Improving the Writing-Evaluation Abilities of
Graduate Teaching Assistants in ECE Labs

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Introduction

In 1999, faculty in the Bagley College of Engineering at Mississippi State University began a project to improve the writing-evaluation skills of graduate teaching assistants (TAs) in charge of undergraduate laboratories in electrical and computer engineering (ECE). Long considered valuable for discipline-specific undergraduate writing experiences, undergraduate laboratories have also proven problematic due to the large gaps between sound writing-instruction pedagogy, the standards and expectations of engineering faculty members for their students' written work, and the actual writing instruction/grading provided by lab TAs, many of whom neither speak nor write English as their first language.

This project began by using writing tutors – who were already assisting ECE faculty and students with existing writing assignments – to work with lab TAs on the quality and consistency of their lab-report grading. This tutor support led to the idea of a screening exam whereby prospective TAs could demonstrate their level of proficiency at grading certain writing elements in a sample lab report. Results from early exam administrations showed the need for further TA support both before and after the exam as well as ongoing performance evaluations, which eventually led to a writing-centered TA workshop as well as the development of online remediation materials. Finally, suggestions from ECE faculty that TAs enroll in some type of writing course to help them with their lab duties resulted in the development of an ESL writing/speaking course partially focusing on issues relevant to ECE.

This paper discusses the project stages outlined above, presents and discusses data collected after two before-and-after exam administrations, and addresses ongoing changes to the project based on collected data and evaluated TA performance.

Writing Tutor Support

Though the ECE department had used writing tutors for several semesters prior to the start of this project, the tutors' role had only consisted of working individually with ECE students on writing assignments. The idea, however, of assisting graduate TAs with grading written work led both the department and the college's Shackouls Technical Communication Program (TCP, of which the tutoring program is a thrust) to modify tutoring duties to include guidance and mentoring for ECE graduate TAs.

Initial tutor reviews of TA-graded lab reports revealed gross inconsistencies in the application of grading standards – two separate documents of highly similar quality, for instance, that received very high (90% or more) and very low (50% or less) grades respectively. Additionally, some TAs marked grammatical or stylistic elements incorrect/inappropriate that were in fact correct/appropriate. Such errors and inconsistencies are not surprising given the fact that 75 to 90 percent of ECE TAs are international students who do not use English as their first language. Nevertheless, these problems immediately exposed the need for some type of assessment tool to determine both the skill level of incoming TAs as well as the amount and type of remediation TAs would require once they began grading student writing.

Discussion of the Screening Exam

The assessment tool we chose for this purpose is a screening exam consisting of a self-contained passage from an authentic ECE lab report that featuring certain types and quantities of grammatical and stylistic errors. The exam, an excerpt of which appears in Figure 1 below, uses superscript numbers to identify errors or ranges of errors. Students read through the lab-report passage (which is roughly 600 words in length) and write their answers on the answer sheet provided with the exam (Figure 2 below shows an excerpt of this answer sheet). This answer sheet contains a list of 25 possible answers in the left-hand column and 25 answer spaces (corresponding with the 25 superscripts in the exam passage) in the right-hand column.

Figure 1. Excerpt from TA Screening Exam and Instructions

Instructions: Identify the errors located in the numbered sentences below, then use the attached list of possible answers to select the correct error, mark the corresponding number on the answer sheet, and correct the error in the space provided. For sentences marked with a range of numbers, the quantity of the range is equal to the quantity of errors in that sentence (e.g., "1-3" below means the sentence contains 3 errors). <u>NOTE</u>: You may find more errors than have been superscripted. Leave them alone; they are not part of the exam.

EXAM PASSAGE

This report discusses the operations of various logic gates such as AND, OR, NAND, NOR, and XOR gates. [1-3]This report also deals with concept of a universal gate, the power of two-level logic, and the use of multiple levels too expand gate inputs. The theory involved here is the concept of the operations of various logic gates and some of their possible combinations. [4]The following chips will be used representing there respective gates: a 7408 chip as an AND, a 7400 chip as a NAND, a 7432 chip as an OR, a 7402 chip as a NOR, and a 7486 chip as an XOR…

Figure 2. Excerpt from Screening Exam Answer Sheet

Possible Answers	Answer Sheet (letter + correction)
A. Subject-verb agreement error **B.** Error in verb form	1.
C. Vague subject or inactive verb **D.** Sentence fragment	2.
E. Overly lengthy sentence **F.** Unnecessary passive voice	3.
	4.

After a one-semester trial administration, we administered the exam twice to the same group of TAs – once before the TAs began their first semester of grading and once after they finished this first semester. At roughly this same time, TAs began enrolling in ESL 5323 Academic Research and Writing Skills, a course offered through MSU's English as a Second Language Center (Figure 3 below shows the full course description). The ECE department began encouraging TAs to enroll in this course largely due to faculty requests for some sort of language preparation before TAs began their lab duties.

Figure 3. Catalog Description of ESL 5323 Academic Research and Writing Skills

ESL 5323. Academic Research and Writing Skills: Focus is on improving the ability of second language speakers to compose and document reports and research papers in English.

Component Goals and Objectives: Students will:

- Become familiar with the mechanics and formats of formal writing
- Learn the technical aspects of organizing and composing research papers
- Develop sentence structure and writing skills
- Practice critical reading
- Become familiar with the resources in the library

The emergence of the ESL course for TAs helped crystallize three research questions surrounding the screening exam:

1. How accurately would the first screening-exam administration reflect individual TAs' abilities to grade technical written English?
2. How much (if any) would TAs' screening-exam scores improve on the second screening-exam administration?
3. Would the ESL course factor into the scores (improved or not) from the second exam administration?

Screening Exam Results and Discussion

The average score for all 18 TAs tested in the first administration was 11.41 out of 25 possible, or 45.63%. The average for the second round was 11.53, or 46.13%. Because this project addresses the abilities and needs of both domestic and international students, examining the data according to this division is useful. Table 1 below, therefore, breaks down the exam results based on the TAs' native-language status. The "ESL" column to

the far right indicates whether the student in question had completed the ESL course previously discussed.

Table 1. TA Exam Results from Two Before-and-After Exam Administrations

Students	11/16/02 Grade	5/9/03 Grade	11/16/02 %	5/9/03 %	ESL
Domestic					
A	13.5	12.5	54%	50%	No
B	17	13	68%	52%	No
Dom. Avg.	**15.25**	**12.75**	**61%**	**51%**	
International					
C	10	6.5	40%	26%	No
D	11.5	10.5	46%	42%	No
E	9	7	36%	28%	No
F	9.5	14.5	38%	58%	Yes
G	8.5	13.5	34%	54%	Yes
H	9.5	14.5	38%	58%	Yes
I	8.5	18	34%	72%	Yes
J	11.5	16.5	46%	66%	Yes
K	7.5	11.5	30%	46%	Yes
L	6	8.5	24%	34%	Yes
M	7.5	10	30%	40%	Yes
N	10	15	40%	60%	Yes
O	11	15.5	44%	62%	Yes
P	11	16.5	44%	66%	Yes
Q	7.5	14	30%	56%	Yes
R	6.5	12	26%	48%	Yes
Intl. Avg.	**8.81**	**13.85**	**35.23**	**55.38**	
Avg. for All 18 Students*	**11.41**	**11.53**	**45.63**	**46.13**	

*Three additional students took the later exam but did not take the former exam. Because they provide no basis for comparison, they have been omitted from this data set.

Table 2. Comparison of Improvement in TA Exam Results With and Without ESL Course

Student	Grade		Grade Difference		%increase	
	11/16	5/9	unnorm	norm	unnorm	norm
A	13.5	12.5	-1.0	1.3	-7%	10%
B	17.0	13.0	-4.0	-1.7	-24%	-10%
C	10.0	6.5	-3.5	-1.2	-35%	-12%
D	11.5	10.5	-1.0	1.3	-9%	11%
E	9.0	7.0	-2.0	0.3	-22%	3%
No ESL Avg.			**-2.3**	**0.0**	**-19%**	**0%**
F	9.5	14.5	5.0	7.3	53%	77%
G	8.5	13.5	5.0	7.3	59%	86%
H	9.5	14.5	5.0	7.3	53%	77%
I	8.5	18.0	9.5	11.8	112%	139%
J	11.5	16.5	5.0	7.3	43%	63%
K	7.5	11.5	4.0	6.3	53%	84%
L	6.0	8.5	2.5	4.8	42%	80%
M	7.5	10.0	2.5	4.8	33%	64%
N	10.0	15.0	5.0	7.3	50%	73%
O	11.0	15.5	4.5	6.8	41%	62%
P	11.0	16.5	5.5	7.8	50%	71%
Q	7.5	14.0	6.5	8.8	87%	117%
R	6.5	12.0	5.5	7.8	85%	120%
ESL Avg.	**8.8**	**13.8**	**5.0**	**7.3**	**57%**	**83%**

The most noteworthy result is the obvious difference the ESL course seems to have made. As shown in Table 2, every student tested who took the ESL course performed better on the exam the second time with an average improvement of 57%. One might expect that a major reason for this improvement is surely that students had seen this type of exam before and so remembered specific issues in need of correction, but the students who had not taken the ESL course had **also** taken a similar exam before, and yet their scores all decreased (none stayed the same). Using student test performance of those not enrolled in the ESL course, we can normalize the results in Table 2 of the fall and spring tests. The result is a dramatic 83% improvement that could arguably be credited to the student's ESL experience.

Initial answers to the research questions above are as follows:

1. Based on tutor and TCP faculty-led reviews of graded lab reports, *the screening exam is an accurate predictor of TA ability*. The writing-related problems that TAs recognized most consistently on the screening exam (greater than 50% correct) were also the problems TAs caught most consistently on lab reports (an average of 60% marked correctly for the three semesters in question). These problems involved low-order writing concerns, many of which were grammatical in nature, and included misspelled words, misuse of first person, faulty paragraph division, use of slang, and misuse/omission of articles. Likewise, the writing problems TAs had the most trouble with on the screening exam (less than 50% correct) were also the problems TAs often missed on lab reports (an average of 80% marked incorrectly or not at all for the three semesters in question, with isolated cases of 90-95% of these problems missed). Not surprisingly, these problems involved higher-order writing concerns related to writing style, including overly repetitious words/phrases, general wordiness, lack of parallelism, vague subjects, unnecessarily inactive verbs, and inconsistency in writing numbers. While such a correlation between the screening exam and the report grading is perhaps predictable, these results are more significant for their usefulness in determining where prospective TAs need the most writing-related remediation, whether through one-on-one instruction, online quizzes and self-tests, or an experience such as the ESL course described above.

2. *Exam scores did improve on the second administration*, though where they improved was surprising: the two domestic students performed more poorly by an average of 10 percentage points, whereas the international students as a whole performed better by an average of over 20 percentage points. The overall improvement for all TAs, however, was only one-half a percentage point, and the percentage itself remained inappropriately low – a failing grade, in fact, if transposed onto a traditional 10-point scale.

3. ***The ESL course clearly appears to have affected student performance on the screening exam***. Every student who took the ESL course performed better the second time with an average improvement of 57%.

Biographical Information

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