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Improving Student Writing through Multiple Peer Feedback

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***Abstract* - This paper describes the design of a study to examine the effects of various types of feedback and revision on student writing quality improvement in a first-year engineering course. We apply the previous work of Cho and MacArthur that showed that multiple peer feedback is superior to single peer and single expert feedback in improving student writing quality. We extend their work to examine the effects of in-class instruction on giving peer feedback, and also examine the effect of giving (rather than receiving) feedback on student revisions. Preliminary findings from this study will be presented at the conference.**

Index Terms – communication, peer feedback, revision, writing

INTRODUCTION

It is widely recognized that effective written communication skills are essential for engineers. [1] This is reflected in the ABET accreditation criterion 3g, that students should develop "an ability to communicate effectively." [2] In addition, International organizations like The Chartered Institute for IT consider communication to be an essential transferrable skill for any student of information technology. [3] However, many engineering instructors are reluctant to integrate writing assignments into their curricula and writing instruction is often relegated to a technical writing service course rather than in the context of engineering courses [4]-[5].

Best practices of writing instruction include a recursive understanding of writing as a process and review of an earlier draft to allow for revisions before the paper is submitted for evaluation. [6]-[7] Revision is considered a fundamental component of improving written work, yet writing assignments in engineering courses are often submitted unrevised. Many engineering instructors feel that they do not have the requisite skills to effectively provide feedback or that within a content-packed course, revision is not possible given the limits of instructors' time, the large class sizes, and the lack of pedagogical training for teaching assistants.

One way to address these concerns is to use peer feedback. Recent research by Cho & MacArthur [8] showed that feedback from multiple peers (MP) in a psychology research methods class was more effective in improving students' writing than feedback from a single expert (SE)—typically the instructor—or a single peer (SP) reviewer. When compared with single-expert and single-peer feedback contexts, multiple-peer (MP) feedback revealed improved student understanding of comments and included non-directive recommendations for revisions, which resulted in more complex repair decisions (global issues like organization and thesis focus vs. local issues like sentence structure and grammatical structure) and new content revisions as well as improved paper quality overall.

The purpose of this study is to examine the various ways that peer review affects student writing quality in a first-year engineering course. We will attempt to reproduce the results from Cho & MacArthur's study in this context, as well as extend it to explore the impacts of different types of peer review instruction. We also compare the effects of the act of peer reviewing vs. the act of receiving feedback.

Research questions include:
1. How do different forms of feedback (SE – single expert, SP – single peer, MP – multiple peer) affect improvement in students' writing quality in an engineering course?
2. How does the form of peer review instruction affect student perceptions of the helpfulness of feedback received?
3. How does training on feedback best practices for writing peer review affect the quality of peer review comments?
4. How does acting as a peer reviewer impact writing improvement?

SETTING

This study will take place in a second-semester course of a first-year engineering program at a large research university located in the southeastern United States. This course includes mainly first-year students intending to major in electrical and computer engineering and computer science, although a small portion of the students are more advanced or intend to major in other disciplines. Approximately 400 students are enrolled in the course.

The Contemporary Issue Report (CIR) is a major assignment in the course. The CIR asks students to select and report on a contemporary issue in electrical and computer engineering or computer science. Students are given a template based on IEEE formatting and citation styles and an example of a report that was written by the instructors. This assignment has been given for three semesters, but past semesters did not include any peer review or opportunity to revise the submission.

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ANALYTICAL FRAMEWORK

To define improvement in writing quality, researchers utilized a rubric with categories in writing mechanics, writing quality, and technical quality. Student work was evaluated against these categories and was assessed as unacceptable, marginal, proficient, or excellent. Writing mechanics were evaluated based upon students' use of assignment template and grammar, mechanics, and spelling. Writing quality was evaluated based upon the paper's structure, conceptual engagement, support, and references. Technical quality was evaluated upon students' ability to engage the problem, link the problem to their field, and discuss solutions, tradeoffs, ethics, and societal impacts of the contemporary issue.

METHODS

In order to confirm and extend the previous findings of Cho and MacArthur, students in this study will be divided into a total of six feedback group conditions. In the prior work, there were three feedback group conditions:

1. Single Expert Feedback (SE),
2. Single Peer Feedback (SP),
3. Multiple Peer Feedback (MP).

Students in all conditions still reviewed others' work based on a general writing rubric.

To extend this framework we further divided the students in this study. Half of the peer feedback condition students received in-class training from a writing instructor on how to give effective feedback, and the other half received their feedback training via a handout developed by the writing instructor. This extends Cho & MacArthur's work to determine the efficacy of two types of instruction on feedback best practices. Within the SE group, students will be divided such that some give no feedback to their peers and some give feedback based on the handout. In this study, our experts consist of both workshop instructors and graders who are advanced engineering students. The peer feedback will not be exchanged in this group so that we can examine the effects of giving peer feedback independently from receiving it. These new parameters mean that this study has a total of six feedback conditions rather than three. The division of students into groups is summarized in Table 1.

TABLE I
DESCRIPTION OF TREATMENT GROUPS

Feedback Condition Group	Received Feedback Parameter	Peer Feedback Instruction Parameter
A	Single Expert	No Instruction
B		Handout
C	Single Peer	Handout
D		In-class + Handout
E	Multiple Peer	Handout
F		In-class + Handout

Student work products in this course are collected for research purposes under IRB approval. Only work products of students who actively consented to this collection are analyzed in this study. In order to ensure equity, we will identify any significant difference between treatment groups in students' mean assignment grades and normalize them.

ANALYSIS

A random sample of student drafts and final papers will be taken from each feedback condition to be evaluated by the researchers. This evaluation will consist of three steps:

1. Assess initial draft according to rubric
2. Code peer or expert feedback on initial draft
3. Assess final submission according to rubric

Feedback will be coded according to the parameters of quality peer feedback included in the handout and in-class instruction. Quality peer feedback guidelines instructed students to write comments that were specific, encouraging, and that offered suggestions for improvement. The evaluation rubric was included in the handout and students were encouraged to use the rubric's values to guide their feedback (e.g. peer feedback should focus more weight on issues of argumentation and source synthesis—worth a combined 20% of the grade—than grammatical errors or typos that are worth only 5% of the grade).

By comparing the level of writing quality improvement between the six feedback conditions, we will be able to verify that multiple peer feedback results in the highest level of improvement. We will also be able to examine the effects of peer feedback instruction on both feedback comment quality and overall paper improvement. Finally, by comparing group A to group B, we can determine the extent to which writing improvement from draft to revision is affected by giving others feedback rather than just receiving feedback, a result that could allow students to become better readers of their own writing during draft stages.

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