USAGE ERROR IN TECHNICAL COMMUNICATION

by

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College students who seek careers as technical communicators must master technical writing and editing skills to succeed in the workplace. Effective technical communication stems from the communicator's ability to perceive usage errors in documents; therefore, this research study examined students' abilities to detect errors commonly found in technical editing tests. A convenience sample of East Carolina University students enrolled in English Composition served as the control group, and students enrolled in technical communication-related courses served as the cluster group. The research study entailed a brief demographic survey followed by a quasi-experiment that consisted of an editing test. The 1,000-word editing test introduced 60 errors into excerpted technical communication documents; some sentences contained multiple errors, while others were error free. The students in this small-scale study detected few of the types of usage errors found on editing tests. The results indicate that (1) Electronic editing tools detect few usage errors, (2) Students in the study group do not perceive most style-related usage errors as errors, and (3) The placement of usage errors may affect error perception. Repeating the study with a larger, randomized sample could yield findings generalizable to technical writing and editing practices and to technical communication pedagogy.

USAGE ERROR IN TECHNICAL COMMUNICATION

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East Carolina University

In Partial Fulfillment of the Requirements for the Degree

Master of Arts

by

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TABLE OF CONTENTS

TITLE PAGE ... i
COPYRIGHT PAGE ... ii
SIGNATURE PAGE ... iii
DEDICATION ... iv
ACKNOWLEDGEMENTS ... v
LIST OF TABLES ... ix
LIST OF FIGURES ... x
LIST OF ABBREVIATIONS ... xi
CHAPTER 1: INTRODUCTION ... 1
Design Limitations ... 2
Definitions ... 2
Ethical Considerations ... 3
CHAPTER 2: LITERATURE REVIEW ... 4
Perceptions of Error ... 4
Prescriptive Errors ... 6
Error Recognition ... 7
Editing Tests ... 8
CHAPTER 3: METHODS ... 10
Research Question and Hypotheses ... 10
Participants ... 10
Measurement Instruments ... 13
Assessment Instrument ... 13
Procedures ... 15
Study Implementation ... 16
Data Analysis ... 17
CHAPTER 4: RESULTS ... 20
Response Rates ... 20
Participant Demographics ... 21
Control Group ... 21

TPC Undergraduate Group ... 21
TPC Graduate Group ... 22
Usage Error Detection Rankings ... 23
Usage Error Detection Rates ... 26
Overall Usage Error Detection Rates ... 26
Overall Usage Error Detection Rates by Category ... 29
Usage Error Detection Rates by Specific Category ... 31
Usage Error Detection Rates by Broad Category ... 38
Order Effects ... 44
CHAPTER 5: DISCUSSION ... 46
Assessment Instruments ... 46
Copyediting Methods ... 46
Copyediting Test ... 47
Usage Error Detection Rates ... 49
Errors by Category ... 49
Study Limitations ... 61
Response Rates ... 61
Sampling ... 61
Copyediting Tools ... 62
Recommendations ... 62
Conclusions ... 64
REFERENCES ... 66
APPENDIX A ... 69
Usage Error Definitions ... 69
Appendix B ... 76
Pre-Thesis Research Approval Form ... 77
IRB Approval Form ... 78
Informed Consent Form ... 79
Appendix C ... 83
Research Study Instructions ... 83

Appendix D 86
Copyediting Document 86
Appendix E 91
Editing Test Error Distribution List 91
Appendix F 92
Instructors' Distribution Instructions 93
Students' Instructions 94
Appendix G 95
Copyediting Document Answer Key 95
Appendix H 100
Editing Test Data Collection Form 100
Appendix I 102
Permission Letter 102
Biographical Sketch 103

LIST OF TABLES

1. The Most Frequent Technical Editing Test Errors 14
2. Error Classifications by Broad Category 19
3. Research Study Response Rates 20
4. 20-Category Error Ranking Comparisons 23
5. 24-Category Error Ranking Comparisons 25
6. Overall Usage Error Detection Rates—Control vs. TPC....................28
7. Overall Usage Error Detection Rates—Control vs. TPC UG vs. TPC Grad....................28
8. Category 1 Usage Error Detection Rates—Control vs. TPC....................35
9. Category 1 Usage Error Detection Rates—Control vs. TPC UG vs. TPC Grad....................35
10. Category 2 Usage Error Detection Rates—Control vs. TPC....................37
11. Category 2 Usage Error Detection Rates—Control vs. TPC UG vs. TPC Grad....................37
12. Broad Category Spelling Usage Error Detection Rates—Control vs. TPC....................41
13. Spelling Usage Error Detection Rates—Control vs. TPC UG vs. TPC Grad....................41
14. Overall Error Detection Data for Test A vs. Test B 44
15. Potential Errors Flagged by Microsoft Word....................52
16. Error Correction Rates for Text Flagged by Microsoft Word 54
17. Errors Resulting from Spell-Check or Grammar-Check False Positive Flags 60
18. Editing Test Error Distribution List....................91
19. Editing Test Data Collection Form 100

LIST OF FIGURES

1. Error Distributions by Broad Categories 18
2. Raw Test Score Distributions 27
3. Overall Error Detection Scores—Control vs. TPC 28
4. Overall Error Detection Scores—Control vs. TPC UG vs. TPC Grad 28
5. Overall Error Detection Rates by Category 32
6. Error Detection Rates by Category—Control vs. TPC 33
7. Error Detection Rates by Category—Control vs. TPC UG vs. TPC Grad 34
8. Category 1 Spelling Scores—Control vs. TPC 36
9. Category 1 Spelling Scores—Control vs. TPC UG vs. TPC Grad 36
10. Category 2 Capitalization Scores—Control vs. TPC 38
11. Category 2 Capitalization Scores—Control vs. TPC UG vs. TPC Grad 38
12. Error Detection Rates by Broad Categories—Control vs. TPC 39
13. Error Detection Rates by Broad Categories—Control vs. TPC UG vs. TPC Grad 40
14. Broad Category Spelling Scores—Control vs. TPC 42
15. Broad Category Spelling Scores—Control vs. TPC UG vs. TPC Grad 42

LIST OF ABBREVIATIONS

ECU..East Carolina University

IRB..Institutional Review Board

RTF..Rich Text Format

TPC...Technical and Professional Communication

TPC UG....................Technical and Professional Communication Undergraduate Student

TPC Grad............................Technical and Professional Communication Graduate Student

CHAPTER 1: INTRODUCTION

For college graduates to succeed in the workplace as technical communicators, they must master technical writing and editing skills. Effective technical communication stems from the communicator's ability to perceive usage errors in documents. A communicator cannot correct an error without first perceiving it as an error. Furthermore, the communicator's perception of error must align with industry's perception of error in workplace documents. Boettger (2011) contends that technical editing tests reflect industry's perception of error; however, his comparative analyses rely primarily on error data from composition studies rather than from technical writing and editing studies.

Eaton (2010) describes editing research as dated and patchy with few longitudinal studies and few studies that extend previous research. While most of the studies on usage error build upon others, few of those studies focus specifically on technical editing. Concerned about the dearth of research, Eaton urges practitioners and academics to do more research in technical editing so the field can progress. Therefore, this study concentrated on the types of usage errors technical and professional communication (TPC) students perceive as errors.

This study built upon Boettger's research on errors in technical editing tests by gathering usage error data from TPC students and examining whether those students were able to detect the types of usage errors frequently found in technical editing tests. In the context of technical editing, error data from TPC students is more relevant than error data from composition students. The TPC error data enabled comparative analyses applicable to technical writing and editing pedagogy as well as to the technical communication field.

This study addressed the following question: How well can technical and professional communication (TPC) students detect the types of errors found on technical editing tests?

East Carolina University (ECU) students enrolled in the spring 2014 semester were recruited for this study, which required participants to provide demographic data and to complete an editing test. The control sample comprised students enrolled in English Composition, a population consistent with previous usage error studies. A cluster sample of students enrolled in TPC-related courses comprised the other sample population. The samples were divided into undergraduate and graduate groups for analysis. As warranted, the samples were further divided by grade level.

This study was designed to detect discrepancies in students' error perceptions and deficiencies in students' technical writing and editing skills. The results may have implications for technical writing and editing pedagogy.

Design Limitations

Three design limitations impacted the results of this research study. First, the data collection period spanned approximately three weeks to fit within semester time constraints; the time constraints limited the sample size. Second, the sampling procedure involved overlapping TPC populations; measures to avoid duplicate responses and protect the integrity of the data relied on students' compliance. Third, students were permitted to use a dictionary and style manual because there was no way to control electronic tool usage.

Definitions

In the literature, definitions of *usage error* are elusive, ambiguous, or vary considerably. The range of error terminology includes formal error, usage error, mechanical error, and grammatical error. For the purpose of this research study, usage error has been defined broadly to encompass four error categories outlined by Boettger: spelling, punctuation, style, and grammar and mechanics.

> *Usage errors* are elements of language either used in (1) nonconventional patterns that readers find distracting, (2) manners that obscure communication, or (3) frameworks that disregard standard written English (Leonard & Gilsdorf, 1990). The elements of language may include words, sentences, and paragraphs; spelling; punctuation; style; and grammar and mechanics.

Specific usage error categories are defined in Appendix A. The definitions are derived from error descriptions by Boettger (2011, 2012), which were based, in part, upon the "culture- and time-bound" error taxonomies of Connors and Lunsford (1988, p. 399) and Lunsford and Lunsford (2008) and *Chicago Manual of Style* (15th edition) guidelines; however, this study adheres to *Chicago Manual of Style* (16th edition) guidelines and *Merriam-Webster's Collegiate Dictionary* (11th edition) spellings.

> *Copyediting*, as defined in the students' instructions, includes the following tasks: correcting spelling, punctuation, grammar, style, consistency, etc.

Ethical Considerations

This research study was conducted in accordance with East Carolina University's institutional review board (IRB) policies for research posing no more than minimal risk, and the data collection procedures complied with the ECU Qualtrics terms of use. Copies of the pre-thesis research approval form, the IRB approval letter, and the informed consent form are located in Appendix B.

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CHAPTER 2: LITERATURE REVIEW

Technical communicators are expected to write well (Hairston, 1981; Lunsford & Lunsford, 2008) and have a mastery of "grammar, punctuation, usage, and mechanics, but this is not always the case" (Thomas, 2009, p. 26). Although the literature addresses students' usage error rates and deficiencies in students' writing and editing skills, the literature contains little empirical research on usage error in technical communication (Boettger, 2011); technical editing "remains the most scholarly underdeveloped subfield of technical communication" (p. 143). Most of the research on error comes from composition studies (Hairston, 1981; Connors & Lunsford, 1988; Lunsford & Lunsford, 2008).

Perceptions of Error

Hairston (1981) studied how 84 professionals (attorneys to business owners) reacted to usage errors in workplace writing. Her questionnaire presented 67 sentences that each contained one error; she asked respondents to indicate how much each error bothered them. She found that status marker errors, such as improper verb usage, double negatives, and beginning sentences with objective pronouns, were the most bothersome error types, followed by mechanical errors and spelling mistakes. However, the construct of the questionnaire sensitized respondents to the presence of errors, possibly skewing the results.

Adapting Hairston's 3-point bothersome scale, Leonard and Gilsdorf (1990) examined how business executives and business professors responded to 45 usage errors in 58 sentences that introduced errors typical of business students' errors. Leonard and Gilsdorf's results resembled Hairston's; those surveyed found sentence-structure errors most distracting, e.g., run-on sentences, fragments, dangling modifiers, and faulty parallelism. Furthermore, academics were found to be more sensitive to errors than executives. Using a 5-point survey instrument, Gilsdorf and Leonard (2001) repeated their study on usage errors. As before, the most distracting errors involved sentence-structure errors; similarly, academics and older readers were more sensitive to errors than executives and younger readers.

Connors and Lunsford (1988) examined the frequency of formal and mechanical errors in 3,000 graded essays from college freshmen and sophomores; however, they failed to define formal errors. The researchers coded each paper using their own taxonomy of 20 error patterns. Due to their dominance (by a factor of 300.0%), spelling errors were studied separately. Results revealed inconsistencies in what teachers deemed serious errors—only 43.0% of serious errors were marked wrong. Connors and Lunsford concluded that college students' error rate has held constant since 1917, but the types of errors have changed.

To determine if error patterns changed with the digital age, Lunsford and Lunsford (2008) replicated Connors and Lunsford's 1988 study. Using a coding rubric based on errors detected in a random stratified sample, they examined 877 graded papers from first-year writing courses, a smaller sample which included longer, mostly argument- and research-based papers. Wrong-word errors replaced spelling errors as the most frequent error, a phenomenon they attributed to spell-checker suggestions. Some errors in capitalization and hyphenation seemed to result from automated word processor features. Overall, they again found that the rate of errors remained constant, but the types of errors changed.

Sloan (1990) compared 20 college freshmen's errors with 20 professional writers' errors, defining error in accordance with Trimmer and McCrimmon's "Handbook of Grammar and Usage" (1988). Sloan found a similar number of errors in both groups. His results (2.04 student errors per 100 words) were consistent with those of Connors and Lunsford (2.26 student errors per 100 words). In contrast, Sloan found that the professional writers made 1.82 errors per 100 words.

Hoping to improve students' comprehension of error, Beason (2001) studied how 14 business people reacted to errors in business writing. Through surveys and interviews, he identified textual (word choice, syntax, punctuation, etc.) and extra-textual (communication situation, reader's interpretive framework, etc.) variables that trigger negative reactions to error. Beason argues that students cannot understand error unless they comprehend its negative impact on writers' ethos.

Prescriptive Errors

Trying to reconcile the prescriptive nature of grammar with its "malleable and arbitrary" rules, Evans (2011) questioned how best to teach grammar. She recommends annotating students' papers with numbers that correspond with a template of common errors, a practice that "lends itself to analysis, since students can count up the occurrences of each number, thus identifying patterns of error" (p. 292). This approach resembles the method used for this research study, which compares TPC students' error detection patterns with errors found in editing tests.

Connatser (2004) proposed that writing and editing decisions should involve both prescriptive and organic grammar. He described organic grammar as an innate skill concomitant with language development and described prescriptive grammar as a skill taught in school. According to Connatser, readers become "error detectors" when organic grammar rules are broken. Although expert editors understand prescriptive grammar and organic grammar, Connatser believes style guides should reconcile the differences between organic grammar and prescriptive grammar usage. Some workplace editing tests incorporate in-house style guides that reconcile these differences.

In an attempt to disavow prospective English teachers of the notion that grammar rules are inviolable, Devet (1996) argues that errors are not "a dichotomous right-versus-wrong" rather "a continuum that reflects the rhetorical context of the writing" (p. 136), while Cook (2001, 2010) advocates rhetorical grammar, which views editing and punctuation as rhetorical choices. Likewise, Connors and Lunsford (1988) and Sloan (1990) suggested that some errors represent rhetorical choices instead of mechanical flaws, and Buehler (2003) described a rhetorical approach to technical editing that relies on rule-based prescriptive grammar. However, to succeed as technical communicators, students must temper their rhetorical choices with workplace perceptions of error.

Error Recognition

Williams (1981) conceives of error as a "flawed verbal transaction between a writer and a reader" (p. 153). His essay with 100 deliberate errors demonstrated how most readers overlook errors when the writing is interesting. People are more likely to consciously perceive errors when they are reading for typographical errors versus reading for content. Context and emotional investment affect how readers respond to rule violations and which types of errors they notice. Boettger's (2011, 2012) research on editing tests illustrates this error-detection phenomenon in workplace contexts.

In some respects, the error rates in previous studies reflect a "rate of attention to error" (Lunsford & Lunsford, p. 800). According to Devet (1996), "errors can be defined as errors only so far as readers notice them" (p. 137), whereas Leonard and Gilsdorf (1990) concluded that some errors are not bothersome because they are either not perceived as errors or do not significantly interfere with meaning. Sloan (1990) conceded that error definitions may vary from person to person. In contrast, Connatser (2004) contends that some errors are not truly errors; rather, those perceived errors reflect “a conflict between organic and prescriptive grammar” (p. 266). These differences in attention to error confound technical communicators’ efforts to determine workplace expectations of error detection.

Although electronic editing tools rely on prescriptive grammar rules to recognize error, artificial intelligence cannot grasp semantics or rhetorical context. Major (2010) examined the usage and effectiveness of Word’s electronic editing tools and noted the detrimental effects of blindly accepting suggested revisions. Major tested Word’s ability to detect 21 error types, most of which coincide with Boettger’s list of errors. Major found, on average, that Word detected 30.0% of the errors, yet the improvement rate was only 19.0%. The electronic tools were most effective at detecting spelling errors.

Editing Tests

Some technical communicators lack the necessary writing and editing skills to succeed in the workplace; therefore, employers use editing tests to assess applicants’ competency. Hart (2003) equates editing tests with job interviews, describing an editing test as a barrier to employment that not only tests an applicant’s skills in spotting obvious errors (e.g., typos) and less obvious errors (e.g., non sequiturs) but also tests an applicant’s approach to editing. Noting that writing and editing require different skills, Hart conceded that perfect edits elude most editors; however, editors should at minimum, “eliminate all errors that typical readers would notice” (p. 13). Therefore, technical communication students must recognize the types of errors commonly noticed in workplace writing.

Enos (2010) acknowledged the problem of graduates lacking adequate skills for employment and the need to prepare students to write and edit in a global environment. She addressed the problem by studying the writing, editing, and proofreading skills of 56 students in introductory business English courses. She conducted a pretest-posttest quasi-experiment using Guffey's Grammar and Mechanics Diagnostic Assessment Tool (*Essentials of Business Communication*, 2007) and concluded that students can improve their editing skills with merely one course, but proficiency requires practice and experience. Furthermore, to succeed as technical communicators, students must identify their editing deficiencies and reconcile them within the context of workplace perceptions of error.

In his research on technical writing and editing tests, Boettger (2011, 2012) extended the work of Hairston, Leonard and Gilsdorf, Connors and Lunsford, and Lunsford and Lunsford. Boettger collected 41 editing tests from various industries and studied the types of errors in the tests, analyzing the error frequency and dispersion. Coders detected 72 types of errors, with each test averaging 54.7 errors and 20.2 different errors. When comparing the 20 most frequent errors with the 20 most dispersed errors, all but four error types overlapped. Spelling and capitalization errors topped both lists, results that corresponded with Connors and Lunsford's 1988 study.

CHAPTER 3: METHODS

This research study entailed a brief demographic survey followed by a quasi-experiment consisting of an editing test (see Appendix C and Appendix D).

Research Question and Hypotheses

This study addressed the following question: How well can technical and professional communication (TPC) students detect the types of errors found on technical editing tests?

The quasi-experiment tested the following hypotheses:

H_0: There is no significant difference between the most frequent types of errors that Boettger found on technical editing tests and the types of errors that technical and professional communication (TPC) students detect on editing tests.

H_1: The TPC students' error detection rates (TPC undergraduates and TPC graduate students) will be higher than the control group's error detection rates.

H_2: The TPC graduate students' error detection rates will be higher than the undergraduates' error detection rates (TPC undergraduates and control group).

H_3: The TPC undergraduates' error detection rates will be higher than the control group's error detection rates.

H_4: The students' error detection rates will increase with education and experience.

Participants

A control sample was recruited from East Carolina University (ECU) students enrolled in the spring 2014 semester in either English 1100 (Foundations of College Writing) or English 1200 (Composition), a population consistent with previous usage error studies. English 1100 is a prerequisite for English 1200; therefore, no students should have overlapped the two courses. To avoid skewed data, only non-controlled registration sections were sampled. In other words, ESL (English as a second language), STEPP (Supporting Transition and Education through Planning and Partnerships), COB (College of Business), and honors sections were excluded from the control sample. Per administrative request, none of the 29 sections taught by graduate teaching assistants were permitted to participate in the control sample.

Combined, the population enrolled in English 1100 and English 1200 comprised approximately 3,450 students (141 sections). At the outset, the sections were randomly sampled using Excel's random number generation function; however, the majority of the instructors opted not to participate. In the end, approximately 8% (11 sections/275 students) of the English 1100/English 1200 population were asked to participate in this study. Ultimately, for the control group, participation difficulties resulted in a self-selected convenience sample.

A cluster sample of students enrolled in various spring 2014 technical and professional communication (TPC) courses were recruited for the other sample population. Students were recruited from the undergraduate courses English 3820 (Scientific Writing), English 3880 (Writing for Business and Industry), and English 4885 (Digital Writing). Additionally, students were recruited from the following graduate courses:

- English 6700 (Technical Editing and Production),
- English 6725 (Directed Readings in TPC),
- English 7701 (Research Methods in TPC),
- English 7710 (Professional Communication),
- English 7712 (Grant and Proposal Writing),
- English 7746 (Training in TPC),

- English 7765 (Risk Communication),
- English 7766 (UX Design), and
- English 8780 (Theories in Visual Representation).

The population enrolled in those TPC courses comprised approximately 660 students combined before excluding overlaps (570 undergraduate spaces and 90 graduate spaces). The undergraduate TPC courses have a prerequisite of English 1200; therefore, the students in this cluster sample should not have overlapped with the control sample. However, some overlap may have occurred among the TPC students, particularly among the graduate students—those with assistantships must take three classes per semester, while those with student loans must take two classes per semester. To discourage duplicate responses, students were instructed to complete the study only one time and to disregard duplicate invitations to participate.

Lauer and Asher (1988) recommend using a minimum sample size of 10 subjects per variable; in this case, the target sample size was at least 240 students. Given the small number of TPC graduate students enrolled at ECU, this target sample size could not have been reached unless (1) participation rates were high, and (2) the TPC sample included both TPC undergraduate students and TPC graduate students.

In an attempt to obtain an adequate sample size, all students enrolled in the spring 2014 semester in TPC graduate courses (about 90 students maximum before excluding overlaps) were asked to participate. For the TPC undergraduate sample, which comprised 350 students maximum before excluding overlaps, the following students were asked to participate:

- all students enrolled in Digital Writing,
- all students in both sections of Scientific Writing,

- all students in three of the six online sections of Writing for Business and Industry, and
- all students in nine face-to-face sections of Writing for Business and Industry.

Again, due to the number of instructors who declined to participate, random sampling efforts failed. Like the control group, the TPC group comprised a self-selected convenience sample.

Of the TPC classes (graduate and undergraduate) sampled, approximately one third were online classes and two thirds were face-to-face classes; in contrast, all of the sampled control group were face-to-face classes. (Four of the online graduate classes had one or two students registered in face-to-face sections for administrative purposes; for this study, the students in these sections have been counted with the corresponding online sections.)

Measurement Instruments

Assessment Instrument

This study used an editing test to assess participants' ability to detect specific types of errors in technical documents. The types of errors studied correspond with Boettger's list of the 20 most frequent technical editing test errors, which are shown in Table 1. In addition, four errors from Boettger's list of the 20 most dispersed errors were included in the study because the lists are very similar. All but four error types appear in both lists; however, the error rankings differ between lists.

Instrument Validity and Reliability

Boettger signed nondisclosure statements to obtain privatized editing tests for his study, a difficult process necessary to maintain the integrity of those tests. Due to the inherent difficulties in obtaining workplace editing tests and the nature of this study, the researcher designed a composite editing test based on Boettger's error frequency and distribution findings.

Table 1
The Most Frequent Technical Editing Test Errors
Used with permission of Ryan Boettger

Table 1: Most Frequent Errors

#	Error or Error Pattern	# found in 41 tests	% of total errors
1	Spelling (including homonyms)	305	13.6%
2	Unnecessary or missing capitalization	152	6.8%
3	Hyphen, em- or en-dash error	93	4.1%
4	Language or nomenclature consistency	86	3.8%
5	Wrong word	83	3.7%
6	Faulty predication	74	3.3%
7	Format/consistency text	69	3.1%
8	Unnecessary shift in verb tense	68	3.0%
9	Unnecessary or missing apostrophe (including its/it's)	62	2.8%
10	Number, date, percentage, time format	54	2.4%
11	Wordiness, rewrite for concision	53	2.4%
12	Misplaced or dangling modifier	51	2.3%
13	Missing or incorrect article	51	2%
14	Lack of subject-verb agreement	50	2%
15	Organization	49	2%
16	Active voice preferred	48	2%
17	Faulty parallel structure	48	2%
18	Missing comma in a series	47	2%
19	Missing comma with a nonrestrictive element	46	2%
20	Repetition	44	2%

Unlike composition studies tests that introduced one error per sentence (Hairston, 1981; Leonard & Gilsdorf, 1990), this editing test, as shown in Appendix D, introduced errors into excerpted documents that technical communicators might encounter in the workplace; some sentences contained multiple errors, while others were error free. The editing test consisted of two excerpts: one from a composting manual and one from a report on disparities in gifted education. The approximately 1,000-word test incorporated 60 usage errors; the distribution of error types is outlined in Appendix E. The length of the test and the number of errors are comparable with the averages of the 41 tests that Boettger analyzed.

The assessment instrument was validated by pretesting it on several recent TPC graduates and on another student in a similar field who was in neither the control sample nor the TPC sample. Further steps were taken for validity:

- *Copyediting* was defined in the emailed students' instructions and in the copyediting instructions that prefaced the copyediting document download link.
- The copyediting instructions served as a model for style and punctuation issues that appeared within the document, e.g. serial commas. Instructions in industry editing tests serve similar purposes, often incorporating the correct spellings of proper nouns and products associated with the company.
- Links to the *Chicago Manual of Style* (16th ed.) and *Merriam-Webster's Collegiate Dictionary* (11th ed.) were embedded in the copyediting instructions.
- The sequence of excerpts was reversed on half of the tests in each group to reduce order effects.
- The tests were randomly distributed to participants in each group.

Procedures

This research study required participants to provide demographic data and to complete an editing test.

Study Implementation

Instructors of the sampled classes were encouraged to incorporate the editing test in their lesson plans; however, this was entirely optional. At the instructor's discretion, instructors could offer extra credit for students' participation in the study with the caveat that the instructor must offer an alternative extra credit option for students who did not wish to participate in the study. Instructors were asked to notify the researcher if the editing test was used in class or if extra credit was offered because either action could affect the participation rate.

The instructors of the sampled classes were asked to distribute to students an email with instructions on how to access the research study. (The instructors' and students' instructions are shown in Appendix F.) Students needed an Internet connection, an email account, a web browser, and a word-processing program to complete the study. Each student had to read the consent form and agree to its terms in order to access the study's demographic questions and editing test. To reduce potential testing anxiety, students were instructed to copyedit a document rather than to complete an editing test. Shown in Appendix D, the copyediting test instructions included links to electronic copies of *Merriam-Webster's Collegiate Dictionary* and the *Chicago Manual of Style*; students had to login to ECU's Joyner Library for free access to the subscription-based style guide.

The test was distributed to all students electronically because many TPC graduate students are strictly distance education students. The copyediting test was distributed through a Qualtrics survey as an RTF file—a universal file format that works with most word processors and computer operating systems. Students had the option to print the test and mark corrections on paper, then scan the corrected document and submit the scanned document as a file upload.

The editing test should have taken about 60 minutes to complete. Students were asked to complete the study within one week.

Data Analysis

The research data were compiled and prepared in an Excel spreadsheet, and then analyzed with the statistical software JMP using the tests outlined below. All of the tests used a p value of .05 or less as a measure of statistical significance. A means analysis was used for the participants' overall detection rate of errors in the editing test; the means of the 24 types of errors introduced into the test were individually analyzed as well. (The editing test errors were counted in accordance with the answer key shown in Appendix G. In addition, any non-errors or errors missed by the researcher were tallied.)

Levene tests were run to check for unequal variance. The data were plotted by quantile and as histograms to check for normal distribution. Depending on the distribution and variance results, ANOVA tests (equal variance), Welch ANOVA tests (unequal variance), or Wilcoxon Rank Sums tests (nonparametric data) were used to compare the ECU students' error data. The samples were divided into undergraduate and graduate groups for analysis. If the ANOVA tests showed statistically significant results, follow-up tests were performed to determine which relationships were significant, e.g., the control group and the TPC graduate group. (Tukey HSD was used for equal variance; Dunnett's C was used for unequal variance.) If the Wilcoxon Rank Sums tests showed statistically significant results, the Wilcoxon Each Pair test was run to determine which relationships were significant.

ANOVAs were also used to analyze the means of the various groups' error types (the control group, the TPC group, and the grade-level subgroups). If the ANOVA tests showed statistically significant results, Tukey HSD or Dunnett's C were performed to determine which relationships were significant, e.g., freshman vs. sophomore, sophomore vs. junior, etc. A two-way ANOVA was used to determine how the number of TPC classes completed, TPC work experience, and grade level affected the error data. If the ANOVA showed statistically significant results, Tukey HSD tests were performed to determine which relationships were significant, e.g., grade level vs. experience. If the Wilcoxon Rank Sums tests showed statistically significant results, the Wilcoxon Each Pair test was run to determine which relationships were significant.

Given the large number of variables, the 24 error categories were collapsed for analysis into four broad categories: spelling, punctuation, style, and grammar and mechanics. The error distribution is summarized in Figure 1; Table 2 delineates the broad category error classifications.

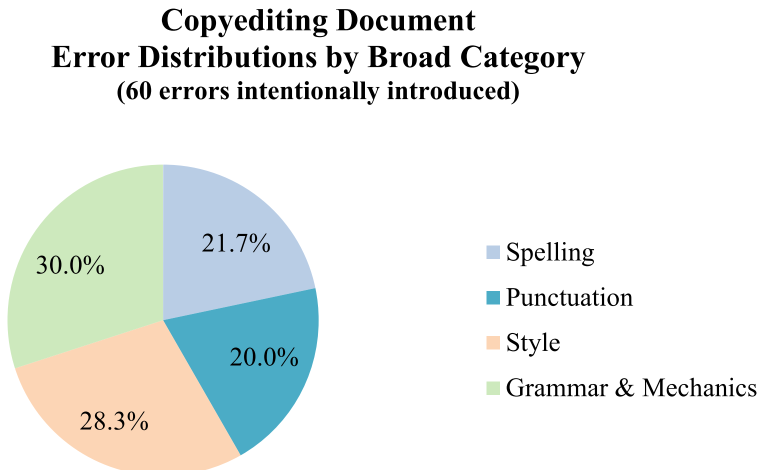


***Figure 1*. Error Distributions by Broad Categories.**

Table 2
Error Classifications by Broad Category

Spelling	**Punctuation**	**Style**	**Grammar & Mechanics**
Misspellings	Hyphens & Dashes	Language Consistency	Capitalization
Wrong Words	Serial Commas	Faulty Parallelism	Faulty Predication
	Commas with Nonrestrictive Elements	Number & Percentage Format	Misplaced & Dangling Modifiers
	Unnecessary Commas	Active Voice Preferred	Unnecessary Verb Tense Shifts
	Transitional Commas	Organization	Articles
		Wordiness	Subject-Verb Agreement
		Repetition	Prepositions
		Text Format Consistency	Singular-Plural Application

CHAPTER 4: RESULTS

Response Rates

Altogether, approximately 12.0% of the sampled population responded to this study, and approximately 5.9% of the sampled population completed the study. In total, 42 students participated. Table 3 outlines the research study response rates for each group. The TPC response rates are likely higher than noted because the sampling numbers are based on enrollment spaces and do not account for overlaps, i.e., students who were enrolled in multiple TPC courses. The completion rates represent the percentage of sampled students in each group who submitted a copyedited document; the completion rates were calculated by dividing the number of completed responses by the maximum number of students sampled and then multiplying the result by 100.

Table 3
Research Study Response Rates

	Maximum # Sampled	# Student Responses	Response Rates	# Completed Responses	Completion Rates
Control Group	275	42	15.3%	23	8.4%
TPC Undergraduate Group	350	33	9.4%	13	3.7%
TPC Graduate Group	90	11	12.2%	6	6.7%

Data from eight participants were discarded because the uploaded copyediting documents textually matched the original documents. Partial survey results (demographic data) were automatically recorded by Qualtrics after two weeks; however, those results were excluded from the analysis because none included a copyedited file.

Participant Demographics

Control Group

All of the control group participants (N = 23) were freshmen or sophomores enrolled in English 1200 (Composition), which has a prerequisite of English 1100 (Foundations of College Writing). The majority of the participants were female (n = 19). Students in the control group represented a variety of majors including nursing, exercise physiology, business, French, neuroscience, religious studies, sociology, biology, chemistry, clinical laboratory science, biochemistry, hospitality management, child development, public health, and elementary education. Two participants declared double majors and two had not yet decided upon majors.

Nearly half of the group (n = 10) had never completed an undergraduate-level technical and professional communication (TPC) course, which would be expected for a group that consisted primarily of freshmen. Yet, 11 participants in the group reported completing 1–3 TPC courses, one participant reported completing 7–9 TPC courses, and one participant reported completing 10 or more TPC courses—these data are questionable. Students may have misreported this information or misinterpreted the definition of a TPC course despite the accompanying list of example TPC courses. The participant who reported completing 7–9 courses scored the third highest in the control group and outperformed all but two of the graduate TPC students, while the participant who reported completing more than 10 TPC courses scored among the bottom half of the control group. None of the participants had worked or interned as a technical or professional communicator.

TPC Undergraduate Group

The TPC undergraduate group (N = 13) comprised eight juniors and four seniors; no sophomores in this group completed the study. Seven participants were female and six were male. Four of the students were enrolled in English 3820 (Scientific Writing); the rest were enrolled in English 3880 (Writing for Business and Industry). The students in this group represented various majors: biology, sports studies, business, marketing, physics, management, mathematics, and management information systems. (East Carolina University does not offer an undergraduate major in technical and professional communication; therefore, the TPC undergraduate group comprised students enrolled in TPC-related courses that count toward the undergraduate certificate in business and technical communication.)

One participant had not completed any undergraduate-level technical and professional communication (TPC) courses, but more than half of the participants (n = 9) reported completing 1–3 undergraduate-level TPC courses. One participant reported completing 4–6 undergraduate-level TPC courses and one reported completing 10 or more. In addition, two participants reported completing 1–3 graduate-level TPC courses and one reported completing 4–6 graduate-level TPC courses—these data are somewhat questionable; perhaps some people reported the number of credit hours instead of the number of courses. None of the participants had worked or interned as a technical or professional communicator.

TPC Graduate Group

The TPC graduate group (N = 6) comprised five graduate students and one postgraduate student; all were female. Participants were enrolled in one or more of the following classes: English 7701 (Research Methods in TPC), English 7712 (Grant and Proposal Writing), English 7765 (Risk Communication), and ENGL 7766 (UX Design). With the exception of one adult education major, all participants in this group were English majors whose concentrations included technical and professional communication, teaching English to speakers of other languages, and multicultural and transnational literatures.

Two participants had not completed any undergraduate-level TPC courses, two participants reported completing 1–3 undergraduate TPC courses, one reported completing 7–9 undergraduate TPC courses, and one reported completing 10 or more undergraduate TPC courses. Four participants had not yet completed any graduate-level TPC courses. One participant reported completing 1–3 graduate-level TPC courses, and one participant reported completing 7–9 graduate-level TPC courses. One participant had worked and interned as a technical communicator for less than a year in each capacity.

Usage Error Detection Rankings

Table 4 depicts how Boettger's list of the 20 most frequent technical editing errors aligns with the types of errors ECU students detected while editing. Boettger's rankings represent the percentage of errors contained within technical editing tests, while the study group rankings represent the percentage of errors students detected in each error category.

Table 4
20-Category Error Ranking Comparisons

Group Ranks	Spelling	Capitalization	Hyphens & Dashes	Language Consistency	Wrong Word	Faulty Predication	Text Format Consistency	Verb Tense Shift	Apostrophes	Number/Percent Format	Wordiness	Misplaced/Dangling Modifiers	Articles	Subject-Verb Agreement	Organization	Active Voice Preferred	Faulty Parallelism	Serial Commas	Commas, Nonrestrictive	Repetition
Boettger	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Overall	1	3	20	17	8	11	7	10	2	9	17	16	5	6	17	13	14	12	4	15
Control	1	3	17	16	6	11	7	10	2	9	18	18	3	7	18	12	13	13	5	15
TPC UG	1	4	14	14	5	10	6	11	3	9	14	14	6	8	14	12	14	12	2	14
TPC Grad	2	3	20	19	8	11	5	8	5	12	14	12	7	1	14	18	14	8	4	14
TPC	1	3	20	19	7	9	6	9	4	9	14	13	7	5	14	14	14	12	2	14

Note. The highlighting denotes tied rankings.

Error categories 21–24 were omitted from this ranking comparison because those error types were pulled from Boettger's list of the 20 most dispersed errors. Performance was generally high on the four error categories from Boettger's list of the most dispersed errors, errors that were widely dispersed but less frequently occurring. In the 24-category error rankings, shown in Table 5, error categories 21–24 ranked among the top 12 categories for all but the control group. In the 24-category rankings, spelling aligned with Boettger's ranking for all groups but the TPC graduates, for whom spelling ranked third.

The null hypothesis, which posited that there would be no significant difference between the most frequent types of errors that Boettger found on editing tests and the types of errors that students detect on editing tests, was rejected based on the percentage of errors detected and the comparison of error rankings. The groups' overall error detection rates ranged from 29.3% to 42.2%, which indicates that the students in this study detected few of the types of usage errors found on editing tests.

A visual comparison of the groups' 20-category error detection rankings reveals little correlation with Boettger's rankings, except for the spelling category rankings, which align for all but the TPC graduate group, where subject-verb agreement displaced spelling by one rank. For the TPC undergraduate group, the wrong word category aligns too. For the combined TPC group, spelling is the only category that correlates with Boettger's rankings.

Boettger's ranking for text format consistency aligns with the control group ranking and the overall group ranking. Additionally, Boettger's rankings in the categories of unnecessary verb tense shift and misplaced/dangling modifiers align with the TPC graduate group rankings. Similarly, the rankings for capitalization, number/percentage format, and organization are off slightly for all study groups, differing by one to three ranks.

Table 5

24-Category Error Ranking Comparisons

Group Ranks	Spelling	Capitalization	Hyphens & Dashes	Language Consistency	Wrong Word	Faulty Predication	Text Format Consistency	Verb Tense Shift	Apostrophes	Number/Percent Format	Wordiness	Misplaced/Dangling Modifiers	Articles	Subject-Verb Agreement	Organization	Active Voice Preferred	Faulty Parallelism	Serial Commas	Commas, Nonrestrictive	Repetition	Comma, Unnecessary	Preposition	Comma, Transitional	Singular-Plural Application
Boettger	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Overall	**1**	**4**	**24**	**21**	**12**	**15**	**11**	**14**	**2**	**13**	**21**	**20**	**8**	**9**	**21**	**17**	**18**	**16**	**7**	**19**	**3**	**5**	**5**	**9**
Control	**1**	**4**	**21**	**20**	**9**	**15**	**10**	**14**	**2**	**13**	**22**	**22**	**4**	**10**	**22**	**16**	**17**	**17**	**8**	**19**	**3**	**7**	**4**	**12**
TPC UG	**1**	**6**	**18**	**18**	**7**	**14**	**10**	**15**	**3**	**13**	**18**	**18**	**10**	**12**	**18**	**16**	**18**	**16**	**2**	**18**	**3**	**7**	**7**	**3**
TPC Grad	**3**	**4**	**24**	**23**	**12**	**15**	**8**	**12**	**8**	**16**	**18**	**16**	**11**	**2**	**18**	**22**	**18**	**12**	**5**	**18**	**5**	**1**	**5**	**10**
TPC	**1**	**5**	**24**	**23**	**11**	**13**	**10**	**13**	**6**	**13**	**18**	**17**	**11**	**9**	**18**	**18**	**18**	**16**	**2**	**18**	**3**	**3**	**7**	**7**

Note. The highlighting denotes tied rankings.

However, the rankings are off considerably for all groups in the categories of hyphens and dashes and language consistency. Those categories ranked at the bottom or in the bottom five. In contrast, the category commas with nonrestrictive elements is number 19 on Boettger's list, yet it ranked among the top five for all study groups.

Little correlation exists between this study's error detection rankings and the formal error rankings of Lunsford and Lunsford and Connors and Lunsford, rankings that reflect the most common usage errors made by composition students. Comparison is difficult because the usage error categories not only differ but the error rankings also reflect errors in different contexts, i.e., error creation versus error detection.

Usage Error Detection Rates

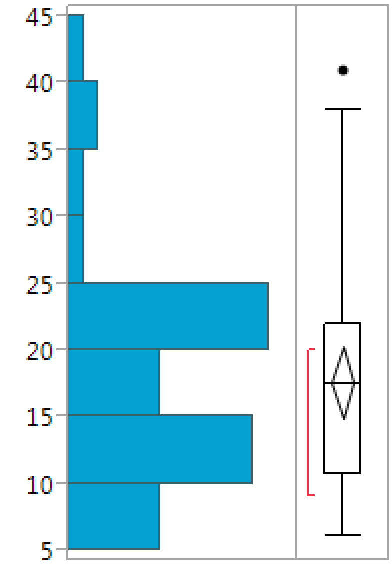
Overall Usage Error Detection Rates

The copyediting test contained 60 errors that were allocated between 24 categories in similar proportions to the error distributions Boettger found in his study on technical editing tests. In this study with 42 participants, the overall error detection rate was 29.3%.

Figure 2 illustrates the distribution of raw test scores for the entire study group (control group, TPC undergraduate group, and TPC graduate group); the scores do not follow a normal distribution curve. For the control group, the scores ranged from 6 to 37; the maximum raw score was 60. For the TPC undergraduate group, the scores ranged from 8 to 23; for the TPC graduate group, the scores ranged from 10 to 41. The grade-level scores ranged from 6 to 41.

Distributions

Total sample



Quantiles

100.0%	maximum	41
99.5%		41
97.5%		40.775
90.0%		30.8
75.0%	quartile	22
50.0%	median	17.5
25.0%	quartile	10.75
10.0%		8.3
2.5%		6
0.5%		6
0.0%	minimum	6

Summary Statistics

Mean	17.547619
Std Dev	8.6000635
Std Err Mean	1.3270186
Upper 95% Mea	20.227587
Lower 95% Mean	14.867651
N	42

Figure 2. **Raw Test Score Distributions.**

Tables 6–7 outline the overall usage error detection rates for each study group and the corresponding statistical test values. Tests showed unequal variance between the three groups.

Table 6

Overall Usage Error Detection Rates—Control vs. TPC

Group	N	M	SD	% detected	test	p value
Control	23	15.13	8.37	25.22	**Levene**	.4122
TPC	19	20.47	8.14	34.12	**Wilcoxon**	.0226

Table 7

Overall Usage Error Detection Rates—Control vs. TPC UG vs. TPC Grad

Group	N	M	SD	% detected	test	p value
Control	23	15.13	8.37	25.22	**Levene**	.0446
TPC UG	13	18.23	4.88	30.38	**Wilcoxon**	.0489
TPC Grad	6	25.33	11.82	42.22		
Control vs. TPC Grad					**Wilcoxon pairs**	.0428

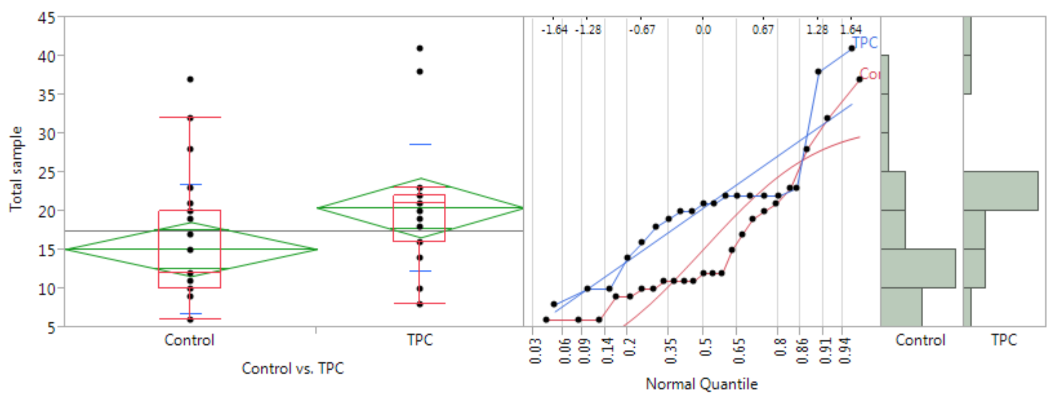


***Figure 3*. Overall Error Detection Scores—Control vs. TPC.**

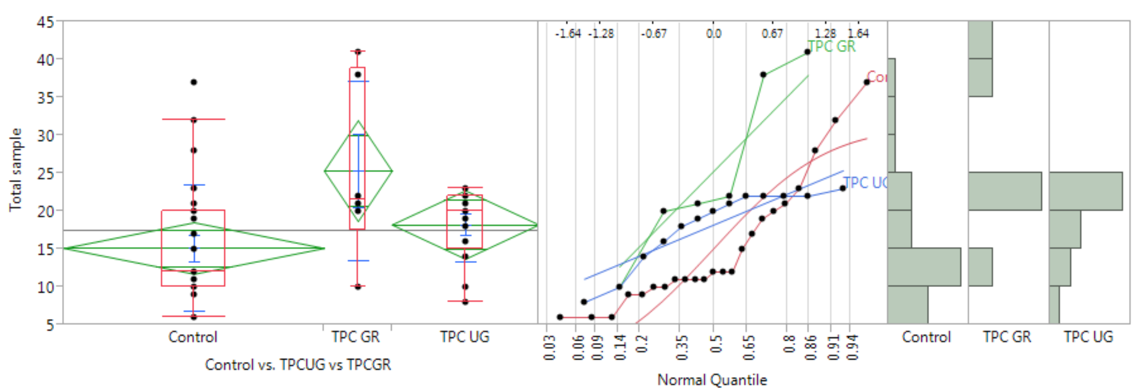


***Figure 4*. Overall Error Detection Scores—Control vs. TPC UG vs. TPC Grad.**

Given the error detection distribution curves shown in Figures 3–4, nonparametric tests were run on the data. A Wilcoxon Rank Sums test showed significance between the overall test scores of the combined TPC group (TPC undergraduate group and TPC graduate group) and the control group. This finding supports the hypothesis that TPC students' error detection rates will be higher than the control group's error detection rates.

Similarly, a Wilcoxon Rank Sums test showed significance between the test scores of the control group, the TPC undergraduate group, and the TPC graduate group. The Wilcoxon Each Pair test showed significance between the control group and the TPC graduate group; however, those results do not entirely support the hypotheses that the TPC graduate students' error detection rates will be higher than the undergraduate students' error detection rates (TPC undergraduates and control group), and that the TPC undergraduate students' error detection rates will be higher than the control group's error detection rates. Even so, the error detection percentages appear to support H_2 and H_3; further tests with a larger sample are needed to determine whether to reject those hypotheses.

Overall Usage Error Detection Rates by Category

The means analysis of the overall test scores for the 24 error categories revealed that students scored the highest in spelling—combined, detecting 264 of 420 possible errors—and lowest in hyphens and dashes—combined, detecting only one of 168 possible errors. Students detected less than 5.0% of the errors in the following categories:

- hyphens and dashes,
- language consistency,
- wordiness,
- misplaced and dangling modifiers,

- organization, and
- repetition.

Students detected less than 10.0% of the errors in the categories active voice preferred and faulty parallelism, and students detected less than 15.0% of the errors in the categories faulty predication and unnecessary verb tense shift. As a whole group, students detected at least half of the errors in the categories spelling, apostrophes, and unnecessary commas. Students detected at least 40.0% of the errors in the following categories:

- capitalization,
- prepositions,
- commas with transitional phrases,
- commas with nonrestrictive elements, and
- articles.

The TPC graduate group scored highest in the category prepositions and lowest in the category hyphens and dashes. The TPC undergraduate group scored highest in the category spelling and lowest in the category repetition. The control group scored highest in the category spelling and lowest in the category organization.

Statistical tests showed no significant differences in overall error detection rates between the genders or number of TPC courses completed. These findings do not support the hypothesis that students' error detection rates will increase with education and experience; nevertheless, the means analysis showed a general trend of increasing detection rates by grade level, which suggests that the hypothesis is valid. Additional studies with a larger sample are needed to support the hypothesis.

It must be noted that some course data was lost in the analysis process. The number of variables complicated analysis, so the data for the number of courses was binned as “no courses” or “one or more courses.” While some information was lost, the binning process helped reduce the effect of the outliers.

Usage Error Detection Rates by Specific Category

Figures 5–7 show the error detection rates for each of the 24 usage error categories. Each group’s strengths and weaknesses are evident in these charts.

Figure 5 depicts the error detection rates for the entire study group in each of the 24 error categories. With an error detection rate of 0.6%, the hyphens and dashes category is barely visible.

Figure 6 compares the error detection rates of the control group with the combined TPC group. Error detection rates for some categories were zero; the TPC group did not detect any errors in the hyphens and dashes category, and the control group did not detect any errors in the wordiness, modifiers, or organization categories.

Figure 7 compares the error detection rates of the control group, the TPC undergraduate group, and the TPC graduate group. Again, error detection rates for some categories were zero.

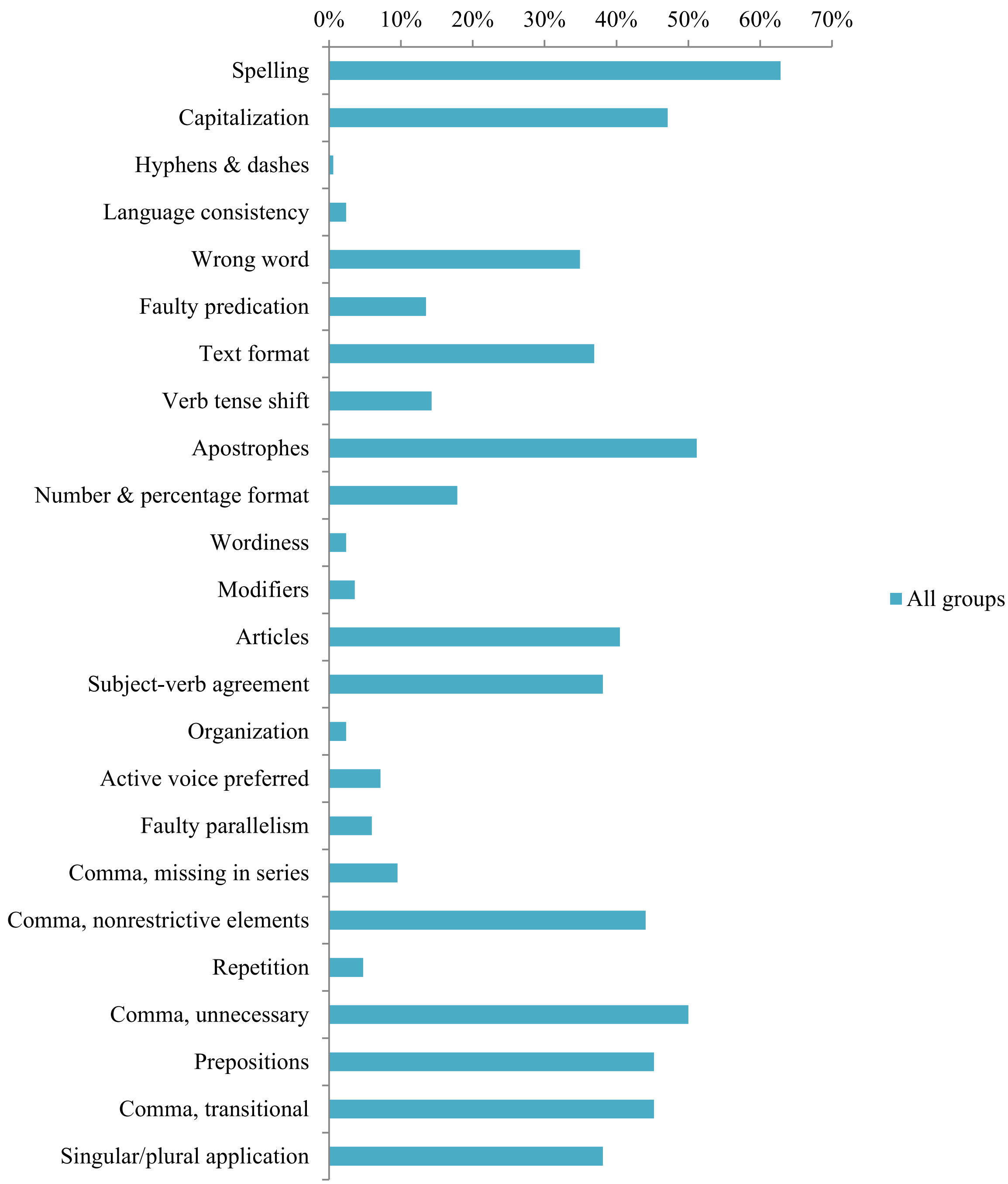


***Figure 5*. Overall Error Detection Rates by Category.**

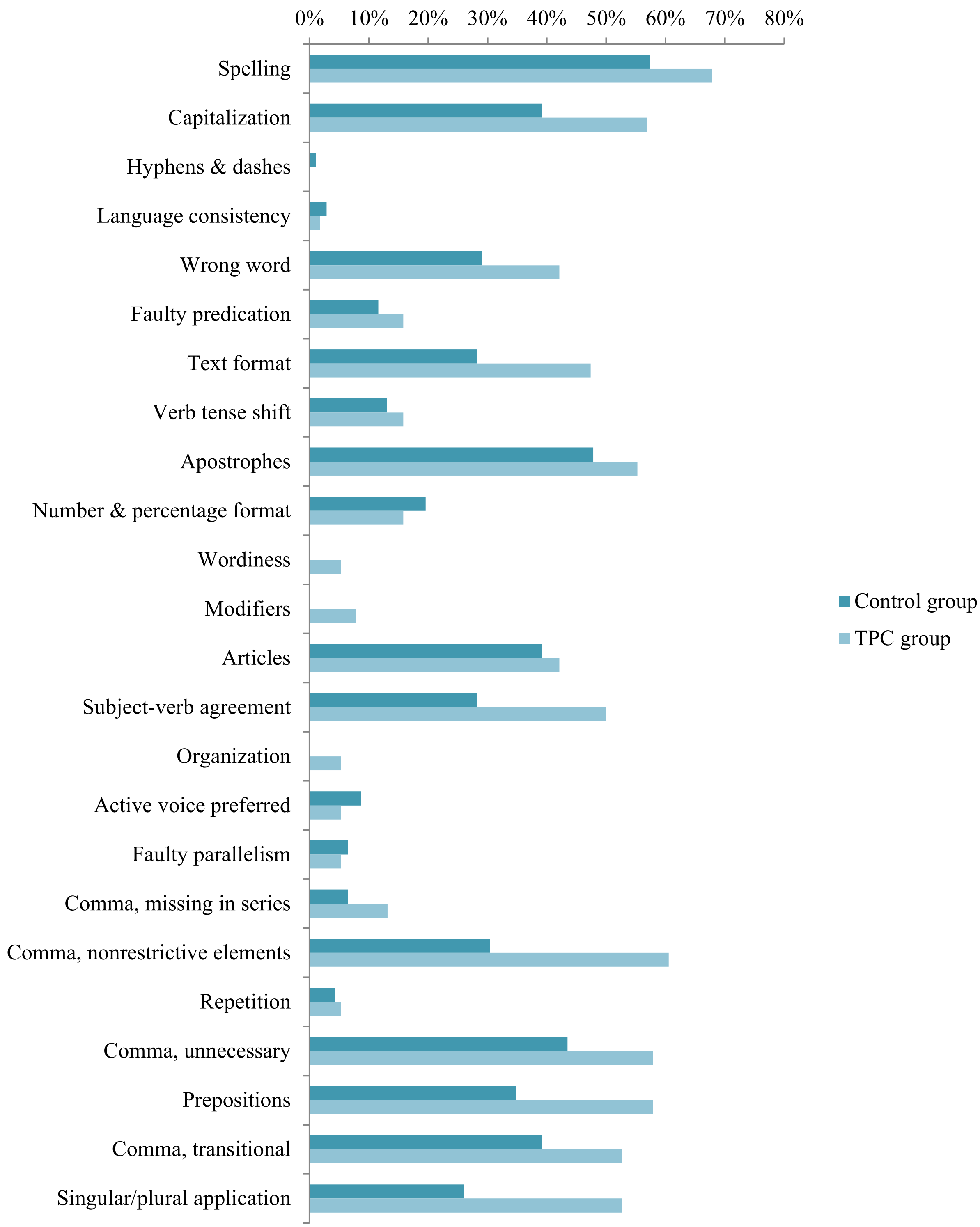


***Figure 6*. Error Detection Rates by Category—Control vs. TPC.**

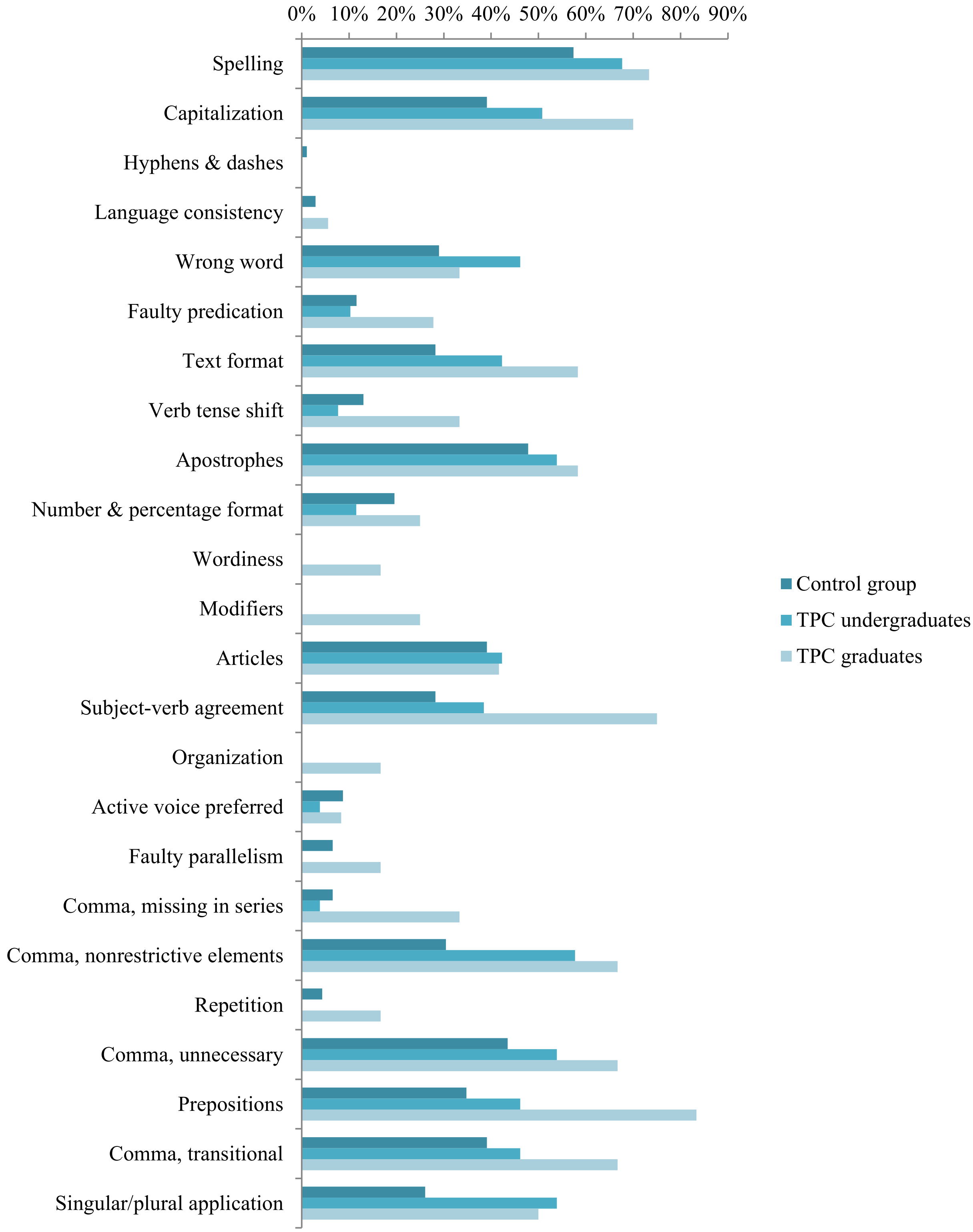


***Figure 7*. Error Detection Rates by Category—Control vs. TPC UG vs. TPC Grad.**

The first six error categories were analyzed statistically. Those categories included spelling (category 1), capitalization (category 2), hyphens and dashes (category 3), language consistency (category 4), wrong word (category 5), and faulty predication (category 6). (The remaining error categories were not analyzed individually because they contained only one or two errors per category.) Despite having only two errors per category, the categories of apostrophes (category 9) and articles (category 13) were analyzed because they contained errors flagged by spelling- and grammar-checkers.

Tables 8–9 outline the overall usage error detection rates for spelling (category 1), which included 10 separate errors—not to be confused with the broad spelling category comprising misspellings and wrong words. The tables also list the corresponding statistical test values for each study group. Tests indicated equal variance between the groups' error detection rates.

Table 8

Spelling (Category 1) Usage Error Detection Rates—Control vs. TPC

Group	N	M	SD	% detected	test	p value
Control	23	5.74	1.57	57.39	**Levene**	.1720
TPC	19	6.95	1.07	67.89	**ANOVA**	.0071

Table 9

Spelling (Category 1) Usage Error Detection Rates—Control vs. TPC UG vs. TPC Grad

Group	N	M	SD	% detected	test	p value
Control	23	5.74	1.57	57.39	**Levene**	0.1045
TPC UG	13	6.77	0.60	67.69	**Wilcoxon**	.0047
TPC Grad	6	7.33	1.75	73.33		
Control vs. TPC Grad					**Wilcoxon pairs**	.0272
Control vs. TPC UG					**Wilcoxon pairs**	.0061

Figures 8–9 illustrate the error detection distribution curves for spelling (category 1). Unlike the curves shown in Figure 9, the curves shown in Figure 8 follow a relatively normal distribution. An ANOVA test revealed a significant difference between the control group and the combined TPC group.

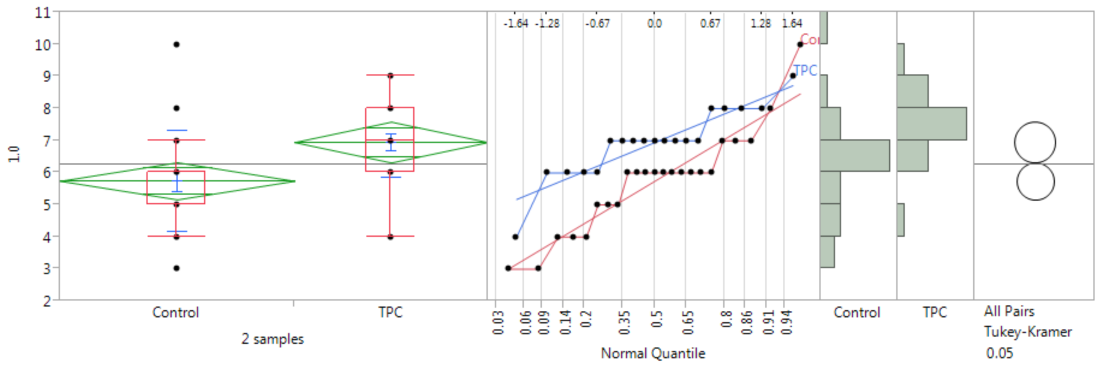


***Figure 8*. Category 1 Spelling Scores—Control vs. TPC.**

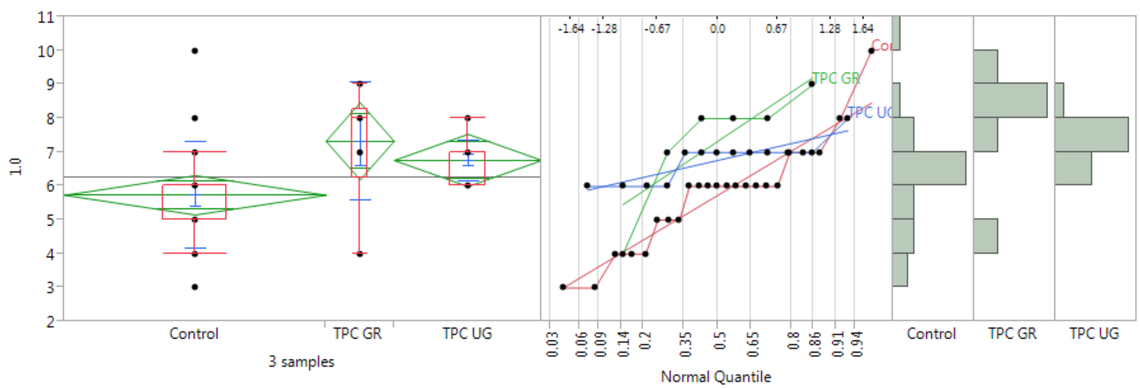


***Figure 9*. Category 1 Spelling Scores—Control vs. TPC UG vs. TPC Grad.**

Based on the error distribution curves shown in Figure 9, nonparametric tests were run on that data. A Wilcoxon Rank Sums test showed significance between the error detection rates of the control group, the TPC undergraduate group, and the TPC graduate group. The Wilcoxon Each Pair test showed significance between two pairs: (1) the control group and the TPC graduate group and (2) the control group and the TPC undergraduate group.

Tables 10–11 outline the overall usage error detection rates and corresponding statistical test values for capitalization (category 2), which included five separate errors. Tests indicated equal variance between the groups' error detection rates.

Figures 10–11 illustrate the distribution curves of the error detection rates. As before, the relatively normal distribution curves begin to skew when the error detection data is examined as three groups instead of two groups—an effect attributable largely to the small sample size.

An ANOVA test revealed a significant difference between the error detection rates of the control group and the combined TPC group. In addition, a Wilcoxon Rank Sums test revealed a significant difference between the error detection rates of the control group, the TPC undergraduate group, and the TPC graduate group for capitalization. Follow-up tests indicated significance between the control group and the TPC graduate group.

Table 10

Capitalization (Category 2) Usage Error Detection Rates—Control vs. TPC

Group	N	M	SD	% detected	test	p value
Control	23	1.96	1.26	39.13	**Levene**	.09442
TPC	19	2.84	1.26	56.84	**ANOVA**	.0288

Table 11

Capitalization (Category 2) Error Detection Rates—Control vs. TPC UG vs. TPC Grad

Group	N	M	SD	% detected	test	p value
Control	23	1.96	1.26	39.13	**Levene**	.9770
TPC UG	13	2.54	1.20	50.77	**Wilcoxon**	.0398
TPC Grad	6	3.50	1.22	70.00		
Control vs. TPC Grad					**Wilcoxon pairs**	.0208

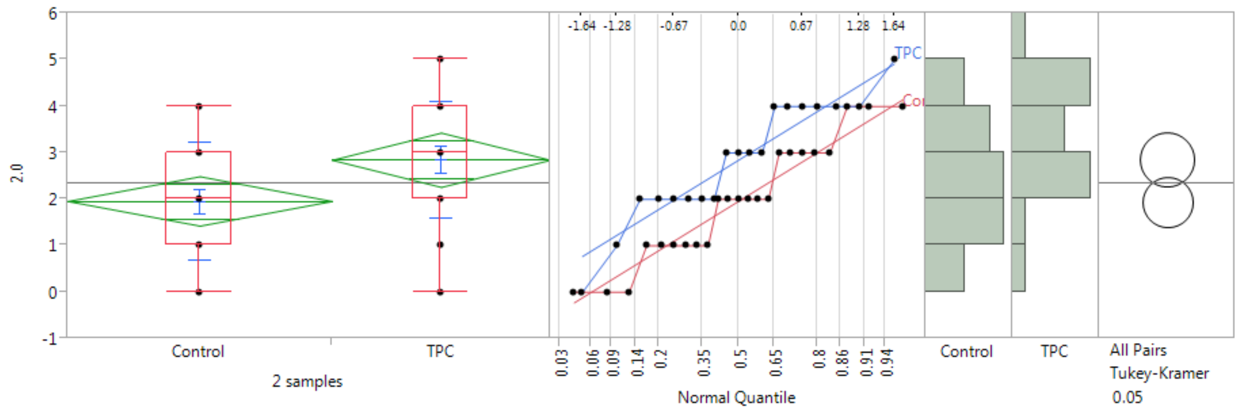


***Figure 10*. Category 2 Capitalization Scores—Control vs. TPC.**

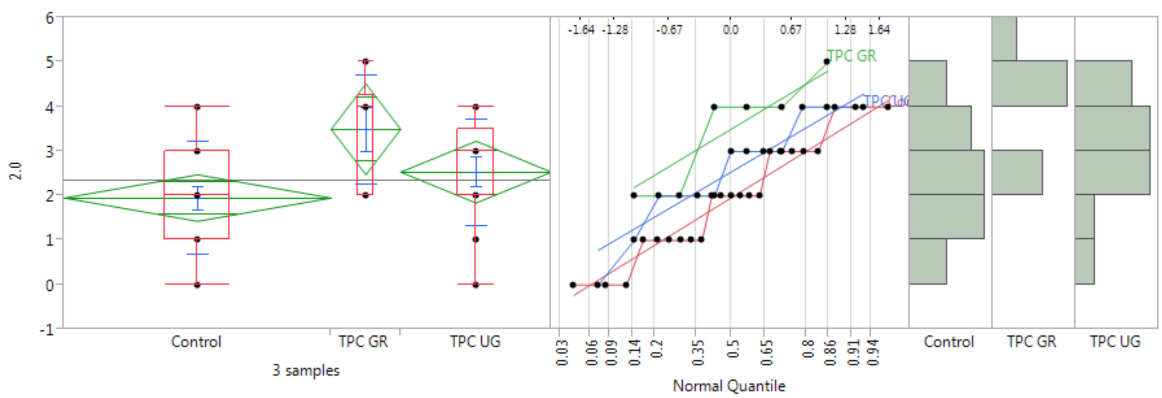


***Figure 11*. Category 2 Capitalization Scores—Control vs. TPC UG vs. TPC Grad.**

Statistical tests did not reveal any significance for error categories 3 to 6, 9, or 13. Moreover, testing found no significance between the individual errors within categories 1 to 6, 9, or 13. However, additional studies are needed to determine whether the results would differ significantly with a larger group.

Usage Error Detection Rates by Broad Category

For analysis purposes, the 24 error categories were collapsed into four broad categories: spelling, punctuation, style, and grammar and mechanics. The error detection rates by category and group are shown in Figures 12–13. Figure 12 compares the error detection rates of the control group and the combined TPC group in each of the four broad categories. The combined

TPC group detected more errors in each category, which supports the hypothesis that the TPC students' error detection rates would be higher than the control group's error detection rates.

Figure 13 compares the error detection rates of the control group, the TPC undergraduate group, and the TPC graduate group in each of the four broad categories. The TPC graduate group consistently detected the highest percentage of errors in each category. In contrast, the control group detected the lowest percentage of errors in three of the four categories; the control group detected a slightly higher percentage of errors than the TPC undergraduate group in the style category.

These findings support the hypothesis that the TPC graduate students' error detection rates would be higher than the undergraduates' error detection rates. However, in the category of style, these findings do not support the hypothesis that the TPC undergraduates' error detection rates would be higher than the control group's error detection rates.

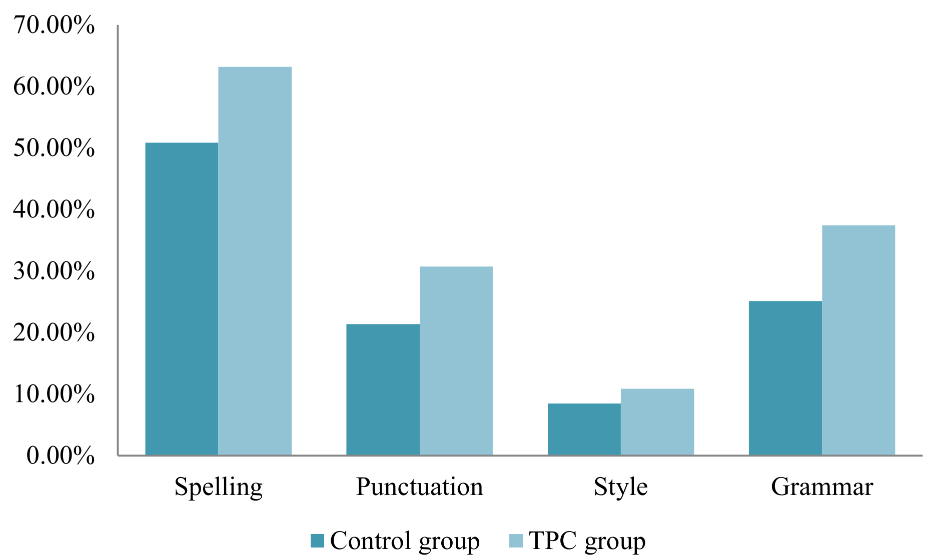


Figure 12. **Error Detection Rates by Broad Categories—Control vs. TPC.**

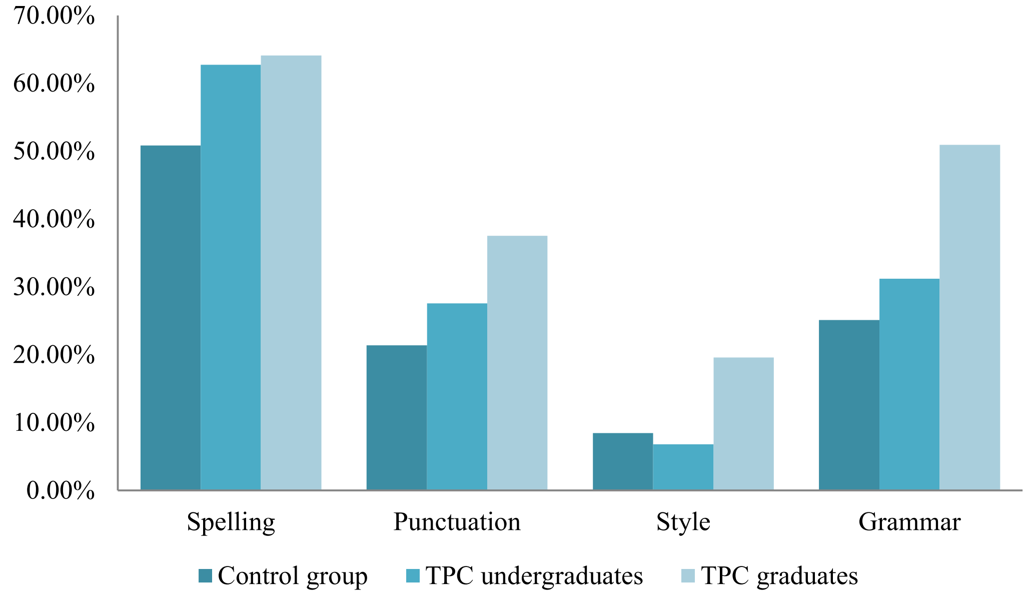


Figure 13**. Error Detection Rates by Broad Categories—Control vs. TPC UG vs. TPC Grad.**

Spelling

The broad category of spelling—not to be confused with the specific category of spelling (error category 1)—consists of the spelling category (error category 1) and the wrong word category (error category 5). The data in the broad category of spelling followed a normal distribution curve.

Group error detection rates for this category ranged from 50.8% (control group) to 64.1% (TPC graduate group). Grade-level error detection rates ranged from 46.2% (sophomores) to 84.6% (postgraduates). Individual error detection rates ranged from 23.0% to 92.3%. Tables 12–13 outline the overall usage error detection rates and statistical test values for the broad category of spelling. Yet again, tests indicated equal variance between the groups' error detection rates. Figures 14–15 illustrate the distribution curves of the error detection rates.

Table 12

Broad Category Spelling Usage Error Detection Rates—Control vs. TPC

Group	N	M	SD	% detected	test	p value
Control	23	6.61	2.02	50.84	**Levene**	.4043
TPC	19	8.21	1.62	63.16	**ANOVA**	.0079

Table 13

Broad Category Spelling Usage Error Detection Rates—Control vs. TPC UG vs. TPC Grad

Group	N	M	SD	% detected	test	p value
Control	23	6.61	2.02	50.84	**Levene**	.1359
TPC UG	13	8.15	1.14	62.72	**ANOVA**	.0302
TPC Grad	6	8.33	2.50	64.10		
Control vs. TPC UG					**Tukey HSD**	.0567

An ANOVA revealed a significant difference between the error detection rates of the control group and the TPC combined group in the broad category of spelling. Furthermore, an ANOVA revealed a significant difference between the error detection rates of the control group, the TPC undergraduate group, and the TPC graduate group. Follow-up tests fell short of significance between the control group and the TPC undergraduate group. Statistical tests showed no significant differences in performance by gender or number of TPC courses completed. The results may differ with a larger sample.

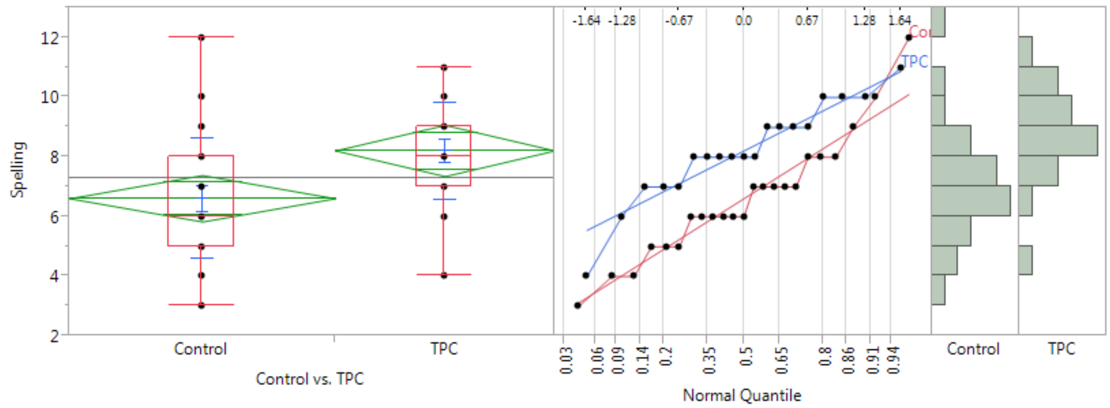


Figure 14**. Broad Category Spelling Scores—Control vs. TPC.**

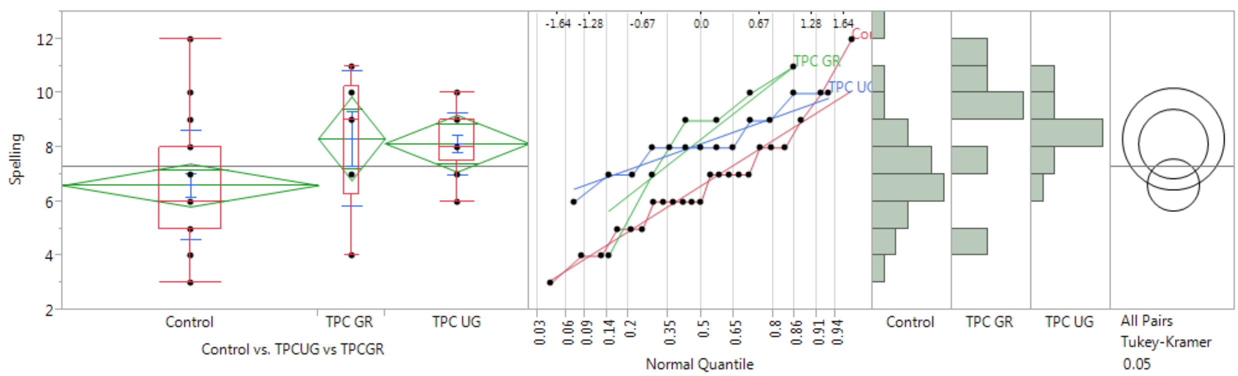


Figure 15**. Broad Category Spelling Scores—Control vs. TPC UG vs. TPC Grad.**

Punctuation

The broad category of punctuation consists of the following categories: hyphens and dashes (error category 3), apostrophes (error category 9), serial commas (error category 18), commas with nonrestrictive elements (error category 19), unnecessary commas (error category 21), and transitional commas (error category 23).

Group error detection rates for this category ranged from 21.4% (control group) to 37.5% (TPC graduate group). Grade-level error detection rates ranged from 8.3% (sophomores) to 50.0% (postgraduates). Individual error detection rates ranged from 8.3% to 66.7%.

Statistical tests showed no significant differences in error detection rates between the groups, grade levels, genders, or number of TPC courses completed. The means analysis showed a general trend of increasing detection rates by grade level; however, further research with a larger sample is needed to determine whether the trend is significant.

Style

The broad category of style consists of the following categories: language consistency (error category 4), text format consistency (error category 7), number and percentage format (error category 10), wordiness (error category 11), organization (error category 15), active voice preferred (error category 16), faulty parallelism (error category 17), and repetition (error category 20).

Group error detection rates for this category ranged from 6.8% (TPC undergraduate group) to 19.6% (TPC graduate group). Compared to other broad error categories, the TPC undergraduate performance in the style category is an anomaly. Grade-level error detection rates ranged from 2.0% (sophomores) to 47.1% (postgraduates). Individual error detection rates ranged from 0% to 47.1%.

Statistical tests showed no significant differences in error detection rates between the groups, grade levels, genders, or number of TPC courses completed. The means analysis showed a general trend of increasing detection rates by grade level; however, further research with a larger sample is needed to determine whether the trend is significant.

Grammar and Mechanics

The broad category of grammar and mechanics consists of the following categories: capitalization (error category 2), faulty predication (error category 6), unnecessary verb tense shift (error category 8), misplaced and dangling modifiers (error category 12), articles (error category 13), subject-verb agreement (error category 14), prepositions (error category 22), and singular-plural applications (error category 24).

Group error detection rates for this category ranged from 25.1% (control group) to 50.9% (TPC graduate group). Grade-level error detection rates ranged from 9.3% (sophomores) to 88.9% (postgraduates). Individual error detection rates ranged from 0% to 88.9%.

Statistical tests showed no significant differences in error detection rates between the groups, grade levels, genders, or number of TPC courses completed. The means analysis showed a general trend of increasing detection rates by grade level; however, further research with a larger sample is needed to determine whether the trend is significant.

Order Effects

Test A, which began with the compost manual excerpt, contained fewer errors in the first excerpt than the second excerpt. In contrast, Test B, which began with the gifted education report excerpt, contained more errors in the first excerpt than the second excerpt. Although the tests were distributed equally, test A was completed more times than test B. In the control group (N = 23), three more subjects completed test A (n = 13) than test B (n = 10). Similarly, in the TPC undergraduate group (N = 13), three more subjects completed test A (n = 8) than test B (n = 5). An equal number of subjects in the TPC graduate group (N = 6) completed test A and test B. Overall, as shown in Table 14, test A participants detected a higher percentage of errors than did test B participants; however, the difference was not statistically significant.

Table 14
Overall Error Detection Data for Test A vs. Test B

	# errors first excerpt	# errors second excerpt	# test takers	% errors detected
Test A	27	33	24	30.49
Test B	33	27	18	27.59

Moreover, additional tests did not reveal any statistical significance in overall performance between Test A and Test B in the broad areas of style, spelling, punctuation, and grammar. No significant difference was detected between male and female test scores either. However, the results might differ with a larger sample.

CHAPTER 5: DISCUSSION

Assessment Instruments

The demographic questions and editing test should have taken about 60 minutes to complete; it is impossible to determine precise completion times because participants had up to one week to complete the copyediting task. Qualtrics recorded completion times ranging from 1 minute 10 seconds to a full week. The short completion times did not necessarily reflect a lack of effort. Some participants, including the one with the shortest completion time, apparently downloaded the copyediting file using one computer and then later used a different computer to submit the copyedited file. Similarly, the longer completion times did not necessarily reflect extra effort—longer times were associated with poor to above average scores.

Most of the participants appear to have taken between 20 minutes and one hour to complete the study. With seven participants, more than an hour but less than a day elapsed between the start time and the completion time; with six participants, more than a day elapsed between start and completion. Although no conclusions can be drawn from the amount of elapsed time, it can be inferred, based on error detection rates and the correlation with spell-check and grammar-check flags, that some of the short completion times (10 minutes or less) reflect the amount of effort expended on the task rather than the participants' error detection abilities.

Copyediting Methods

Although participants were given the option to submit a scanned copyedited document, none chose to copyedit on hardcopy. Participants were not instructed how to mark copyedits on paper or electronically. Most participants (n = 32) made direct changes to the text that were evident when comparing documents electronically or visually. Some participants (n = 8) marked copyedits using advanced word-processing features, i.e., track changes and comments. One participant denoted copyedits using yellow highlighting and another participant denoted copyedits using a red font. Copyediting comments revealed that at least one participant consulted the online edition of the *Chicago Manual of Style*.

Copyediting Test

Individual test scores ranged from 10.0% to 68.3%. Those scores, which are considerably lower than the pilot testers' scores, can be interpreted in several ways. First of all, the scores may reflect student behavior or attitudes. The participants, who had little stake in the outcome, may not have spent enough time or effort copyediting and may have relied solely on electronic editing tools. Spell-check alone will yield a minimum score of 10.0%.

Another possibility is that the test scores reveal gaps in students' knowledge. For instance, the test scores may indicate unfamiliarities with the conventions of standard written English or the conventions of technical communication; the latter of the two explanations is more likely for college students, especially for the control group. An email from a student may help explain some of the low scores—at least one student did not understand what copyediting entailed. Perhaps the definition of copyediting tasks should have prefaced each excerpt. However, the results indicate that many participants skimmed or skipped over the instructions.

Some error categories were more problematic than others. Few, if any, students detected usage errors in hyphens and dashes, language consistency, wordiness, organization, and repetition; all those errors fall under the broad category of style. The groups' error detection rates (6.8% to 19.6%) for style-related usage errors suggest that most of the participants were unfamiliar with Chicago style conventions or interpreted the guidelines differently. Participants who were unfamiliar with the specified style conventions were unlikely to perceive the style errors as errors. Likewise, those participants who were unfamiliar with technical writing conventions would have been less likely to perceive the errors in language consistency and organization. Similarly, participants may have been unfamiliar with specific types of usage errors, such as faulty predication and faulty parallelism.

The test design is the most obvious explanation for the low scores—perhaps the test was too difficult. The researcher concedes that some elements of the test were difficult; however, those elements were representative of the types of errors professional editors encounter. Moreover, each error category corresponded with Boettger's research on the types of errors commonly found on technical editing tests.

Alternately, the placement of errors may have conflicted with participants' expectations. Grammar exercises typically include one or two errors per sentence, whereas this test contained large chunks of error-free text that may have lulled test takers into complacency. The errors in this test were often located in clusters, unlike composition studies tests that introduced one error per sentence, e.g., Hairston (1981) and Leonard and Gilsdorf (1990). In addition, the errors were placed within headings and lists—textual elements that facilitate scanning and skim reading.

Furthermore, error perception may have been a factor. Mental processing could account for a small percentage of errors, particularly those errors involving missing content; the brain accommodates by filling in missing words or by correcting minor errors—the errors are not consciously perceived. Close reading—or reading aloud—might have helped the students detect those types of errors.

Finally, the low test scores may confirm one or more findings in the literature: (1) The usage errors were not perceived as errors, (2) The usage errors were not bothersome or distracting, or (3) The usage errors did not affect comprehension or obscure communication.

Usage Error Detection Rates

As hypothesized and as shown by statistical analysis, the TPC group performed better overall than the control group at detecting usage errors. Percentagewise, the TPC graduate group performed better than the TPC undergraduate group, who performed better than the control group; however, the differences between the three groups' scores were not always statistically significant. When examining the errors by broad categories (spelling, punctuation, style, and grammar and mechanics), statistical tests showed significant differences in error detection rates in the spelling category only. Percentagewise, performance differences between the TPC graduates and the control group varied the most in the categories of style and grammar and mechanics.

Errors by Category

A visual comparison of Boettger's list of the 20 most frequent technical editing errors with the types of errors ECU students detected while editing revealed little correlation between rankings. The spelling category ranked first for all groups except the TPC graduate group, where subject-verb agreement displaced spelling by one rank. In addition, little correlation exists between this study's error detection rankings and the formal error rankings of Lunsford and Lunsford and Connors and Lunsford, rankings that reflect the most common usage errors made by composition students. In contrast, in this study, the rankings across groups were similar in most categories.

That said, comparison with composition study rankings is difficult because the usage error categories not only differ but the error rankings also reflect errors in different contexts, i.e., error creation vs. error detection. Even though the composition study error rankings, editing test error rankings, and error detection rate rankings are not directly comparable, inferences can be made when comparing the various rankings. For instance, if composition studies indicated that students frequently made a specific type of error, rankings from error detection studies might confirm that the error remains a problem or might suggest that students are capable of detecting the error in a different context, e.g., in someone else's work.

Moreover, these misalignments in rankings have potential implications for aspiring technical communicators. In order to succeed on workplace technical editing tests, one must be proficient in detecting and correcting the types of errors commonly found on the tests. More importantly, one must be proficient in detecting and correcting the errors commonly found in technical communication documents. Theoretically, the more usage errors one can detect from the error categories ranked highest in Boettger's list, the better one would perform on an editing test—a test that is assumed to be representative of the types of errors found in technical communication documents.

Spelling

The broad category of spelling consists of the spelling category (error category 1) and the wrong word category (error category 5). As the statistical tests indicated, the TPC group performed significantly better than the control group in the spelling category. The overall error detection rate for spelling was 51.5%—the highest overall error detection rate of the four broad error categories. The combined TPC group detected 63.2% of the errors and the control group detected 50.8% of the errors. Performance in this category may have been enhanced by the use of dictionaries, spell-check, and grammar-check.

In an effort to make the spelling and grammar errors appear less prominent on the copyediting test, the researcher adjusted the document proofing settings to hide spelling and grammar errors. Computer-savvy students could easily circumvent those measures by activating the word processor's spell-checker and grammar-checker; however, the students then had to determine whether the grammar- and spell-checker flags were accurate and which suggestions, if any, were correct.

Microsoft Word flagged about 25.0% of the errors in this study. For comparison, Major (2010) found that, on average, Word flagged 30.0% of errors with improvement rates of 19.0%—the 11.0% difference was attributed to false positive flags and incorrect suggestions. Not including proper nouns, Word flagged about 16 potential errors in the copyediting document—the number of flags varies with the version of Word and the proofing settings. Most of the flags identified potential misspellings. At least two of the flags were false positives, i.e., bonemeal and advise. Table 15 shows the text flagged by Word 2007 and Word 2010 and whether Word suggested correct or incorrect alternatives.

Based on the number of flagged errors with correct suggestions, spell-check users should have correctly detected at least six errors in the copyediting document—a number that coincides with the lowest scores in the study. Participants could have detected as many as 13 usage errors by selecting the correct spell-check and grammar-check suggestions. Overall, participants detected 390 of the 546 errors correctly flagged by Word, which equates to 71.4% of those errors. The error detection results are consistent with Major's findings that Word's electronic editing tools are most effective at detecting spelling errors—the broad error category with the highest error detection rate.

Table 15
Potential Errors Flagged by Microsoft Word

Text Flagged	Suggestions Offered
a outdoor pile	correct suggestion
effects	correct suggestion
focussing	correct suggestion
shreded	correct suggestion
similiar	correct suggestion
wholes	correct suggestion
criteria is	correct and incorrect suggestions
militarys	correct and incorrect suggestions
reccommendations	correct and incorrect suggestions
underacheivers	correct and incorrect suggestions
advise	incorrect suggestion
author	incorrect suggestion
bonemeal	incorrect suggestion
c/n	incorrect suggestion
DoD	incorrect suggestions
pvc	incorrect suggestions

It can be inferred from the copyediting documents and error detection rates that some participants copyedited using electronic editing tools exclusively, while others copyedited using none. Eight participants' scores (six from the control group and four from the TPC undergraduate group) correlate with spell-check flags, which implies that those participants made changes only to text flagged by spelling- and grammar-checkers. In contrast, some of the copyedited files were returned as RTF files with the proofing options disabled and with some of the errors intact that were easily correctable with spell-check, which implies that those participants detected errors without the use of electronic spelling- and grammar-checkers.

The spelling data indicate an overreliance on electronic editing tools; in many instances, the students did not detect the errors unless the errors were flagged. Although the spelling data were largely a function of the word-processing software's ability to detect errors rather than the students' ability to detect errors, the data provide insight on how students make decisions about errors. For example, few students (n = 6) correctly handled the criteria/criterion error despite the spell-check flag. Word offered correct and incorrect suggestions.

Table 16 outlines the error correction rates for the text flagged by Word. Interestingly, the TPC graduate group's error correction rates for more than half of the flagged items are lower than hypothesized when compared to the TPC undergraduate group. Similarly, the TPC undergraduate group's error correction rates for nearly one quarter of the flagged items are lower than hypothesized when compared to the control group. Those discrepancies probably reflect differences in spell-check and grammar-check use or differences in word-processing settings rather than differences in correctly selecting the suggested alternatives. However, it is possible that the TPC graduate group found spelling and capitalization errors less bothersome than the other usage errors.

Word 2007 flagged the word *author,* yet none of the participants made incorrect changes to that word. Either this error flag did not cause problems or none of the participants used that version of Word. Alternately, it is possible, though improbable, that none of the participants used spell-check or grammar-check. In several cases, it appears that spell-check and grammar-check use resulted in additional errors. For instance, one person changed *pvc* to *pace* instead of *PVC*. Another person changed *c/n* to *can* instead of *C/N*. Both of those incorrect revisions correspond with alternate text suggested by Word.

Table 16

Error Correction Rates for Text Flagged by Microsoft Word

	Correction Rates				
Text Flagged	Control Group	TPC Groups Combined	Control & TPC Groups Combined	TPC Undergraduate Group	TPC Graduate Group
a outdoor pile	60.87%	68.42%	64.29%	69.23%	66.67%
effects	26.09%	68.42%	45.24%	69.23%	66.67%
focussing	73.91%	94.74%	83.33%	100.0%	83.33%
shreded	86.96%	100.0%	92.86%	100.0%	100.0%
similiar	100.0%	100.0%	100.0%	100.0%	100.0%
wholes	56.52%	68.42%	61.90%	69.23%	66.67%
criteria is	8.70%	21.05%	14.29%	23.08%	16.67%
militarys	86.96%	100.0%	92.86%	100.0%	100.0%
reccommendations	100.0%	94.74%	97.62%	92.31%	100.0%
underacheivers	100.0%	94.74%	97.62%	92.31%	100.0%
c/n	43.48%	78.95%	59.52%	84.62%	66.67%
DoD	56.52%	63.16%	59.52%	53.85%	83.33%
pvc	56.52%	63.16%	59.52%	69.23%	50.00%

Note. The highlighted cells denote scores that are lower than hypothesized for the group.

Five of the 13 spelling errors in this copyediting test were not flagged by Word. For example, spell-check did not flag the homophone *brake*; only eight participants detected the usage error and emended the text to *break*. One participant's revision read *braking* instead of *breaking*. Likewise, the commonly confused word *insures* eluded the majority of the participants (seven of 42 students detected the usage error, three of whom were graduate students).

Taken together, the introduction of errors and participants' misspelling detection rates support Lunsford and Lunsford's (2008) conclusion that the use of spell-checkers reduces spelling errors but increases wrong word errors. The copyediting test results substantiated another shortcoming of spell-checkers: Spell-checkers often do not detect wrong word errors already within the document, e.g., compose instead of compost.

Punctuation

The broad category of punctuation consists of the following categories: hyphens and dashes (error category 3), apostrophes (error category 9), serial commas (error category 18), commas with nonrestrictive elements (error category 19), unnecessary commas (error category 21), and transitional commas (error category 23). The overall error detection rate for punctuation was 23.3%. The combined TPC group detected 30.7% of the errors and the control group detected 21.4% of the errors.

Statistical tests did not reveal any significant differences in error detection rates for punctuation. However, within the punctuation category two specific errors proved troublesome for the three groups in this study: serial commas and hyphens and dashes.

Perhaps the trickiest error in the punctuation category was the phrasal adjective *well-aired*; the phrase should appear hyphenated when it precedes the noun and open when it follows the noun. Only one participant in the study detected this error. None of the participants detected the other three hyphenation and dash errors.

The instructions contained the phrase *academically gifted military children*, yet no one detected the *academically-gifted* hyphenation error in the heading. One participant's revisions included the correct phrase, yet that participant overlooked the hyphenation error too. Similarly, few participants added a serial comma after *South Carolina*, yet the instructions illustrated the use of a serial comma in the same phrase. (Likewise, no one noticed the nonparallel *Compost*

Methods headings in the composting excerpt, yet the term *composting* was consistently used in the instructions, the definition subheadings, and within the definitions.) These error detection findings are consistent with Rude and Eaton's (2011) warning that errors located in headings are easily missed.

The text of the copyediting test was displayed in Times New Roman, and the headings were displayed in Arial; both are proportional fonts suitable for differentiating hyphens, en dashes, and em dashes. For example:

Times New Roman	**Arial**
K-12 (hyphen)	K-12 (hyphen)
K–12 (en dash)	K–12 (en dash)
K—12 (em dash)	K—12 (em dash)

However, none of the participants detected the hyphenation error in K-12, which should have been corrected to K–12 because an en dash denotes *to*. Although "many readers may not notice the difference—especially between an en dash and a hyphen—correct use . . . is a sign of editorial precision and care" (*Chicago Manual of Style*, p. 331). Perhaps the participants interpreted the Chicago style guidelines differently.

The error would have been more noticeable if presented as K—12, but the data suggest that participants would have replaced the em dash with a hyphen. For instance, some participants changed the en dash in a numerical range to a hyphen or incorrectly revised text to include hyphens instead of en dashes. This lack of differentiation between hyphens and en dashes suggests that the error was not perceived as an error or did not significantly interfere with meaning—findings consistent with those of Leonard and Gilsdorf (1990).

Style

The broad category of style consists of the following categories: language consistency (error category 4), text format consistency (error category 7), number and percentage format (error category 10), wordiness (error category 11), organization (error category 15), active voice preferred (error category 16), faulty parallelism (error category 17), and repetition (error category 20).

The overall error detection rate for style was 9.4%—the lowest overall error detection rate of the four broad error categories. The low error detection rates suggest that style is an area of weakness for many of the participants in this study. The combined TPC group detected 10.8% of the errors and the control group detected 8.4% of the errors. The TPC graduate group was the only group that detected any errors in the style subcategories wordiness and organization.

Statistical tests did not reveal any significant differences in error detection rates for style. However, the TPC undergraduate performance in the style category was lower than hypothesized. Percentagewise, the control group performed slightly better than the TPC undergraduate group in the style category. This finding is probably attributable to four factors: (1) three participants in the control group performed better than some of the graduate students, (2) two participants in the TPC undergraduate group corrected only items flagged by spell-check or grammar-check—no style errors were flagged, (3) few style errors were detected overall, and (4) the small sample size. Further studies are needed with a larger sample.

The text format inconsistencies were detected more frequently than the other style errors. Even though some participants detected the text format inconsistencies, most did not detect the language and nomenclature inconsistencies. Unlike the text format inconsistencies, the language inconsistencies could impact the document's meaning. Perhaps the inconsistencies were too subtle or simply did not bother the participants.

In contrast, the journalistic-style attributions seemed to bother several participants. Some participants prudently added quotation marks to the paraphrased text or queried the issue. Other participants changed the journalistic-style attributions to inline academic citations, resolving several usage issues in the process. (Academic citations and footnotes were intentionally replaced with journalistic attributions because citations exceeded the scope of the copyediting study.)

Grammar and Mechanics

The broad category of grammar and mechanics consists of the following categories: capitalization (error category 2), faulty predication (error category 6), unnecessary verb tense shift (error category 8), misplaced and dangling modifiers (error category 12), articles (error category 13), subject-verb agreement (error category 14), prepositions (error category 22), and singular-plural applications (error category 24).

The overall error detection rate for grammar and mechanics was 27.5%. The TPC graduates detected half of the errors, while the control group detected about a quarter of the errors. The combined TPC group detected 37.4% of the errors. Detection rates were similar for the control and TPC undergraduate groups. Only three of the 18 errors in this category were flagged by grammar-check; therefore, grade level and the number of TPC courses completed may explain the significant differences between error detection rates. Additional studies with a larger sample might help explain these differences.

The difference in detection rates for capitalization errors may be attributable to small sample sizes and electronic editing tools. The data suggest that some students did not use electronic editing tools, while other students activated spell-check but not grammar-check; when activated, grammar-check flagged most of the capitalization issues. The error detection rate for each of the flagged words was 59.5%, a rate considerably higher than the rates for the two unflagged words: Ammonia (35.7%) and States (21.4%).

The TPC graduate group was the only group that detected any errors in the misplaced/dangling modifier category; the group detected 25.0% of the modifier errors, which equates to 3.6% for the entire study. Other usage errors with overall low error detection rates included faulty predication (13.5%) and unnecessary verb tense shift (14.3%).

Overall, the participants detected 38.1% of the subject-verb agreement errors. Intervening modifiers seem to have had minimal effect on error detection results. Participants detected 20.2% of the subject-verb agreement errors with an intervening modifier, yet detected only 17.9% of the other subject-verb agreement error, which placed the subject and verb side by side, i.e., parents deploys.

Non-Errors

Participants' copyediting resulted in miscellaneous non-errors—improvements or errors that were not counted against the error detection rates. Revisions produced non-errors such as punctuation errors, sentence fragments, and awkward wording. Some revisions altered the meaning of sentences, and some revisions were superior to the wording of the answer key.

The most common non-errors resulted from false positive spell-check or grammar-check flags. Table 17 details the prevalence and distribution of those errors resulting from electronic editing tools.

The word *bonemeal* was spelled correctly, yet 63.2% of participants changed the spelling to *bone meal*, trusting the spellchecker suggestion instead of consulting the designated dictionary. On the other hand, if the test had contained the open compound *bone meal*, the spelling error would likely have gone unnoticed considering how many wrong word errors were not detected.

Table 17

Errors Resulting from Spell-Check or Grammar-Check False Positive Flags

	Percentage of Students Who Introduced Errors				
Text Flagged	Control Group	TPC Groups Combined	All Groups Combined	TPC Undergraduate Group	TPC Graduate Group
advise	17.4%	36.8%	26.2%	46.2%	16.7%
author	0.0%	0.0%	0.0%	0.0%	0.0%
bonemeal	34.8%	63.2%	47.6%	69.2%	50.0%

Similar problems occurred with *advise*; some participants accepted the spell-checker suggestion *advice*, and others attempted to rephrase the sentence using the phrases *advice given by* or *advised by*—some revisions were acceptable and others introduced errors The most successful revisions were those that substituted a different verb, incorporated a different sentence structure, or converted the attribution to an inline academic citation.

Interestingly, of the nine subjects (seven in the control group and two in the TPC undergraduate group) who detected only errors flagged by spell-check or grammar-check, only three of the seven subjects in the control group were tripped up by the false positives, yet both people in the TPC undergraduate group were tripped up by at least one of the false positives.

Missed Errors

One participant caught an error missed by the researcher: The *Department of Defense Education Activity Administrators' Manual* incorrectly appeared as the *Department of Defense Education Activity Manual*. The title discrepancy does not impact the results of the error categories being studied. (Participants were not expected to fact-check the document.)

Study Limitations

Three problems limited the validity of this study: response rates, sampling, and copyediting tools.

Response Rates

Participation in this research study was hampered by numerous issues:

- The university cancelled classes for multiple days because of severe weather; some instructors declined to participate because the closures had disrupted their instructional schedules.
- Several instructors declined to participate because they objected to the original wording in the IRB-approved recruitment letter concerning extra credit options.
- Several instructors declined to participate because of timing or because the study did not fit with their lesson plans.
- Except for those who were offered extra credit, students had little incentive to participate.
- As a distance student, the researcher had little to no interaction with participants.

The poor response rate is a limitation that affected the external validity of the study. The study involved 24 variables; for valid results, each group needed to comprise at least 240 students (Lauer and Asher, 1988). The total response rate (N = 42) fell far short of the target sample size.

Sampling

Regardless of the random sampling procedures established in the study design, the samples comprised self-selected students, most of whom participated for extra credit. Students did not have an equal chance of being selected for the study because so few instructors agreed to participate. The resultant convenience sample is a limitation that affects the external validity of the study. A larger, randomized data set is needed to generalize the results to other populations.

The sampling procedure involved overlapping TPC populations, so students were instructed to complete the study only once. Measures to avoid duplicate responses relied on students' compliance; given the study's low response rate and that students had little incentive to complete the study multiple times, duplicate responses were unlikely but possible. (The majority of the participants received extra credit for participation.) Any duplicate responses would have harmed the internal validity of the study.

Copyediting Tools

Students were permitted to use a dictionary and style manual because there was no way to control electronic editing tool usage. The data suggest that many of the participants used electronic tools; however, there is no definitive way to know how many participants used resources such as spell-check, grammar-check, dictionaries, or style guides. Likewise, it is impossible to determine which, if any, resource negatively or positively impacted the error detection results or to what extent. The lack of control over the testing conditions limited the internal validity of the study.

The convenience sample, low response rate, and varied copyediting tool usage preclude generalization of the study results.

Recommendations

Faculty support must be cultivated to improve student participation rates. Subsequent studies should offer small incentives, beyond extra credit, that encourage student participation. Personal interaction with students might improve participation as well.

Repeating the study with a larger, randomized sample could yield findings generalizable to technical writing and editing practices and to TPC pedagogy. Additional research should be conducted with samples that include students from other universities and perhaps even technical and professional communicators. Future studies should be conducted in a controlled environment where subjects either have no access to copyediting tools or are assigned to groups and provided with specific copyediting tools. Studies should include both electronic- and paper-based editing tests to reflect the varied testing conditions potential hires encounter in workplace environments.

Based on the results of this study, additional data should be collected on the perception of errors located within headings. In this study, faulty parallelism and hyphenation errors were not detected in headings; however, other error types might be more easily detected, e.g., misspellings, wrong words, capitalization errors, or missing/wrong articles and prepositions. Likewise, similar data should be collected on errors located in lists, perhaps using shorter lists than what were featured in this study. Further research could address how obvious or distracting an error must be before it is noticed in headings or lists.

A longer data collection period is recommended. A longitudinal study that examines TPC students' writing and editing skills from freshman year through graduation may provide additional insight on usage error and error perception in technical communication. The study might include an analysis of existing papers that uses methods similar to those of Connors and Lunsford as well as pretests/posttests that help measure improvement rates after freshman composition. The follow-up studies might provide data needed to support or refute assertions by faculty and industry of poor student-writing skills, e.g., Thomas (2009), Hart (2003), and Enos (2010).

Conclusions

Several conclusions can be drawn from the results of this study: (1) Electronic editing tools detect few usage errors, (2) Many style-related usage errors were not perceived as errors, and (3) The placement of usage errors may affect error perception.

Electronic editing tools, namely, spell-check and grammar-check, serve as poor substitutes for copyeditors. In this study, electronic editing tools correctly detected about 22.0% of the usage errors. However, about half of those who relied on electronic tools broke the cardinal rule of editing: Do no harm. Participants introduced errors associated with false positive flags and incorrect spell-check and grammar-check suggestions. These results support Major's (2010) findings that electronic editing tools can help or hinder copyediting and with Lunsford and Lunsford's (2008) conclusion that spell-check reduces spelling errors but increases wrong word errors. Students must be taught to recognize the deficiencies and perils of electronic editing tools.

Similarly, students must learn to recognize errors in order to correct them. It can be inferred from the error detection rates that few students perceived the style-related usage errors; therefore, the *Chicago Manual of Style* was not a helpful editing tool. "Errors can be defined as errors only so far as readers notice them" (Devet, 1996, p. 137). Students who did not perceive the style errors had no reason to consult the style guide or to correct the errors. To succeed on style-intensive technical editing tests, students would benefit from additional instruction in style issues and the use of style guides.

Furthermore, it can be concluded from the study results that the placement of usage errors may affect error perception. None of the participants detected usage errors located within document headings, and error detection rates for usage errors located within lists were consistently low. Most participants overlooked at least one usage error when errors appeared in clusters. These findings are consistent with those of Hairston (1981) who conceded that it is easier to spot one error per sentence and with those of Rude and Eaton (2011) who warned that errors located in headings are easily missed. In the context of testing, these error patterns may not have aligned with students' expectations; if that is the case, students' expectations must be realigned to improve error detection rates.

This study built upon Boettger's (2011, 2012) research on errors in technical editing tests by gathering usage error data from TPC students and examining whether those students were able to detect the types of usage errors frequently found in technical editing tests. In the context of technical editing, error data from TPC students is more relevant than error data from composition students. If the error detection rates in this study accurately reflect the students' ability to perceive usage errors, few students in this study would perform well on a workplace technical editing test. In order to succeed as technical communicators, students must recognize any discrepancies in error perception and identify their editing deficiencies, reconciling them within the context of workplace perceptions of error.

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APPENDIX A

Usage Error Definitions

These definitions and taxonomies are derived from error descriptions by Boettger (2011, 2012), which were based, in part, upon the error taxonomies of Connors and Lunsford (1988) and Lunsford and Lunsford (2008). Errors were defined in accordance with *Chicago Manual of Style* (16th ed.) guidelines and *Merriam-Webster's Collegiate Dictionary* (11th ed.) spellings.

Active voice preferred

In general, communicators prefer active voice (the subject acts) to passive voice (the subject is acted upon). Error classification: style.

Apostrophe, unnecessary or missing

Apostrophes indicate possession; missing letters; and, occasionally, plural forms, e.g., A's (plural) vs. As (adverb, conjunction, etc.). Unnecessary or missing apostrophes are usage errors, e.g., IQ's (possessive) for IQs (plural). Error classification: punctuation.

Article, missing or incorrect

Articles precede nouns and noun phrases to limit meanings, e.g., a wrench (any wrench) vs. the wrench (a specific wrench). Missing or incorrect articles may alter the meaning of a sentence. Error classification: grammar and mechanics.

Capitalization, unnecessary or missing	Capitalization errors were defined in accordance with the *Chicago Manual of Style*, 16th ed., e.g., DOD (*Chicago Manual of Style*) vs. DoD (the GPO's *Manual of Style*). Error classification: grammar and mechanics.
Comma, missing in a series	Depending on the style manual, serial commas should be used to separate items in a series of three or more, e.g., manure, bonemeal, and alfalfa meal. The final comma helps prevent confusion. Error classification: punctuation.
Comma, missing with a nonrestrictive element	Nonrestrictive elements provide nonessential information and should be set off by commas, e.g., ammonia, a gas that forms as a by-product. Error classification: punctuation.
Comma, missing in a parenthetical or transitional expression	This error category overlaps with the missing comma with nonrestrictive element category. For the purpose of this study, this error is defined as a comma missing after an introductory or transitional phrase, e.g., In contrast to state schools, DOD schools offer…. Error classification: punctuation.

Comma, unnecessary	Unnecessary commas may manifest in various locations, such as between a subject and verb, between adjectives that are not coordinate, or around restrictive elements. Error classification: punctuation.
Faulty predication	Faulty predication is an error in logic; it occurs when the subject and the predicate (the verb or verb phrase) do not work together. Faulty predication often manifests in these forms: the subject is when, the subject is where, and the reason is because. Error classification: grammar and mechanics.
Format/consistency text	Text format errors include inconsistent use of boldface, italics, heading formats, and similar stylistic issues. Error classification: style.
Hyphen, em-, or en-dash error	Hyphenation, em-, or en-dash errors were defined in accordance with the *Chicago Manual of Style*, 16th ed., e.g., prekindergarten and K–12. Error classification: punctuation.
Language or nomenclature consistency	Terminology should remain consistent throughout a document because synonyms may confuse readers, e.g., gifted and talented

	instead of academically gifted. Error classification: style.
Missed error	A missed error consists of an unintentional error that the researcher may have made when creating and revising the test. Error classification: missed error.
Modifier, misplaced or dangling	Modifiers should appear close to the words that they modify. Readers may become confused when modifier relationships are unclear. Error classification: grammar and mechanics.
Non-errors	Non-errors are changes to the copyediting document that were not counted in the error detection rates. Non-errors errors may include errors that resulted from revisions, improvements, or notable correct revision alternatives; these changes were tallied separately from the test's intentional errors. Error classification: non-error.
Number, date, percentage, time format	Style manuals dictate how number, date, percentage, and time formats are handled, e.g., whether to spell out percent or to use the % symbol. Generally, consistent usage is more

	important than the choice of format. Error classification: style.
Organization	Organizational errors include the failure to use transitions, directional language, topic statements, and forecasting statements. Error classification: style.
Parallel structure, faulty	Faulty parallelism results when like sentence parts are combined with an unlike part that creates an unbalanced sentence structure. This error commonly occurs in headings and list items and when combining a series of phrases with a clause. Error classification: style.
Preposition, wrong or missing	Prepositions indicate relationships between words. Readers may become confused when prepositions are omitted or if the wrong prepositions are used. Error classification: grammar and mechanics.
Repetition	Repetition or redundancy may occur as a word- or sentence-level error; the same words or ideas unnecessarily appear more than once, e.g., IRB board and DOD department. Error classification: style.

Singular/plural application, incorrect	Singular and plural application errors may manifest in various situations, such as when nouns and pronouns do not agree in number or when modifiers and nouns do not agree in number. Error classification: grammar and mechanics.
Spelling	Spelling errors include homophones (e.g., their/they're), general misspellings, and misspellings of compound words and proper nouns. Error classification: spelling.
Subject-verb agreement, lack of	Singular subjects require singular verbs; plural subjects require plural verbs, e.g., parents deploys (incorrect) vs. parents deploy (correct). Likewise, first-person subjects require first-person verbs, and so on. Error classification: grammar and mechanics.
Usage error	Usage errors are elements of language either used in (1) nonconventional patterns that readers find distracting, (2) manners that obscure communication, or (3) frameworks that disregard standard written English (Leonard & Gilsdorf, 1990). The elements of

	language may include words, sentences, and paragraphs; spelling; punctuation; style; and grammar and mechanics. Error classification: usage.
Verb tense, unnecessary shift	Verb tenses should remain consistent unless the time changes. Unnecessary shifts in verb tenses confuse readers. Error classification: grammar and mechanics.
Wordiness, rewrite for concision	Using too many words to express an idea, wordiness may occur as a word-level or sentence-level error. Wordiness often manifests as unneeded adverbs, imprecise word choices, and verbose phrases, e.g., one time per seven-day period. Error classification: style.
Wrong word	A wrong word error consists of incorrect word choices that may result from spell-check suggestions, e.g., pace for PVC; from picking similar-sounding words, e.g., advice vs. advise; from not consulting a dictionary for precise meanings, e.g., prohibit vs. forbid; or from a lack of proofreading, e.g., begging for beginning. Error classification: spelling.

APPENDIX B

Pre-Thesis Research Approval Form

IRB Approval Form

Informed Consent Form

Pre-Thesis Research Approval Form

Pre-Thesis or -Dissertation Research Approval Form

Before beginning thesis or dissertation research, this checklist should be completed by the master's or doctoral candidate in conjunction with the thesis or dissertation director. Please NOTE: All thesis and dissertation research must be approved by the thesis or dissertation director and the Unit Graduate Program Director. All students whose thesis or dissertation projects involve human subjects must have their proposed research approved by the University and Medical Center Institutional Review Board (UMCIRB) before beginning the studies involving those subjects. Likewise, all students whose projects involve animals must have their proposed research approved by the Institutional Animal Care and Use Committee (IACUC) before beginning those studies. A copy of the appropriate approval must be submitted with this form, or with an updated form when it is known that the research requires the involvement of such subjects, and must be included in the Appendix of the completed thesis or dissertation.

Date: 12/3/2013 Student name, phone, and email: Suzan Flanagan, 910-764-1688, Flanagans12@students.ecu.edu

Banner ID: B00758040

Working Title of Thesis or Dissertation Research: Usage Error in Technical Communication

Yes Have you selected an appropriate director for your master's or doctoral work?

Name: Dr. Michael Albers

Yes Have you selected an appropriate committee for your master's or doctoral work?

If so, please list:

1. Dr. Brent Henze
2. Dr. Donna Kain
3. ___
4. ___

Yes Has your proposed research been reviewed and approved by your director?

Yes Does your research involve human subjects?

No Has it been approved by the UMCIRB?

If not, when will it be reviewed for approval? 2/14

No Does your research involve animals?

___ Has it been approved by the IACUC?

If not, when will it be reviewed for approval? ___

No Does your research involve potential biohazards such as recumbent DNA, viral vectors, infectious agents, human blood products etc.?

___ Has it been approved by the by the Biosafety Committee?

If not, when will it be reviewed for approval? ___

Approvals:

[signature] 12/5/13

Thesis or Dissertation Director Signature Date

[signature] 12/6/2013

Program Director Signature Date

Acknowledgement of Receipt by Graduate School:

Dean of the Graduate School or designee Date

IRB Approval Form

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** · www.ecu.edu/irb

Notification of Initial Approval: Expedited

From:	Social/Behavioral IRB
To:	Suzan Flanagan
CC:	
	Michael Albers
Date:	2/5/2014
Re:	UMCIRB 14-000024 Usage Error in Technical Communication

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 2/5/2014 to 2/4/2015. The research study is eligible for review under expedited category #7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
Flanagan-consent-form.docx	Consent Forms
Flanagan-copyediting-document.docx	Standardized/Non-Standardized Instruments/Measures
Flanagan-demographic-questions.docx	Surveys and Questionnaires
Flanagan-IRB-thesis-research-proposal-1-13-14.docx	Study Protocol or Grant Application
Flanagan-recruitment-emails.docx	Recruitment Documents/Scripts

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418
IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418

Informed Consent Form

East Carolina University

Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Usage error in technical communication
Principal Investigator: Suzan Flanagan
Institution/Department or Division: East Carolina University/English

---

Researchers at East Carolina University (ECU) study problems in society, health problems, environmental problems, behavior problems and the human condition. Our goal is to try to find ways to improve the lives of you and others. To do this, we need the help of volunteers who are willing to take part in research.

Why is this research being done?

The purpose of this research study is to examine students' perception of usage errors. The decision to take part in this research is yours to make. By doing this research, we hope to learn how students' usage errors compare with errors found on technical editing tests.

Why am I being invited to take part in this research?

You are being invited to take part in this research because you are a student at East Carolina University. If you volunteer to take part in this research, you will be one of about 1,000 people to do so.

Are there reasons I should not take part in this research?

I understand I should not volunteer for this study if I am less than 18 years of age.

What other choices do I have if I do not take part in this research?

You can choose not to participate.

Where is the research going to take place and how long will it last?

The research procedures will be conducted in various ECU classrooms or online. The total amount of time you will be asked to volunteer for this study is approximately 1 hour over the next 1 week.

What will I be asked to do?

You are being asked to do the following:

- to answer several brief demographic questions for categorization purposes
- to copyedit a document (using a dictionary and style guide, if desired) for research purposes

What possible harms or discomforts might I experience if I take part in the research?

It has been determined that the risks associated with this research are no more than what you would experience in everyday life.

What are the possible benefits I may experience from taking part in this research?

We do not know if you will get any benefits by taking part in this study. This research might help us learn more about college students' writing and editing skills. There may be no personal benefit from your participation but the information gained by doing this research may help others in the future. At their discretion, some instructors may offer extra credit for participation in this study; however, in the event that extra credit is offered, you could choose an alternate extra credit option instead of participating in this research study.

Will I be paid for taking part in this research?

We will not be able to pay you for the time you volunteer while being in this study.

What will it cost me to take part in this research?

It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?

To do this research, ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:

- Any agency of the federal, state, or local government that regulates human research. This includes the Office for Human Research Protections.

- The University and Medical Center Institutional Review Board (UMCIRB) and its staff, who have responsibility for overseeing your welfare during this research, and other ECU staff who oversee this research.

How will you keep the information you collect about me secure? How long will you keep it?

The aggregate data may be used for future research or for publication, presentations, or teaching. Individual student data will not be identified and will remain confidential. The information may be stripped of identifiers and used in future research without anyone knowing it is information from the participant. The research information and identifying information will be kept for up to 10 years. Electronic data will be stored on secure networks and password-protected backup media. Physical data will be stored in a secure location in the researcher's home.

What if I decide I do not want to continue in this research?

If you decide you no longer want to be in this research after it has already started, you may stop at any time. You will not be penalized or criticized for stopping. You will not lose any benefits that you should normally receive.

Who should I contact if I have questions?

The people conducting this study will be available to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at flanagans12@students.ecu.edu.

If you have questions about your rights as someone taking part in research, you may call the Office for Human Research Integrity (OHRI) at 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the OHRI, at 252-744-1971.

I have read and understood this consent form, and I consent to participate in this research study.

● Yes

● No

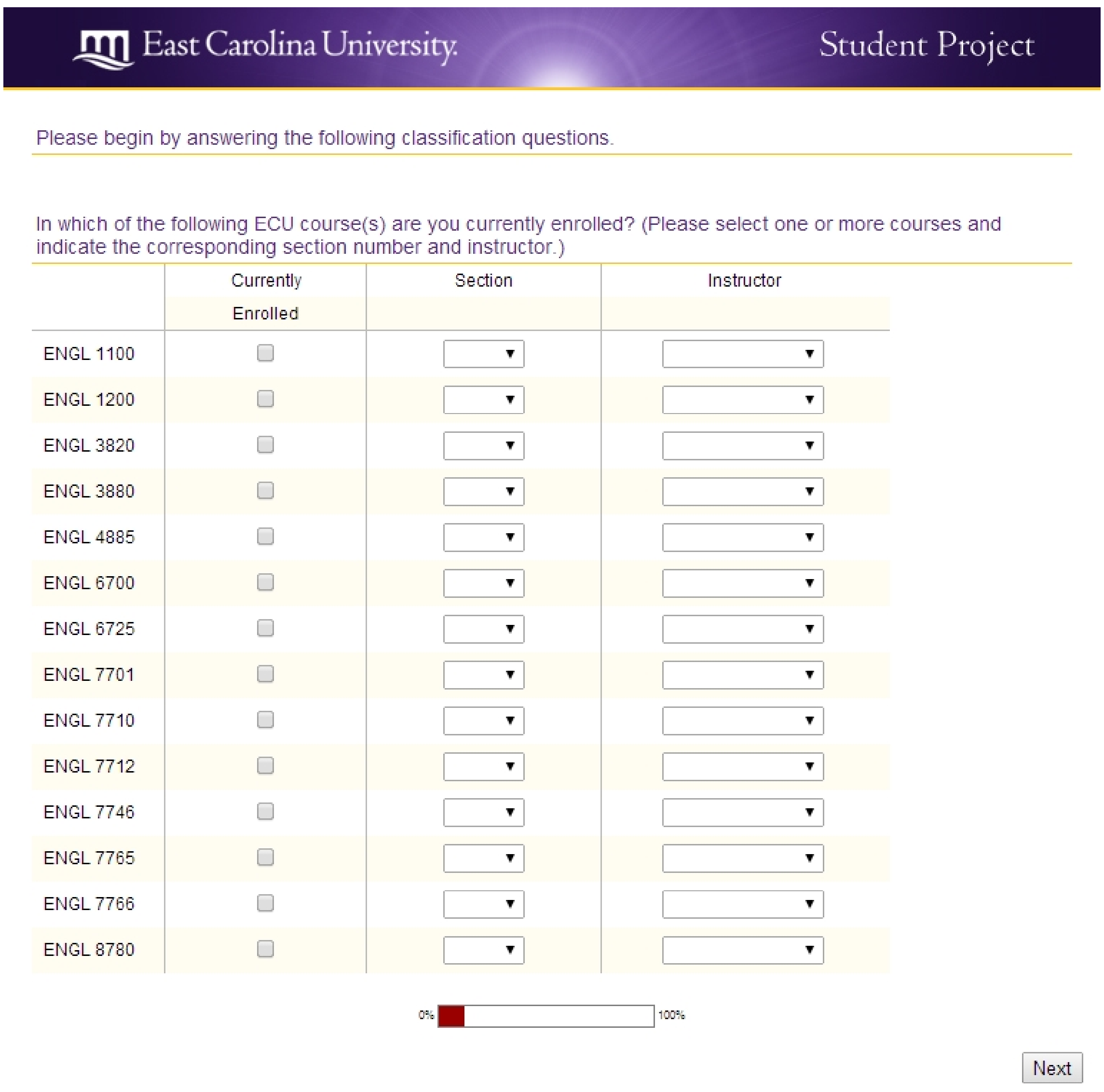
APPENDIX C

Research Study Instructions

Thank you for your interest in participating in this research study. Some students may have received multiple invitations to participate in this research study—**students should complete the study one time only.**

This research study has two sections. In the first section, you are asked to answer demographic questions. In the second section, you are asked to copyedit two excerpts. Please complete both sections.

Please contact the researcher at flanagans12@students.ecu.edu if you have any problems completing or submitting the study.


East Carolina University Student Project

Please begin by answering the following classification questions.

In which of the following ECU course(s) are you currently enrolled? (Please select one or more courses and indicate the corresponding section number and instructor.)

	Currently Enrolled	Section	Instructor
ENGL 1100			
ENGL 1200			
ENGL 3820			
ENGL 3880			
ENGL 4885			
ENGL 6700			
ENGL 6725			
ENGL 7701			
ENGL 7710			
ENGL 7712			
ENGL 7746			
ENGL 7765			
ENGL 7766			
ENGL 8780			

0% 100%

Next

East Carolina University. Student Project

What is your field of study?

Major:

Minor:

Certificate concentration:

0% 100%

Next

East Carolina University. Student Project

Please indicate your year in school. (Please select one option.)

- Freshman
- Junior
- Graduate
- Sophomore
- Senior
- Postrgraduate

What is your gender? (Please select one option.)

- Male
- Female

Approximately how many undergraduate-level technical and professional communication (TPC) courses have you completed at ECU or another college?

Examples of TPC courses include professional writing, business writing, digital writing, technical writing, editing, document design, scientific writing, professional communication, etc. (Please select one option.)

- None
- 1 to 3 courses
- 4 to 6 courses
- 7 to 9 courses
- 10 or more courses

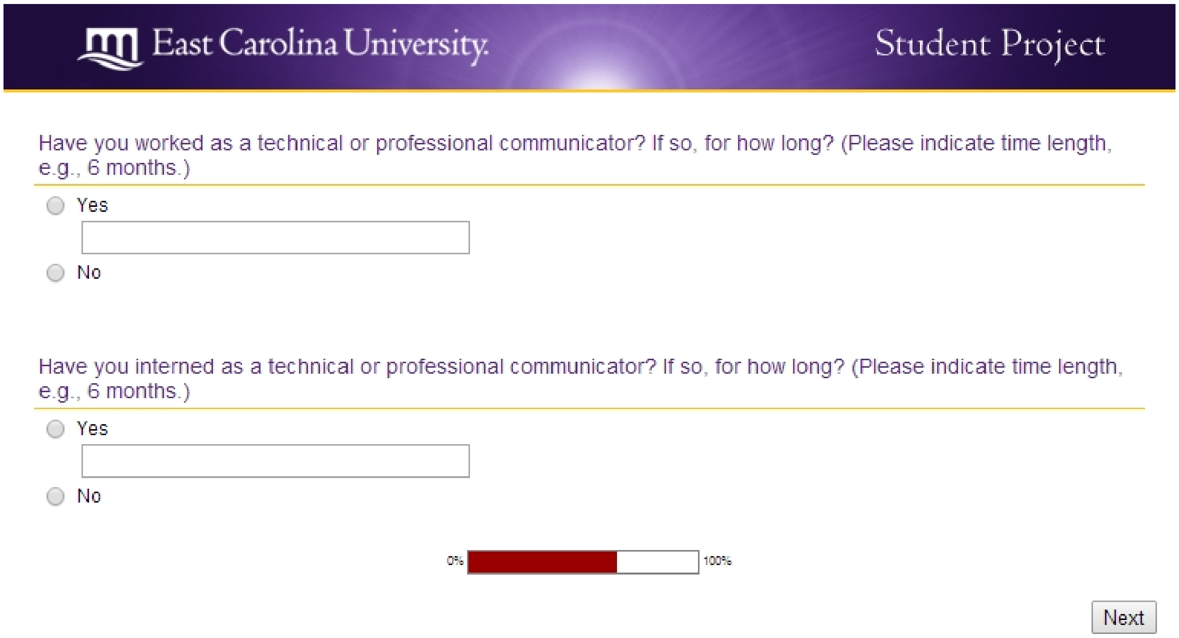
Approximately how many graduate-level technical and professional communication (TPC) courses have you completed at ECU or another college?

Examples of TPC courses include professional writing, business writing, digital writing, technical writing, editing, document design, scientific writing, professional communication, etc. (Please select one option.)

- None
- 1 to 3 courses
- 4 to 6 courses
- 7 to 9 courses
- 10 or more courses

0% 100%

Next



East Carolina University Student Project

Have you worked as a technical or professional communicator? If so, for how long? (Please indicate time length, e.g., 6 months.)

Yes

No

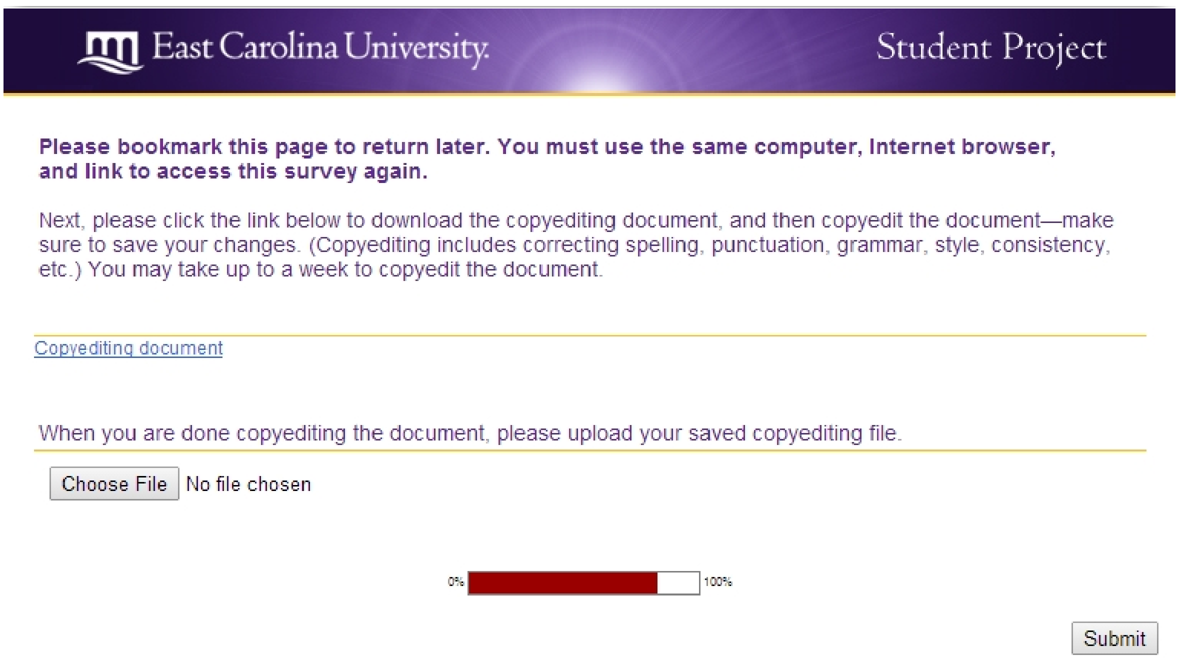
Have you interned as a technical or professional communicator? If so, for how long? (Please indicate time length, e.g., 6 months.)

Yes

No

0% 100%

Next



East Carolina University Student Project

Please bookmark this page to return later. You must use the same computer, Internet browser, and link to access this survey again.

Next, please click the link below to download the copyediting document, and then copyedit the document—make sure to save your changes. (Copyediting includes correcting spelling, punctuation, grammar, style, consistency, etc.) You may take up to a week to copyedit the document.

Copyediting document

When you are done copyediting the document, please upload your saved copyediting file.

Choose File No file chosen

0% 100%

Submit

East Carolina University Student Project

Thank you for participating in this research study.

Extra Credit Participation Code: R_ezldDTZr70ymLjL
(if applicable)

0% 100%

APPENDIX D

Copyediting Document

This copyediting document consists of two excerpts. Please copyedit both excerpts using Chicago style conventions. You may use the *Chicago Manual of Style* and *Merriam-Webster's Collegiate Dictionary*. (The link to the *Chicago Manual of Style* requires signing in to Joyner Library with your student credentials.)

Please copyedit this excerpt from a composting manual. Note: all first and last names are spelled correctly.

Compost Methods

Bin composting—a common form of composting that layers compost materials in wire, wood, or plastic bins designed to keep the compost piles moist, well-aired, and easily turned

Cold composting—also known as *passive composting*; a slow-rotting, seldom-watered, and seldom-turned outdoor pile, which composts at low temperatures that do not kill diseases or weed seeds

Hot composting—also known as *active composting*; a outdoor pile that composts at temperatures around 140°F to speed the decay process

Worm composting—a form of indoor composting that combines kitchen scraps, shredded newspapers, and special types of worms in a compost box

Composting Tips

- Check local regulations; composting is prohibited by some communities.
- Do not compost diseased plant material.
- Keep the compost heap moist to accelerate decay.

- Covering new waste with old compost will prevent pests, such as flies and raccoons.
- Prevent odors by turning the compost at least one time per seven-day period.
- Eliminate odors by turning compost pile and by adding carbon-rich materials, soil, or mature compost.
- Use cold fireplace ashes to neutralize acidic materials, such as oak leaves and pine needles.
- Brake large compost materials into smaller pieces to speed decomposition.
- Increase air circulation by drilling wholes into pvc pipes and inserting the pipes in the compost pile.

Composting Chemistry

Carbon/Nitrogen Ratios

Compost piles contain a mixture of carbon-rich and nitrogen-rich materials. The ratio of carbon to nitrogen effects the decay rate of a compost pile. Too many carbon-rich materials, such as leaves, keep the compost pile from heating up. (Hot piles decay faster.) Too many nitrogen-rich materials, such as grass clippings, cause the compose pile to produce Ammonia a gas that forms as a by-product. (Ammonia smells unpleasant and slows the decay rate.) Too few nitrogen-rich materials prevent the compost pile from heating up.

According to Martin and Gershuny's *Rodale Book of Composting*, the ideal carbon-to-nitrogen ratio for a compost pile ranges between 25:1 and 30:1. The carbon-to-nitrogen (C/N) ratio would express parts per weight. Decayed compost has a c/n ration around 15:1. Prior to decay, compost should have a C/N ratio between 25 parts carbon to 1 part nitrogen and 30 parts carbon to 1 part nitrogen.

Amendments

A compost pile needs a diverse mixture of ingredients to maintain an ideal C/N ratio. Limestone, fertilizer, or peat moss can be added to balance mixtures that lack diversity, advise Ball and Kourik authors of *Easy Composting*

Activators

Compost piles need water and air to thrive. To speed up the decay rate, add activators to the compost pile. Activators contain nitrogen and protein. Martin and Gershuny recommend layering activating ingredients the compost pile; commonly used activators include alfalfa meal, manure, bonemeal and rich garden soil.

Please copyedit this excerpt from a report on the educational disparities that academically gifted military children encounter in nine states with large military populations (California, Texas, Pennsylvania, Mississippi, Georgia, Florida, North Carolina, South Carolina, and Virginia). Note: all first and last names are spelled correctly.

Educating Academically-Gifted Military Children

The Military Child Education Coalition reports that military families move about nine times over a 20-year career. Those frequency moves may present additional challenges for academically gifted military children who encounter disparities in gifted education. The militarys Exceptional Family Member Program insures that children with learning disabilities have access to appropriate educational services. However, the program lacks a similar guarantee for gifted children.

Federal law does not mandate the education of gifted children, and definitions of giftedness vary from state to state, as do screening requirements and educational services. Though no standard definition exists, *"giftedness"* is generally when a child exhibits exceptional intelligence or talent, explains Dr. Ann Robinson, author of *Best Practices in Gifted Education*.

Statistics published in the *Gale Encyclopedia of Childhood & Adolescence* indicate that some states classify 10% of the population as gifted, while others classify only 1–2 percent of the population as gifted. As a result, children identified as gifted in one state may not be considered gifted and talented in another state.

The nine states examined in this report uses multiple-criteria assessments to determine giftedness. The assessments are where students are evaluated by methods that range from standardized tests to portfolio evaluations. Nationwide, testing requirements are similiar; however, some states adhere to strict testing guideline, while other states are more flexible, relying on checklists and focussing on the child as a whole.

The reason IQ tests are no longer used as the primary indicator of giftedness is because they do not measure creativity or leadership abilities. Certain versions of the test cannot measure IQ's exceeding 140, yet the tests remain widely used as measures of aptitude. Most gifted programs require an IQ score of 130 or higher. Exceptions include Mississippi, which required an IQ score of 120, and Florida, which lowers the IQ requirement to 110 for minorities due to the fact that studies have shown the tests to be culturally biased, Greenlaw and McIntosh explain in *Educating the Gifted*.

Although no single criteria is used to determine program eligibility, failure to meet specific criteria can prohibit students from receiving services. North Carolina requires students to have maintained a B average in the area of giftedness for two years prior to receiving services. Gifted underacheivers with poor grades will not qualify for services regardless of test scores, portfolios, or reccommendations. Such requirements pose problems for military children whose grades decline when their parents deploys.

Children who otherwise meet the criteria for giftedness do not necessarily receive gifted services. Georgia, Pennsylvania, South Carolina and Virginia do not provide services unless parents or teachers can demonstrate that the gifted child requires differentiated educational services. South Carolina delays services until first grade, while North Carolina does not serve students until third grade. The other states analyzed provide gifted services to children in grades K-12.

In contrast, to state schools Department of Defense (DOD) schools offer gifted services to children as early as pre-kindergarten. The *Department of Defense Education Activity Manual* outlines a key advantage of the DOD school system: children previously identified as gifted by the DoD department are automatically eligible for services upon transferring. Likewise, intrastate transfers reduce problems with eligibility for gifted education programs.

To continue receiving gifted services, most states require students to meet performance standards. Maintaining an overall B average or higher is sufficient in most states. Yet, some States only require students to maintain a B average in the area of giftedness. California is more lenient—once gifted, always gifted.

After you have completed both sections, please save the file and upload it to the Qualtrics survey using either the link you received by email or the survey page you bookmarked, and then click the submit button. If you have any problems completing or submitting the study, please contact the researcher at flanagans12@students.ecu.edu.

APPENDIX E

Table 18

Editing Test Error Distribution List

#	Error	# inserted	Locations inserted
1	Spelling	10	shreded/shredded; wholes/holes; brake/break; effects/affects; insures/ensures; similiar/similar; focussing/focusing; criteria/criterion; underacheivers/underachievers; reccommendations/recommendations
2	Capitalization, unnecessary or missing	5	pvc; Ammonia; c/n; States; DoD
3	Hyphen, em- or en-dash error	4	Academically-Gifted/Academically Gifted; pre-kindergarten/prekindergarten; well-aired/well aired; K-12/K–12
4	Language or nomenclature consistency	3	compost heap/pile; activating ingredient/activators; gifted and talented/gifted
5	Wrong word	3	ration/ratio; compose/compost; frequency/ frequent
6	Faulty predication	3	gifted is when; assessments are where; the reason is because
7	Format/consistency text	2	Worm composting missing boldface; remove italics or quotations from *"giftedness"*
8	Verb tense, unnecessary shift	2	would express/expresses; required/requires
9	Apostrophe, unnecessary or missing	2	militarys/military's; IQ's/IQs
10	Number, date, percentage, time format	2	20-year career/twenty-year career; %/percent (correct if consistently used % or percent, depending on whether deemed a technical document or not)
11	Wordiness, rewrite for concision	2	one time per seven-day period /once a week or weekly; due to the fact that/because
12	Modifier, misplaced or dangling	2	to continue receiving gifted services; only
13	Article, missing or incorrect	2	a[n] outdoor pile; turning [the] compost
14	Subject-verb agreement, lack of	2	states … uses; parents deploys
15	Organization	2	Conversely, too few; For example, North
16	Active voice preferred	2	composting is prohibited/prohibit composting; limestone . . . can be added/add limestone
17	Parallel structure, faulty	2	Compost Methods/Composting Methods; Covering … will/Cover . . .
18	Comma, missing in a series	2	bonemeal[,] and rich; South Carolina[,] and
19	Comma, missing with nonrestrictive element	2	[,]authors of *Easy Composting*; [,]a gas that
20	Repetition	2	Prior . . . nitrogen/delete sentence; DOD department/delete department
21	Comma, unnecessary	1	In contrast, to/In contrast to
22	Preposition, wrong or missing	1	ingredients [in] the compost
23	Comma, missing parenthetical/transitional	1	In contrast to state schools[,] Department
24	Singular/plural application, incorrect	1	testing guideline/guidelines

APPENDIX F

Instructors' Distribution Instructions

Students' Instructions

Instructors' Distribution Instructions

Dear [Instructor's Name]:

Your class ENGL [####], section [###], has been selected to participate in a research study conducted by Suzan Flanagan, a graduate student at East Carolina University who is conducting this research for her master's thesis. **If your class will not be participating in this study**, please contact the researcher as soon as possible at flanagans12@students.ecu.edu so that another class can be selected.

The purpose of this research study is to examine students' perception of usage errors. Participation is voluntary and poses no foreseeable risk. By allowing your class to participate, you will help contribute to the body of knowledge.

Students will be asked to do the following:

- to read and submit a research consent form
- to answer several brief demographic questions (year in school, major, etc.) for categorization purposes
- to copyedit a document (using a dictionary and style guide, if desired) for research purposes

You are being asked to do the following:

- to email the attached "Students' Instructions" to all students in the designated class:
    - ENGL [####], section [###]
- to notify the researcher if the copyediting exercise is incorporated into your lesson plans
- to notify the researcher if students are offered extra credit for participating in this research study

***The Qualtrics survey links are case sensitive.** If students have problems with the links, they should copy and paste the link address directly into their browsers.

You are encouraged to incorporate the copyediting exercise into your lesson plans; however, this is entirely optional.

Thank you for your cooperation.

Sincerely,

Suzan Flanagan
East Carolina University
Candidate for MA in English
Concentration in Technical and Professional Communication
flanagans12@students.ecu.edu

Students' Instructions

As a student enrolled in ENGL [####], section [###], you have been selected to participate in a research study conducted by Suzan Flanagan, a graduate student at East Carolina University who is conducting this research for her master's thesis. The researcher may be reached at flanagans12@students.ecu.edu.

The purpose of this research study is to examine students' perception of usage errors. Participation is voluntary and poses no foreseeable risk. By participating, you will help contribute to the body of knowledge. Prior to participating in this research study, you must read and submit the consent form. Should you receive more than one invitation to participate in this study, please ignore the additional request(s).

This research study should take about 60 minutes to complete; however you may take up to a week to complete the study. It consists of answering a few demographic questions and copyediting a document. Copyediting tasks include correcting spelling, punctuation, grammar, style, consistency, etc. You may use the *Chicago Manual of Style* and *Merriam-Webster's Collegiate Dictionary* while copyediting the document. (The link to the electronic version of the Chicago Manual of Style requires signing in to Joyner Library with your student credentials.)

You will need a word-processing program to copyedit the document. If you prefer, you may print the document and mark corrections on the paper, then scan the corrected document and submit the scanned document as a file upload. (Please contact the researcher at flanagans12@students.ecu.edu if you have trouble accessing or submitting the document.)

Your participation in this research study would be greatly appreciated. Please click the link to access the consent form. **The link is case sensitive—if the link does not work, please copy and paste the link address directly into your browser:** [link]

Thank you for your time.

Sincerely,

Suzan Flanagan
East Carolina University
Candidate for MA in English
Concentration in Technical and Professional Communication
flanagans12@students.ecu.edu

APPENDIX G

Copyediting Document Answer Key

This copyediting document consists of two excerpts. Please copyedit both excerpts using Chicago style conventions. You may use the *Chicago Manual of Style* and *Merriam-Webster's Collegiate Dictionary*. (The link to the ***Chicago Manual of Style*** **requires signing in to Joyner Library with your student credentials.)**

Please copyedit this excerpt from a composting manual. Note: all first and last names are spelled correctly.

Composting Methods

Bin composting—a common form of composting that layers compost materials in wire, wood, or plastic bins designed to keep the compost piles moist, well aired, and easily turned

Cold composting—also known as *passive composting*; a slow-rotting, seldom-watered, and seldom-turned outdoor pile, which composts at low temperatures that do not kill diseases or weed seeds

Hot composting—also known as *active composting*; an outdoor pile that composts at temperatures around 140°F to speed the decay process

Worm composting—a form of indoor composting that combines kitchen scraps, shredded newspapers, and special types of worms in a compost box

Composting Tips

- Check local regulations; some communities prohibit composting.
- Do not compost diseased plant material.
- Keep the compost pile moist to accelerate decay.

- Cover new waste with old compost to prevent pests, such as flies and raccoons.
- Prevent odors by turning the compost pile at least once a week.
- Eliminate odors by turning the compost pile and by adding carbon-rich materials, soil, or mature compost.
- Use cold fireplace ashes to neutralize acidic materials, such as oak leaves and pine needles.
- Break large compost materials into smaller pieces to speed decomposition
- Increase air circulation by drilling holes into PVC pipes and inserting the pipes in the compost pile.

Composting Chemistry

Carbon/Nitrogen Ratios

Compost piles contain a mixture of carbon-rich and nitrogen-rich materials. The ratio of carbon to nitrogen affects the decay rate of a compost pile. Too many carbon-rich materials, such as leaves, keep the compost pile from heating up. (Hot piles decay faster.) Too many nitrogen-rich materials, such as grass clippings, cause the compost pile to produce ammonia, a gas that forms as a by-product. (Ammonia smells unpleasant and slows the decay rate.) Conversely, too few nitrogen-rich materials prevent the compost pile from heating up.

According to Martin and Gershuny's *Rodale Book of Composting*, the ideal carbon-to-nitrogen ratio for a compost pile ranges between 25:1 and 30:1. The carbon-to-nitrogen (C/N) ratio expresses parts per weight. Decayed compost has a C/N ratio around 15:1.

Amendments

A compost pile needs a diverse mixture of ingredients to maintain an ideal C/N ratio. Add limestone, fertilizer, or peat moss to balance mixtures that lack diversity, advise Ball and Kourik, authors of *Easy Composting*.

Activators

Compost piles need water and air to thrive. To speed up the decay rate, add activators to the compost pile. Activators contain nitrogen and protein. Martin and Gershuny recommend layering activators in the compost pile; commonly used activators include alfalfa meal, manure, bonemeal, and rich garden soil.

Please copyedit this excerpt from a report on the educational disparities that academically gifted military children encounter in nine states with large military populations (California, Texas, Pennsylvania, Mississippi, Georgia, Florida, North Carolina, South Carolina, and Virginia). Note: all first and last names are spelled correctly.

Educating Academically Gifted Military Children

The Military Child Education Coalition reports that military families move about nine times over a twenty-year career. Those frequent moves may present additional challenges for academically gifted military children who encounter disparities in gifted education. The military's Exceptional Family Member Program ensures that children with learning disabilities have access to appropriate educational services. However, the program lacks a similar guarantee for gifted children.

Federal law does not mandate the education of gifted children, and definitions of giftedness vary from state to state, as do screening requirements and educational services. Though no standard definition exists, *giftedness* is generally defined as exceptional intelligence or talent, explains Dr. Ann Robinson, author of *Best Practices in Gifted Education*. Statistics published in the *Gale Encyclopedia of Childhood & Adolescence* indicate that some states classify 10 percent of the population as gifted, while others classify only 1–2 percent of the population as gifted. As a result, children identified as gifted in one state may not be considered gifted in another state.

The nine states examined in this report use multiple-criteria assessments to determine giftedness. The student assessment methods range from standardized tests to portfolio evaluations. Nationwide, testing requirements are similar; however, some states adhere to strict testing guidelines, while other states are more flexible, relying on checklists and focusing on the child as a whole.

IQ tests are no longer used as the primary indicator of giftedness because they do not measure creativity or leadership abilities. Certain versions of the test cannot measure IQs exceeding 140, yet the tests remain widely used as measures of aptitude. Most gifted programs require an IQ score of 130 or higher. Exceptions include Mississippi, which requires an IQ score of 120, and Florida, which lowers the IQ requirement to 110 for minorities because studies have shown the tests to be culturally biased, Greenlaw and McIntosh explain in *Educating the Gifted*.

Although no single criterion is used to determine program eligibility, failure to meet specific criteria can prohibit students from receiving services. For example, North Carolina requires students to have maintained a B average in the area of giftedness for two years prior to receiving services. Gifted underachievers with poor grades will not qualify for services regardless of test scores, portfolios, or recommendations. Such requirements pose problems for military children whose grades decline when their parents deploy.

Children who otherwise meet the criteria for giftedness do not necessarily receive gifted services. Georgia, Pennsylvania, South Carolina, and Virginia do not provide services unless parents or teachers can demonstrate that the gifted child requires differentiated educational services. South Carolina delays services until first grade, while North Carolina does not serve students until third grade. The other states analyzed provide gifted services to children in grades K–12.

In contrast to state schools, Department of Defense (DOD) schools offer gifted services to children as early as prekindergarten. The *Department of Defense Education Activity Manual* outlines a key advantage of the DOD school system: children previously identified as gifted by the DOD are automatically eligible for services upon transferring. Likewise, intrastate transfers reduce problems with eligibility for gifted education programs.

Most states require students to meet performance standards to continue receiving gifted services. Maintaining an overall B average or higher is sufficient in most states. Yet, some states require students to maintain a B average only in the area of giftedness. California is more lenient—once gifted, always gifted.

APPENDIX H

Table 19

Editing Test Data Collection Form

#	Error category	#	Error	Detected	Missed	Comments
1	**Spelling**	1.0	shreded/shredded			
		1.1	brake/break			
		1.2	holes/wholes			
		1.3	effects/affects			
		1.4	insures/ensures			
		1.5	similiar/similar			
		1.6	focussing/focusing			
		1.7	criteria/criterion			
		1.8	undercheivers/underachievers			
		1.9	reccommendations/ recommendations			
2	**Capitalization, unnecessary or missing**	2.0	pvc			
		2.1	Ammonia			
		2.2	c/n ratio			
		2.3	DoD			
		2.4	States			
3	**Hyphen, em- or en-dash**	3.0	well-aired			
		3.1	Academically-Gifted			
		3.2	K-12			
		3.3	pre-kindergarten			
4	**Language or nomenclature consistency**	4.0	compost heap/pile			
		4.1	activating ingredients/activators			
		4.2	gifted and talented/gifted			
5	**Wrong word**	5.0	compose/compost			
		5.1	ration/ratio			
		5.2	frequency/frequent			
6	**Faulty predication**	6.0	gifted is generally when			
		6.1	assessments are where			
		6.2	the reason is because			
7	**Format/consistency text**	7.0	Worm composting needs boldface			
		7.1	*"giftedness"*			

#	Error category	#	Error	Detected	Missed	Comments
8	**Verb tense, unnecessary shift**	8.0	would express/expresses			
		8.1	required/requires			
9	**Apostrophe, unnecessary/missing**	9.0	militarys			
		9.1	IQ's			
10	**Number, date, percentage, time format**	10.0	20-year career			
		10.1	%/percent			
11	**Wordiness, rewrite for concision**	11.0	one time per seven-day period			
		11.1	due to the fact that/because			
12	**Modifier, misplaced/dangling**	12.0	to continue receiving gifted services			
		12.1	only			
13	**Article, missing/incorrect**	13.0	a[n] outdoor pile			
		13.1	turning [the] compost pile			
14	**Subject-verb agreement, lack of**	14.0	states …uses			
		14.1	parents deploys			
15	**Organization**	15.0	Conversely, too few			
		15.1	For example, North			
16	**Active voice preferred**	16.0	composting is prohibited			
		16.1	limestone … can be added			
17	**Parallel structure, faulty**	17.0	Compost Methods			
		17.1	Covering . . . will			
18	**Comma, missing in a series**	18.0	bonemeal, and rich			
		18.1	South Carolina, and Virginia			
19	**Comma, missing with nonrestrictive element**	19.0	a gas that forms			
		19.1	authors of *Easy Composting*			
20	**Repetition**	20.0	Prior to decay . . . nitrogen			
		20.1	DOD department			
21	**Comma, unnecessary**	21.0	In contrast, to			
22	**Preposition, wrong/missing**	22.0	ingredients [in] the compost			
23	**Comma, missing parenthetical/transitional**	23.0	In contrast to state schools,			
24	**Singular/plural application, incorrect**	24.0	testing guideline/guidelines			
	Non-errors					
	Missed errors					
	TOTALS					

APPENDIX I

Suzan Flanagan
P.O. Box 35592
Fayetteville, NC 28303

March 23, 2014

Ryan Boettger, PhD
Department of Linguistics & Technical Communication
University of North Texas
1155 Union Circle #305298
Denton, TX 76203

Dear Dr. Boettger:

I am a completing a master's thesis at East Carolina University entitled "Usage Error in Technical Communication." I would like your permission to reprint in my thesis an excerpt from the following:

Boettger, R. (2011). Examining error in the technical communication editing test. *Proceedings of the 58th Annual Technical Communication Summit*. Sacramento, CA: 142–147.

The excerpt to be reproduced is Table 1: Most Frequent Errors.

The requested permission extends to any future revisions and editions of my thesis, including non-exclusive world rights in all languages, and to the prospective publication of my thesis by UMI. These rights will in no way restrict republication of the material in any other form by you or by others authorized by you. Your signing of this letter will also confirm that you own the copyright to the above-described material.

If these arrangements meet with your approval, please sign the letter where indicated below and return it to me. Thank you very much.

Sincerely,

Suzan Flanagan

Suzan Flanagan

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

Ryan K. Boettger

Ryan Boettger

3/24/2014

Date

BIOGRAPHICAL SKETCH

A member of the Society for Technical Communication and the Association of Teachers of Technical Writing, Suzan Flanagan is a freelance writer and editor whose interests include environmental science, living history, distance learning, technology, and travel. She holds a B.A. in communication studies with a minor in computer studies from the University of Maryland and a graduate certificate in professional communication from East Carolina University. Her research interests include usage error patterns; the intersection of editing and rhetoric, especially in respect to editorial comments, prescriptive grammar, and usage error; and editing in the context of single sourcing, usability, and user experience design.