allusive. Consider the selection of typefaces in the examples of text shown in Figure 1. The top line might convey the handwritten nature or age of the U.S. Constitution. The bottom line might inappropriately convey a sense of medieval age or Eastern European or Germanic origin. Because typography is subtle but powerful, it makes a useful example. It helps sensitize one to aesthetics in general. (We should use business-like typefaces in technical writing to convey the business of our work.)

Sometimes we think of engineering as "applied science and math." It is true that science and math are applied when we do engineering, but engineering has more breadth than that. Heuristics may be applied. Ergonomics may be applied. Safety codes, developed by a complex political and legal process, may be applied. One more aspect of engineering that certainly should be applied is the aesthetic aspect. By explicitly including consideration of typography when we teach students how to write laboratory reports, we do justice to the breadth of engineering and sensitize the students to the aesthetic aspect of engineering work.

Engineering laboratory reports

One of the common objectives of requiring students to do engineering laboratory work is to teach them to communicate technical concepts effectively in writing. Actual practice writing about engineering lab work in the context of engineering lab courses is vital. Development of writing skill can start in one course or semester, but ought to continue throughout subsequent semesters. Since engineering reports are written in several courses rather than just one, they provide repeating opportunities for students to develop writing skills.

Grading written lab reports can be one of the most time consuming and tedious tasks an engineering faculty member or teaching assistant takes on, even if it is rewarding. Adding typography to the list of items needing a grade could be an additional burden.

Holistic grading is one method that can be used to reduce the tedium of grading written lab reports while increasing the effectiveness of the learning experience for the students. Examples of holistic grading rubrics can be found in the literature. For one example see [4]. These rubrics usually contain statements indicating that the writing should be displayed via good typography. On the other hand, the students have probably had little or no exposure to the principles of good typography. The students will learn better if they are given some specific guidance before writing and feedback after writing, all in the context of holistic grading.

Students especially need guidance on aspects of typography that are unique to SMET writing. Although some courses on technical writing may cover some of these aspects of typography, in many cases students are not required to take a technical writing course. Even if the students do take a technical writing course, the concepts they learn need to be reinforced with practice. Thus, the students need feedback on the typography in their engineering reports.

Some typography basics

Students should understand that there are categories of text styles. "Body text" and "display text" are two commonly used phrases to describe these categories. Body text is used for the text in the main flow of the paper and display text is used for captions, labels on graphics, and other similar text outside of the main flow of the text. Usually the body text is a serif typeface and the display text is a sans-serif typeface, or vice versa. Pick up a half-dozen or so engineering textbooks as examples and show students how each uses typefaces. This simple act will help students more than simply admonishing them not to use too many typefaces.

Students should be held accountable for displaying numbers in correct formats. Units should be spaced from numbers (5.0 kV, not 5.0kV). Leading decimals should not be allowed (0.5, not .5). Students should know when to spell numbers out. ("The design used five sections of 2 ft. diameter pipe. . ." not "The design used 5 sections of two-foot diameter pipe.) Scientific formats should use the symbol font for the "×." (3.5×10^3, not 3.5 X 10^3 or 3.5 x 10^3 —this example is more dramatic in a serif typeface) Numbers in tables should be justified so that all the decimal points align vertically.

In equations, variables (except those in Greek letters) should be displayed in italics and functional names in normal text. There should be non-breaking spaces on either side of equals, plus, and minus signs but no spaces around dots used to indicate multiplication or slashes used for division. (*f*(*t*) = 5cos(ω*t*), not f(t)=5cos(ωt)) An asterisk should not be used for multiplication (except in computer code). ($5 \times 2 = 10$, not 5*2=10) Equations must not break across lines

unless they are too long to fit on a single line. Important equations ought to be displayed centered on a line of their own, possibly with an equation number set flush right.

Computer listings ought to be displayed as figures using a fixed-pitch font so that indentations appear as the programmer intended.

Conclusion

Engineers need to be sensitive to the aesthetic aspects of their work. This is necessary for the public appreciation of the work done. Engineering lab reports provide one opportunity to give students feedback on aesthetics. Furthermore, modern word processors have raised the bar for what is considered acceptable. In response, engineering educators should sensitize students to the basics of typography and aspects of it that are unique to SMET writing.

We the people of the United States. . .

𝔚𝔢 𝔱𝔥𝔢 𝔭𝔢𝔬𝔭𝔩𝔢 𝔬𝔣 𝔱𝔥𝔢 𝔘𝔫𝔦𝔱𝔢𝔡 𝔖𝔱𝔞𝔱𝔢𝔰. . .

Figure 1. Typefaces are allusive. What does each typeface remind you of?

Citations

[1] J.H. Kok, *Patterns of the Western Mind*, Sioux Center, IA: Dordt College Press, 1998, p. 209.
[2] Public Broadcasting System, *Building Big*, "Bridges," TV broadcast October 2000.
[3] C. Seerveld, *Rainbows for the Fallen World* Ontario Canada: Toronto Tuppence Press, 1980.
[4] E.C. Pappas, R.W. Hendricks, "Holistic Grading in Science and Engineering," *Journal of Engineering Education*, vol. 89, pp. 403–408, October, 2000.