

# Integrating and Editing Information for Science and Engineering Research Papers Using Electronics and Classroom Techniques

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## ABSTRACT

- Writing for technical purposes is a crucial skill for science and engineering students to master. Researchers' methodology and results are not only recorded as data, but are also explained and interpreted. Therefore, being able to express oneself with precision and accuracy is of utmost importance for those in such exact sciences. By learning and understanding techniques for editing, revising, and integrating information, students can confidently refine their research papers to meet the highest standards needed for publication.
- Some of the common shortcomings of editing and revising which have been encountered while instructing university students in Japan, from integration of no corrections and improvements to incorrect amalgamation of suggestions, will be described. Possible reasons for these oversights will be explored and tenable solutions for implementation to assist the students will be offered, allowing immediate and direct application of what is learned when polishing technical papers for publication.

## I. INTRODUCTION

- Technical reading and writing are skills that require the ability to analyze, define, explain, and interpret data and ideas. In addition to understanding what one reads, being able to express oneself with precision in fields requiring exactness such as science and engineering is of utmost importance. In order to accomplish this, not only is a thorough understanding of vocabulary and grammar necessary and conducive to clarity, but also consistent adherence to conventional layout is required to gain acceptance for publication.
- In this presentation, we will explore students' performance when given opportunities for assistance and three examples of editing shortcomings that were evident in research papers, which were designed and written over the course of one semester in my technical reading and writing classes at Waseda University. In particular, we will look at in-class layout instruction, students' capitalizing on the opportunity for multiple draft submissions, and comments and suggestions that were ignored or incorrectly integrated, which can be essential to producing refined research papers. By exposing and examining students' performance in terms of editorial weaknesses, I hope instructors of technical writing can address these issues, and facilitate understanding and better integration of corrections by the students, resulting in higher overall quality of submitted research papers and assignments.

## II. METHODOLOGY

- Students were given ample support and instruction regarding language and layout of research papers, including classroom and textbook exercises and electronic feedback, to ensure excellence and accuracy in their work. To instil proper organisation of text and data even further, a 4-page worksheet based on *Appendix B: Guide to Authors* of the student's text [1] was distributed and completed in pairs during class. The purpose of the supplement was to simplify the complex layout guidelines into an easily readable form which could be quickly referenced. The handouts were labeled with layout details pertinent to technical research papers, such as indentations, line spacing, and font style.
- Furthermore, multiple electronic drafts of the research papers were allowed and encouraged to afford students sufficient feedback and opportunity to refine their work. A total of three submissions were possible: two optional drafts on which comments and advice were given, and one final paper, with submissions via Waseda University's electronic system called Course N@vi. Within each draft received, comments, corrections and suggestions were written with track changes activated. However, if a subsequent submission revealed that all or a majority of the advice had been ignored and improvements not made, the draft was returned with comments instructing the student to review and incorporate prior suggestions, and no additional errors were noted.

## III. RESULTS and DISCUSSION

- Figure 1 depicts the supplemental layout worksheets completed in class which, coupled with textbook exercises and discussion throughout the term regarding the research papers, seemed to prove inadequate to ensure conventions be incorporated correctly into students' papers.
- Several papers were submitted with varying alignments from section to section. For example, some contained a left-aligned abstract while the remaining sections were flush left-right. This could be the result of sections being written at different times, resulting in inconsistent type settings.

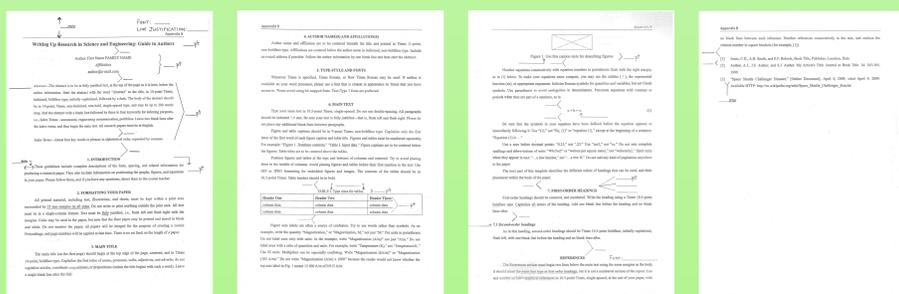


Figure 1. Research paper layout details in worksheet style from Anthony's "Appendix B: Guide to Authors" [1].

- An example from one final submission illustrates the failure to properly synthesize information learned from the course, as shown in Figure 2. (The name and e-mail address have been changed to respect the student's privacy.) Surprisingly, despite explicit explanation both in class and via track changes of how to utilize capitalization in titles, and including the affiliation, this type of error appeared in several students' work.

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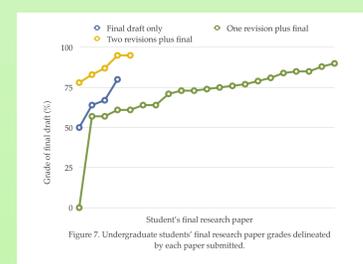
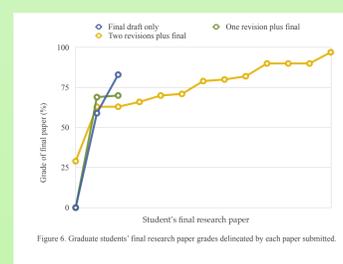
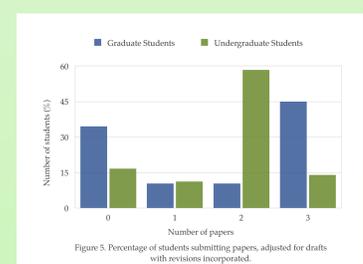
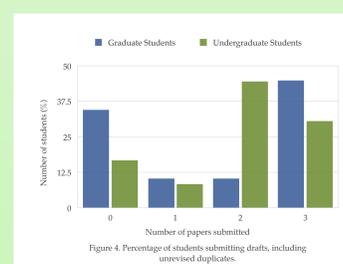
Figure 2. Author's affiliation shown using incorrect capitalization in three words: *Science*, *Bioscience*, *Waseda*.

- Another area rife with inconsistencies was the reference section, less commonly with respect to the order of information contained in the individual listings than with respect to the header's capitalization, the numbering of the section, or the misalignment of the text margins, where text within the citation was either unevenly aligned, as in Figure 3, or set to a distance other than the 7.5mm indented margin of the text's paragraphs. However, as shown in Figure 3, this listing itself also fails to follow IEEE citation standards for order of information [1].

	Reference
5.	Researchers create short-term memories in vitroDr. Ben Stowbridge 2012/10
[1]	AvailableHTTP <a href="http://www.sciencedaily.com/releases/2012/09/120910143407.htm">http://www.sciencedaily.com/releases/2012/09/120910143407.htm</a> 2014/05/19
[2]	Mechanism of making long-term memory Masatoshi Yoshida 2010/09/09
	AvailableHTTP <a href="http://pooneil.sakura.ne.jp/archives/permalink/001296.php">http://pooneil.sakura.ne.jp/archives/permalink/001296.php</a>

Figure 3. References section showing multiple layout errors.

- A closer look at term-end papers and resulting grades is presented in Figures 4-7. In general, 44.83% of the graduate students submitted 3 versions (Figure 4), of which 100% had integrated tracking change feedback into subsequent versions (Figure 5), whereas that was not the case for undergraduates. Although three papers were submitted by 30.56% of the undergraduates as seen in Figure 4, some of them were duplicates with virtually no revisions incorporated whatsoever, bringing the adjusted total of fully amalgamated papers to just 13.89% for undergraduates, as shown in Figure 5.
- The advantage of receiving and incorporating editing advice and adhering to stipulated guidelines is reflected in Figures 6 and 7, which clearly show that term paper final grades were higher for students who took full advantage of two feedback sessions leading to more polished final products.



## IV. CONCLUSIONS

- In conclusion, proper research paper layout remains a challenge for technical writers. Future efforts must be made to find innovative means of reinforcing and ensuring adherence to correct protocol in order to improve researchers' opportunities for publication, not to mention increasing their course grades. This may include having instructors confirm students' knowledge of using electronic track changes and pinpoint areas of editorial weakness. Clearly, great benefits can be reaped by instructor feedback and suggestions being integrated into successive drafts, resulting in higher overall quality. Furthermore, if writing efficiency can be improved, perhaps even more valuable content can be covered in class, or more in-depth study of other areas can occur. In other words, it is likely that the course progression would become more efficient, resulting in an opportunity to more fully maximize learning.

## REFERENCES

- [1] L. Anthony, "Appendix B: Guide to Authors," in *Writing Up Research in Science and Engineering — Foundations*. Tokyo, Japan: Waseda University, 2013, pp. 127-130.