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Assessment of Engineering Writing at Western Washington University

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Title: Assessment of Engineering Writing at Western Washington University

Problem statement:

Effective writing skills are crucial to the transfer of knowledge and information in all fields. In Engineering, writing skills are the key to communicating the results and findings of engineering analysis, since this analysis is not only represented by graphs, plots, equations, etc. but is also presented in technical reports, lab reports, proposals, and articles. Engineering programs emphasize the importance of teaching students effective writing skills by implementing some writing proficiency courses in their curriculum. However, these programs are usually concerned with how to prepare and assess their students to have effective writing skills to help them in their professional careers. The Accreditation Board for Engineering and Technology (ABET), through its 'k' students' outcomes, requires that engineering programs show clear evidence of a strong engineering communication outcomes through engineering technical writings, and also requires a clear assessment process to gauge these outcomes. This study provides an outcomes-based assessment for evaluating the writing skills of Engineering & Design students in a senior-level writing proficiency class sequence.

Method:

At Western Washington University, the department of Engineering & Design requires a three-course sequence for senior level engineering students as their capstone project. This sequence includes a WP1 and a WP2 designated course, MFGE/PCE 491 and MFGE/PCE 492 respectively. During 2015/2016 academic year, 24 students were registered for this class sequence. This study includes the assessment of the writing skills for seventeen registered students in these classes who volunteered to participate and signed a consent form. The assessment is based on evaluating students' writings for selected samples of their work during the classes.

The sample selection followed standard criteria, i.e. samples were chosen from work on assignments rather than exams to reduce time and stress factors. Students were notified that the quality of their writing is as important as the content of it for their assignments. Moreover, individual assignments were sampled as well as group assignments. A rubric was designed and distributed among participating students for the evaluation process. The writing skills were categorized as weak, moderate and strong. A survey was then designed and administered during the third class in the sequence in order to collect data from the students about their previous

writing skills, the background document they submitted during the first class, the proposal document they submitted during the second class, and the overall assessment of their writing experience and improvement in this capstone class sequence.

During the first class, students had several writing assignments including two short essays, a literature review analysis for their group project, and a final project background document. Because this is writing proficiency course, students were expected to write a draft of their assignments, receive feedback, and make revisions before submitting the final document at the end of the course. Moreover, students received a written explanation about the goals and expectations required for their assignment in addition to the grading rubric. During the second class, students focused on the project proposal background document, where they were asked to continue building on it as their projects progressed. Students were asked to submit the part they added to the document at the middle of the quarter to receive feedback, revise the writing in response, then combine and submit the document at the end of the class.

Results and Discussion of Assessment:

The very first two essay assignments that were not directly related to the capstone project document were evaluated based on the provided rubric (Appendix A). Results of the evaluation are as follows:

Table 1: Assessment of first two assignments

Criteria	Essay 1	Essay 2
Weak	0	2
Moderate	9	5
Strong	8	10

Results in table 1 show that the majority of students’ writing is in the moderate to strong scale which is expected from senior level students. Students received detailed feedback about their writing with regards to the rubric criteria, which they were encouraged to review in order to improve the quality of their future work. This was emphasized if they received a weak or moderate evaluation. The feedback was given to students in two ways; orally during individual group meetings and as written marginal notes on their paper submissions that were returned to them. To evaluate this process of feedback and to gain more perspective about the students’ experience during this process, a survey was designed and sent to the seventeen students. Eleven students responded to the survey.

As mentioned in the previous section, the survey included four categories:

- Previous writing skills,
- The background document the students submitted during the first class,
- The proposal document they submitted during the second class,
- The overall assessment of their writing experience in this capstone class series

All eleven students satisfied Western’s WP requirement, however, only two students mentioned having taken extra elective WP classes, those two students among those evaluated as strong writers during the two classes. The majority of the students rated themselves as average in

their writing ability when they first joined Western, and above average when they started these classes (table 2). Moreover, when the students were asked about improvement in their writing skills at the end of the second class in this sequence, 9 out of 11 agreed that their ability to communicate clearly via writing was significantly improved through the process of creating and editing the proposal and receiving the feedback.

Table 2: Results of survey first category; previous writing skills

Questions	Below Average	Average	Above average
Writing ability when you first enrolled at WWU	1	6	4
Writing ability at the beginning of fall quarter 2015	3	2	5
Enjoyment of writing at the beginning of fall quarter 2015	5	5	1
Ability to communicate ideas through writing	3	5	3
Ability to follow grammatical rules in your writing	2	5	4

When the students were surveyed about the effectiveness of the goals and expectations required for their final document, which was distributed to them at the beginning of the first class, the sample was split between agreement and disagreement that the expectations were clear (table 3). Most students referred to this in their comments as a lack of a standardized template. Addressing this could have eliminated any guesses that the students had to make in order to understand the goals and expectations of the assignment. However, after receiving the feedback on their writing, almost all of the students agreed that the feedback helped them understand the expectations and as a result contributed to the overall improvement of their writing.

Table 3: Results of survey second category; the background document during the first class

Questions	Yes	No
Clear goals and expectations	6	5
Clear grading rubric	4	7
Clear and helpful instructor feedback	10	1
Overall writing improvement	11	0

One interesting finding though is that the majority of the students did not find the grading rubric to be clear and usable during their writing process. One of the comments on this was that the rubric did not actually provide enough information about the structure and details of the information that needed to be communicated through the writing. Also, as the goal of the assignment was not clear to half of the students in the sample at the beginning of the first class, their ability to use the rubric in an efficient way was influenced negatively throughout the process. Based on these findings, the researchers suggest that the next time this class is offered, the instructor might provide a detailed explanation of the writing expectation with a detailed writing rubric. Also, providing a template with structured guidelines and examples of well-written samples (or the other way around) and preferably supporting this with in-class exercises related to writing proficiency, seem to be required elements of an effective writing proficiency course.

A subset of the questions regarding the grading rubric and instructor's feedback were posted again in the third survey category to gauge the students' understanding of the rubric after

more one-on-one feedback periods since this class carries a WP2 credit. Table 4 shows that the students felt the grading rubric was more clear and useful during the second class and that the instructor feedback was consistent with the rubric. This indicates that as the students gained an understanding of the goals and expectations of their assignment, their writing started to be more consistent with what is expected, and the grading rubric became more helpful to them. This emphasizes the importance of providing clear explanations of student expectations and provides them with examples of what good/bad writing looks like with a clear connection to the grading rubric.

Table 4: Results of survey third category; the proposal document during the second class

Questions	Yes	No
Clear grading rubric	10	1
Clear and helpful instructor feedback	10	1

The third survey category included a section where students could comment on the feedback they received from the instructor during the writing process. The question was open-ended and worded “Did the feedback you received from your instructor help you to improve the overall quality of your writing?”. Nine out of the eleven students reported that the feedback was helpful and productive. Comments included “feedback helped me focus on the important topics”, “it was helpful in terms of qualitative speech vs. quantitative speech when conveying information in paper and to sponsors”. One of the two students who said that the feedback was not helpful commented that this is in relation to the content of their technical work and said that “Since this requires me to shoehorn an incompatible project into the document described, this did not meaningfully improve my writing ability”, this re-emphasizes the point that the relation between clarity of assignments’ objectives and goals and students’ writing ability has a strong positive correlation.

At the end of the survey, students were asked to self-assess their writing experience throughout this class sequence. Table 5 summarizes the responses. When asked about the overall improvement in communication/presentation ability, the majority of the students responded positively about their improvements, however, they did not really specify if there were any specific improvements happened during this process in terms of grammar, style, or writing voice. The researchers think that this information can be better interpreted if the structure of the questions regarding the writing conventions was more clear to the participants, indicating that these questions need to be modified for future use.

Table 5: Results of survey second category; the background document during the first class

Questions	Agree	Disagree	Neither
Overall improvement of communication ability	9	1	1
Overall improvement in grammatical use	6	1	4
Overall improvement in style and voice	4	1	6
Overall improvement in quality/presentation of content	7	1	3

Final remarks:

This study serves as a pilot run for a 5-year research plan on outcome-based engineering-writing assessment at WWU. Listed below are some preliminary key findings that the researchers found to be significant at this early point in the study.

- The relation between clear assignment requirements and the writing ability demonstrated by students has a strong positive correlation (based on feedback).
- Students could benefit from different examples of what good/bad writing looks like with a clear connection to the grading rubric and given requirements/expectations.
- Students could greatly benefit from feedback on grammatical patterns of error, repetition/over explanation, and weakness in word choice/flow/voice.
- Generic writing rubrics may not be as beneficial to the students as a detailed rubric specific for their assignment, as more broad rubrics tend to use high-level language familiar only to those with strong writing and communication experience. Although these more open rubrics correctly detail the necessary information, they do so in a way that is inaccessible to those who lack this experience, unfortunately often also those that need the information the most.

Although it is still early to provide evidence on the level of proficiency that Western engineering students acquire in their senior level, the researchers think that this study sets a profound foundation for an ongoing evaluation of the process of adapting writing proficiency classes into the curriculum. The question that should be asked here is, “What is the expectation when a class CRN is followed by a WP designation? What are the criteria that should be implemented into the class and how can we actually teach writing skills in these classes rather than just evaluating them? “