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Instructor Feedback and Its Impact on L2 Engineering Students' Revisions

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Abstract: The objective of this case study is to examine the use of instructor feedback in L2 learners' revision of their engineering reports. Seventeen third year engineering students at a university in Malaysia participated in this study. Instructor feedback and students' revisions in their first and final drafts were the primary data collection instruments. Content analysis was used to analyze the written work. Findings highlighted that most of the instructor feedback triggered students' revisions, which consequently resulted in significant writing improvements in the students' final drafts. Two major recommendations of this study are: one, a structured collaborative supervision between writing instructors and the engineering faculties can reap positive results in students' writing development. Two, wiki can be efficiently used as a feedback-revision tool for the implementation of a structured collaborative supervision.

Keywords: Feedback, Revision, L2 Learners, Engineering Students, Report-Writing.

1. Introduction

Communication skills is a part of the criteria included in the Accreditation Board for Engineering and Technology's (ABET) Engineering Criteria 2000 (EC 2000) and is a required program outcome for the accreditation purpose of engineering programs. Under its Criterion 3g, graduates of engineering programs "must demonstrate an ability to communicate effectively" (ABET, 2013: 1). This puts a great emphasis on developing engineering students' communication skills, specifically speaking and writing skills. This sentiment is echoed by employers who seek employees who can effectively communicate with stakeholders (Yaacoub, 2011). Studies conducted within the second language (L2) context such as Malaysia, too has observed that professional engineers and employers value effective English communication skills, especially good writing skills (Kassim & Ali, 2010; Nordin, 2013). The studies suggested that having effective writing skills is a bonus to new graduates because a considerable amount of an engineers' working hours is spent on writing technical documents such as reports and proposal

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writing, while speaking skills will help in expressing the ideas efficiently. As such, higher education institutions must be put to task to ensure that engineering graduates have the required communications kills.

The expectations from the accrediting body and employers pose a new challenge for engineering faculties and a major question which needs to be answered is: who is responsible for teaching and assessing these skills? Students are often left to develop the skills on their own, perhaps facilitated by faculty members who do not possess expertise to teach technical writing or taught by writing instructors in stand-alone technical writing courses. The ABET program outcome has made it essential for engineering faculties to find ways to collaborate closely with their language department to develop students' communicative ability within the engineering discipline. In 2000, Willliams suggested designing programs which integrate the teaching of engineering content with communication skills (ie writing) within the same course, with both content/ faculty instructors working collaboratively with those from the language department. That was two decades ago but Huang in 2017 is still highlighting the need for collaboration between writing and content instructors. The basis for the suggestions is that when students are taught by content instructors who are not trained to teach writing, the instructors may adopt their own beliefs about writing to teach the skill which may not benefit the students. Conversely, writing instructors who are not engineering content experts may find difficulties in providing sound instructions on the specificity of the content.

Reave (2004) who conducted a survey of 73 top-ranked engineering schools in the US and Canada found five types of collaborations between engineering content with writing instruction, which are partnership, team teaching, communication modules, expert feedback, and communication across the curriculum (CAC) programs. The study concluded that the best approach is CAC because the program is often in the form of writing instruction that is distributed across all engineering courses and students are required to develop a writing portfolio of all the work in these courses which are then evaluated by faculty and language/ communication faculty instructors.

In Malaysia, it is observed that technical writing courses are mostly taught by writing instructors without proper consultation with engineering faculties. It is taught in isolation from engineering content and students often find various difficulties in applying what is learnt in these classes to their engineering faculty writing tasks. Understanding that measures need to be taken to develop engineering students' writing skills to meet the requirements of the accreditation body and needs of the industry, has motivated this study to investigate the feasibility and impact of feedback in the form of online language support, on engineering report writing skills. The research questions for the study are as follows:

1. Do language instructor feedback lead to students' revisions via wiki?
2. Do students' revisions lead to writing improvement?

Hence, this paper reports on a case study which examined the effects of a language instructor's online support on engineering students' revisions and report writing skills. This study focused on a collaboration between an engineering faculty and the language department in supervising students with their final year engineering project report. The aim was to investigate whether the provision of language feedback to students could lead to improvements in their report-writing. It elaborates on the process, the types of instructor feedback given and revisions students made via wiki.

1.1 The Effect of Feedback on Revision and Writing Quality

Feedback strategies can vary according to the type, function, source and medium in which feedback is provided; each shaping revision differently (Hyland, 2000; Lira-Gonzales & Nassaji, 2020). For instance, content feedback is often used to address the adequacy, clarity and organization of content whereas form-focused feedback usually draws attention to language/grammar-related problems such as tenses, word choice and mechanics of the text. Research of ESL writing classrooms have shown that feedback provided either by the instructor, peers or others such as professionals, either given face-to-face or online can facilitate quality revisions (e.g Ashwell 2000; Hyland 2000; Liu & Sadler, 2003;

Song, Lee, & Leong, 2017). Thus, feedback has its function in encouraging revisions which may lead to improved text quality.

In regards to revision, researchers have however been more cautious in identifying which type of revision (surface or meaning revisions (Faigley & Witte, 1981) results in better text quality. Some researchers claimed that meaning changes have been observed to result in text improvement (Min 2006). Other researchers cautioned against making simplistic conclusions about the relationship and have gone on to explore this claim and suggest that even formal changes such as edits in spelling mechanics or word substitution can result in text improvement if students successfully revised the error (Ashwell 2000; Stevenson et al. 2006). The juxtaposition points to the fact there is no conclusive evidence to support claims that one type of revision is more superior to another. However, body of research points to an important element for writing instruction which is the fact that students' revisions can enhance their writing skills. However, Zhang and Hyland (2018) suggested that an important element other than the type of feedback is students' engagement with the feedback which can results in successful revisions.

In terms of efficiency, the feedback-revision process is one of the meticulous and tedious processes in the writing process. A lot of classroom time is taken up for this purpose which may be taxing on the instructor specifically due to class size and schedule, students may not be receiving immediate feedback. In addition, tracking of feedback and revisions may prove to be difficult in a pen-and paper-based classroom. Findings from studies exploring the use of online feedback have indicated positive impact of computer-mediated or automated feedback in increasing the number of feedback exchanged with peers and instructor (Braine, 2001; Liu & Sadler, 2003; Zhe & Zhang, 2018). It was also observed that students receiving feedback through this medium revised their drafts more frequently and consequently improved the quality of their writing more than ESL students receiving face-to-face feedback (Hewett, 2000; Liu & Sadler, 2003; Tuzi, 2004). This could be the result of the environment provided by computer-mediated communication (CMC) tools which is conducive, less anxiety-ridden and allows for an "expanded audience" (Tuzi, 2004: 232). Computer-mediated feedback also increases the immediacy of feedback and this is a feature that students expect in a writing classroom. Golz (2001) found that the students liked the idea of receiving immediate reaction to their work in group conferences with their peers and instructor, as well as having the opportunity to get to know their instructor and peers in a more casual environment. However, there is little research indicating the impact of online feedback on revisions and writing quality. Further research in the area of online feedback, revision and writing quality is justified to enhance the body of knowledge and facilitate writing instruction.

2. Materials and Methods

Due to the tenuous and tentative nature of this study, the researchers felt that a qualitative research design would be a more suitable option. A case study research design was adopted and measures to ensure the rigor and trustworthiness were taken which included: triangulation of data sources, keeping a detailed audit trail, conducting repeated observations, recording and transcribing interviews, peer examination of findings and clarifying researcher's biases. As one of the researchers was also the language instructor assuming a participant-observer role, clarifying the researcher's biases is an essential element in ensuring that there was no threat to the trustworthiness of the study (Fraenkel & Wallen, 2006). Content analysis of the data collected helped provide an in-depth explanation of this phenomenon (Wiersma, 2000). However, the researcher also felt that the inclusion of some quantitative data would better explain the effects of the language support on students' report writing. The instructor feedback and students' revisions were enumerated for frequency and percentage. A non-parametric test was also used to test the significance of writing improvement between students' first and final drafts.

This study was carried out at a technical university in Malaysia and the aim was to provide language support to final year engineering students who were in the process of writing their final year report. It was conducted over a 10-week period and students who were enrolled in a final-year undergraduate course, Undergraduate Research Project, participated. Attrition rate was high and the number of participants which was 74 at the beginning of the language support classes reduced to 17 by the third week; of the seventeen; 8 were male and 9 females. Throughout the duration of the study the students were assigned by their content/ faculty supervisor to write a research report based on an engineering

topic that they had discussed. The report comprised of five chapters: introduction, literature review, methodology, results and conclusion. The researcher and the students met once a week for a duration of two hours in the first five weeks of the study (Table 1). In these sessions the researcher, as the language instructor, provided input on how to write and organize the content of each chapter as well as provide expert feedback through wiki as students wrote their drafts. The remaining 5 weeks of the study was dedicated to feedback and the researcher provided feedback via wiki each time students revised their report.

Content analysis was used to examine the data from interviews and documents. Scoring rubric were used to evaluate the students' drafts, instructor feedback and students' revision. Two raters were used for each analysis and training of raters to examine the data was conducted and a simple agreement of 90% was achieved for all ratings. Inter-rater reliability was also tested on all ratings or coding. Table 2 summarizes the data collection instruments and analysis methods applied in the study.

3. Results & Discussion

3.1 Results

Instructor Feedback and Students' Revisions via Wiki

The feedback was analysed using Stern and Solomon's (2006) coding categories which divides feedback into four types of comments: global, middle, micro and other types of comments. Within each type the feedback was further divided into various categories, for example within micro type feedback the categories included word choice phrasing, missing words and pieces, grammar or punctuation, spelling or typos, technical style, and references or citations. The inter-rater reliability (Kappa) for this instrument is 0.74 (Stern and Solomon, 2006) which indicates a strong reliability.

In this study, most of the instructor feedback provided were at micro level or form-focused feedback (63.4%), but there were also other types of feedback (13.7%) apart from middle (22%) and global (0.9%) level feedback indicating that the students did receive a variety of feedback via wiki from the writing instructor via wiki (see Table 1).

Most of the micro level feedback given were for missing words and pieces (23.5%) followed by feedback on word choice (16%), grammar/ punctuation (11.4%), references/ citation (7.2%), technical style/ formatting (5.1%), and spelling/ typos (0.3%). It can be observed that the feedback given mainly dealt with the errors made by the students in their reports. From the types of feedback given it suggests that most of the errors students made was in the language, mechanics and organization of the reports.

Table 1: Types of Feedback Provided

FEEDBACK LEVEL	Types of Feedback Provided			TOTAL	
		n	%	n	%
GLOBAL LEVEL	Overall paper quality	7	0.5		
	Paper structure & organization	6	0.4	13	0.9
MIDDLE LEVEL	Quality of specific thought & claims	29	1.8		
	Procedure & techniques	1	0.06	343	22
	Clarity of content	256	16.3		
	Paragraph & sentence structure/ style	57	3.65		
MICRO LEVEL	Word choice phrasing	249	16		
	Missing words & pieces	366	23.5		
	Grammar/ Punctuation	178	11.4	989	63.4
	Spelling/ Typos	4	0.3		
	Technical style/	80	5.1		

	Formatting				
	References/ Citations	112	7.2		
OTHER	Personal expressions	6	0.4		
TYPES	Scholarly advice	176	11.3		
	"Road maps"	9	0.6	21	13.
	Question posed	17	1.1	4	7
	Direct comments	5	0.32		
	Other	1	0.06		
	Total			15	10
				59	0

Analysis of the students' reports revealed that more than half of the revisions done were surface changes and the remaining 17.4 % were meaning changes. The surface changes were formal changes which neither changed the meaning of nor added new information to the text such as changes in spelling, formatting and tenses, modality or punctuation. On the other hand, the meaning changes were mainly macrostructure changes which altered the gist of the text such as additions or deletions of elaborations in the report (Table 2).

Table 2: Students' revisions via wiki

Surface changes		**Meaning changes**		**Total**
Formal	**Meaning preserving**	**Micro Structure**	**Macro Structure**	***n (%)***
937 (51.2)	574 (31.4)	114 (6.2)	205 (11.2)	1830 (100)

One of the reasons given by the students for making more surface than meaning revisions were that they usually obtained ideas for their report from journal articles and were afraid that if they changed too much of the original sentence they would distort the meaning due to their low language proficiency. Therefore, they would just substitute words or phrases rather than change the whole sentence or paragraph leading to occurrences of plagiarism. In addition, the subject-matter; engineering, was difficult so they did not want to jeopardize their assessment marks by altering too much of the original texts and distorting the meaning. This was something that was allowed by their faculty supervisor and a reason for this could be because "patch writing" and copying words from others was something permissible in science and technology writing. The medium for writing, i.e. wiki, could have also contributed to the types of revisions made by the students because making small, spontaneous edits is less taxing online than with pen-and-paper (Chen, et al. 2005). Furthermore, the types of instructor feedback could have also been an influence on the students' revisions. The instructor feedback was mostly at micro level or form-focused feedback which may have resulted in the more surface revision comprising mainly changes in spelling, formatting and tenses, modality or punctuation.

In the interviews with students, some of the students claimed that they revised everything after receiving feedback via wiki, while others said they revised between 20 – 70 % of the feedback given. However, in reality the students used most of the language instructor feedback and Table 3 illustrates the comparison between feedback given and revisions made via wiki.

Table 3 Comparison between feedback and revisions via wiki.

Student	**Writing instructor feedback**	**Student revision**	**% of feedback used**
S1	128	104	81.3
S2	89	73	82
S3	123	81	66

S4	78	52	67
S5	136	112	82.4
S6	43	35	81.4
S7	107	100	94
S8	85	75	88
S9	72	62	86
S10	107	67	63
S11	72	59	82
S12	52	37	71
S13	91	82	84
S14	41	35	85
S15	226	220	97
S16	86	75	87
S17	23	13	57
Total:	1559	1282	

Generally, the students valued the language instructor feedback and they said:

> S1: I think all elements (of feedback) are important for me like contents, language and all that to write the best thesis (report) [sic].

> S4: For me, if my reader cannot understand my writing, I like the way they criticize like put in details and state what sort of process like format and things like that. Although it supposedly technical report, if the message is not delivered, how can I write a good article (report) right? [sic]

Evidently, instructor feedback led to students' revisions as seen in the percentage of feedback used by the students, which was between 57 to 94 percent of the feedback provided in the language support via wiki. Although there was only a moderate correlation between the two variables (r = 0.54), the main finding reflects the influence of language support in facilitating students' revisions. This suggests that language support is indeed a welcome and beneficial collaboration to have between the language and engineering departments, which could lead to writing improvement in the students' report-writing.

Writing Improvement

As a way to gauge the effectiveness of the feedback and revisions on students' writing quality their first and final drafts were assessed by two independent raters using the ESL Composition Profile (Jacobs, et al., 1981) for the reports. In this study, the inter-rater reliability of the assessment rubric was at Cronbach alpha coefficient was ά = .82 which indicates a good reliability.

Figure 1 illustrates the impact the feedback and revisions from the language support helped improve the reports in terms of the quality of language, vocabulary and organization.

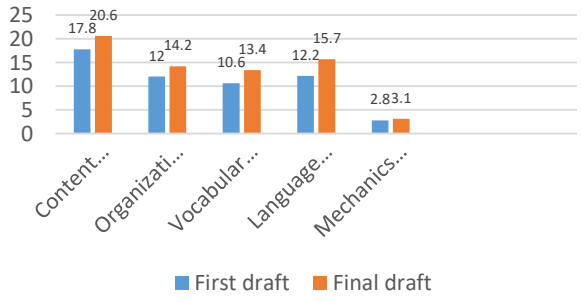

Figure 3: Students' mean writing improvement between the first and final drafts using ESL Composition Profile

The students improved the most in the language of their reports (3.5 %), followed by delivery of content (2.8 %), vocabulary (2.8%), and organization (2.2 %). The component in which the students showed the least improvement was the mechanics of their reports which was only 0.3 percent. The mean improvement was 11.9. This suggests that the students made many revisions in the language of their reports which included revising their vocabulary and organization. It is observed that this was done in response to the comments made via wikis by the writing instructor.

Again, to gauge if there was a significant improvement between the drafts a Wilcoxon signed-rank test (Wilcoxon test) was used. Table 7 illustrates that there was a significant improvement between the first and final drafts where the mean rank for negative ranks was 5.00 and the mean rank for positive ranks was 9.25 ($z = -3.385$, $p = .001$).

Table 4: Writing improvement between first and final drafts assessed using ESL Composition Profile

N		**Mean Rank**	**z**	**p**
a. Negative Ranks	1	5.00		
b. Positive Ranks	16	9.25	-3.385[a]	.001
c.Ties	0 Total 17			

a. Based on Negative ranks: Final draft < First draft
b. Positive ranks: Final draft > First draft
c. Ties: Final draft = First draft
Significant at $p \leq 0.05$

3.2 Discussion

This study was primarily aimed at investigating the impact of a structured collaborative supervision between content and language instructor on the development of ESL engineering students' report writing skills. It specifically looked at the language instructors' feedback, students' revisions and writing development after feedback and revision.

Firstly, the findings indicate that instructor feedback did lead to students' revision. Although there was a moderate correlation between the two variables, the percentage of feedback used by the students was high. Students in this study used the feedback provided to them to revise their reports. Thus, it could be noted that the feedback provided via wiki by the language instructor led to student revisions supporting findings from studies by Ashwell (2000), Hyland (2000), Liu and Sadler (2006) Song, Lee, & Leong (2017) and Lira-Gonzales & Nassaji (2020), which suggested that feedback given by peers or instructor could lead to students revising their work.

In addition, the students' revisions were successful in improving the students' report writing skills in most aspects of the report that was assessed such as: content, language, organization, delivery of content, vocabulary and mechanics. There is literature on ESL writing process which indicates that ESL writers' revisions do not often lead to improved text quality especially when they make more surface than meaning level revisions (Min, 2006). Findings in this study negates results from those studies but confirms that of other studies which postulate that any type of feedback can lead to successful revisions, regardless of whether they are surface or meaning level revisions as long as students revised successfully (Ashwell 2000; Stevenson, et al. 2006). Therefore, Faigley and Witte's (1981) caution to not make simplistic conclusions as to which type of revision would lead to improved text quality holds true still. This study contributes to the area of feedback and revision through illustrating that even with surface revision revisions can successfully lead to positive writing development. In terms of the language support collaboration with the engineering faculties, the study illustrates how it can be carried out especially when online platforms are utilized as in this study.

4. Conclusion & Pedagogical Implications

The findings of this study suggest that the use of wiki to mediate feedback and revisions in developing the students' report writing skills was successful. The feedback received via wiki was well-accepted by the students and used in their revisions. The students' revisions were also successful in improving their reports and report writing skills. It can be said that this indicates that wiki is a suitable online tool for the structured collaborative feedback whereby feedback and revisions are clearly visible on the web pages for both students and instructors to track writing development. Thus, wiki offers a conducive platform for effective and efficient of provision of language support and collaborative supervision by the faculty supervisor and writing instructor.

The researcher puts forth two major implications from this study for writing instructors who would like to start a structured collaborative supervision and provide language support to engineering students writing their final year project reports. Firstly, language support should have a place in engineering education. Findings from this study illustrates that students made significant writing improvements especially in the language, organization, and vocabulary of their reports. However, prior to the collaboration the faculty supervisor and writing instructor need to discuss a mutual schedule which would optimize students' time and effort as well as benefit them in the long run. Specific guidelines should also be drawn out on what are the responsibilities of the faculty supervisor and writing instructor respectively. This would avoid inconsistent and redundant supervision which may waste students' time. A logbook recording student's interaction with both the faculty supervisor and writing instructor should be used as an audit trail for all that is discussed and feedback that are given to the student. For this purpose, wiki can provide the platform for e-logbook as the facilities it provides makes it easy to trace feedback given, revisions made and improvements in text quality. In addition, the collaborative supervision has to be scheduled in the students' time-table and course registration so that they will commit to the class. As observed in this study, due to the voluntary nature of the language support classes attrition rate was high.

Secondly, the use of wiki as a feedback-revision tool for a structured collaborative supervision should be recommended. In the literature, and also in this study it is stressed that wiki is an effective and efficient computer-mediated tool for the process writing classroom whereby feedback and revisions are clearly visible through wiki History facility. However, one thing that is noteworthy in this study is that the feedback via wiki was only provided by the writing instructor. Future collaborative supervision should include the faculty supervisors' feedback too. In this way, the students' writing development could be easily tracked and the impact of feedback from both the faculty supervisor and language instructor could be clearly measured and compared. In this case, more feedback could have been provided to the students if a more supportive teaching and learning environment is evident. With proper dissemination of information on how wiki could facilitate teaching and learning, and training on how to use the tool for that purpose, greater results could have been possible. Thus, dissemination of information on the merits of wiki and training faculty supervisors, language instructors as well as students on how to use the tool effectively are essential to its implementation in a structured collaborative supervision.

Finally, this study has taken a step to suggest that structured collaborative supervision is feasible through the use of online tools and can also help fulfil the expectations from the accrediting body and employers, who demand graduates with effective English communication skills, specifically in writing skills.

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