The Role of Feedback in Enhancing Students' Learning Experience: An Evaluation of Student Perspectives and Attitudes

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Abstract

Feedback is a key element in the development of students' understanding and evolution in their learning process. Students receive feedback in so many forms including peer feedback, instructor feedback and external feedback from employers or other industries. For this feedback to be valuable, students need to appreciate it, act on it, and consider it as part of the learning process. The literature shows that there is a discrepancy between instructors' objectives for feedback and students' perception of the effectiveness of feedback to improve learning. Mostly, students tend to focus on grades rather than reflect on the feedback and take actions to improve their learning. Even when instructors give detailed personalized comments in students' delivered work, the students may not reflect and take actions unless the reflection is part of the grading process.

This paper conducts a review of the types of feedback students receive in their undergraduate studies in five different programs: architectural engineering, civil engineering, engineering technology management, environmental engineering, and geological engineering. In addition, a survey is administered to students to understand feedback techniques used in engineering undergraduate programs. In the survey, students reflect on the types of feedback they received, and indicate which types of feedback they believe are most effective in their learning development. The survey also evaluates how the perception of effectiveness of the type of feedback is influenced by demographic factors. This paper discusses the first stage of the research project. The next stage includes developing an information session for students that is informed by the survey results and the literature. The information session aims to provide students an understanding of how to utilize different types of feedback. Students will then be interviewed a year later to determine if their perception and use of feedback has changed.

Introduction

Classroom assessments extend beyond just collecting information about students' learning. Instead, good practices of assessment in institutions of higher education aims to evaluate students learning and support improvement in learning. This is accomplished via summative assessments and formative assessments. Summative assessments evaluate learning at the end of instruction and are essentially the grade. On the other hand, formative assessments occur during the learning process. Assessment practices can play a significant role in students' learning experience [1]. Assessment influences learning in several ways including providing self-confidence and motivation to students, encouraging both active and passive learning styles, evaluating and reinforcing learning, and emphasizing what is important and providing feedback [2]. However, the quality of assessment is based on the practices employed by instructors [3]. Good practices for assessment integrate the three key elements of teaching and learning including active learning, frequent feedback and regular interactions between students and teachers [4]. Assessment and feedback are crucial components in teaching and learning in engineering education [5]. Therefore, the impact of assessments on students can be significantly influenced by the quality of feedback they receive.

Feedback serves various purposes including notifying students about their current performance, their achievement of course objectives, and bridging the gap between students' current performance and desired performance [6]. Furthermore, good feedback practices encourage self-assessment, provides clarification on what is good performance, motivates and fosters self-esteem and informs the instructor's teaching [7].

According to Subheesh, N. P., & Satya, S. S. [5], assessing engineering student's learning is significantly more challenging due to several factors including the fact that engineering students need to develop skills to design and conduct experiments, use engineering tools and techniques, analyze and interpret data, and work in multidisciplinary teams. Therefore, the feedback provided to students must also take these challenges into account.

There are several ways of classifying feedback including formative versus summative, and formal versus informal. Summative feedback, which is often connected to a grade, usually occurs at the course, and focuses on summarizing the teaching and learning process. Examples of summative feedback include exams, projects, and portfolios. Formative feedback provides guidance to students on the gaps in their knowledge, resources needed, and learning strategies needed to meet the course outcomes. Examples include in classroom feedback from instructors and peer feedback. Other types of formative feedback employed in engineering ranging from content feedback [8], to IT-based automated delivery of real time individual student feedback [9] [10]. The feedback generated on student performance can be used by instructors for early intervention for students to achieve the target learning outcomes [11]. Formative feedback has been shown to be effective in enhancing students learning. However, the effectiveness of formative assessment and feedback is dependent on the type of learner and the learning outcomes [12]. Formative assessment and feedback can enhance students' self-reflection on their learning experiences which can lead to students' being more proactive about their learning [8]. Formal feedback typically occurs at the end of the learning cycle and include high stakes activities including exam. This type of feedback is based on assessment with pre-defined criteria. Typically, formal feedback is summative in nature and provides information on a student's level of knowledge. On the other hand, informal feedback is typically integrated with other activities and are usually formative in nature. Since informal assessments are usually low or no stakes, students can receive feedback to improve their learning without the stress associated with formal assessments.

To be effective, however, feedback must be timely, informative, and engaging to the students to lead to learning improvement [13]. Feedback should inform the students about what areas they need to improve on and provide guidance on how they can carry out the improvements or revisions [2]. Provision of both on-time and helpful feedback during instruction and learning is key. As found by Pellegrino et al., 2001 [13], receiving feedback on their work in real time can allow individuals to acquire a skill faster.

It is also important that students take a leading role in the feedback process, thus switching from a teacher-centered to a learner-centered practice [14]. Students need to work on receiving and applying feedback from different resources such as instructors, peers, etc. [15]. There are several tools proposed to enhance the reception and application of feedback such as ipsative process [16]. As such it is important to better understand from the students' perspective how feedback is perceived, what type of feedback they value and to work with them on training skills to allow them to benefit from feedback and take more of a leading role. This paper discusses the initial stage of

a research project where data is collected to better understand students' perception on feedback. The results are considered in the preparation of training tools that will aid in the feedback process and will be conducted at a later stage.

Data Collection and Rationale

Data collection was conducted using an internet-based survey tool that was administered to engineering students in University X. The survey was administered to students over a 2-week period. The survey was designed to collect information from students on a wide range of topics related to students' attitudes and perceptions about the feedback they have received during their engineering undergraduate education. The two types of assessment were clearly defined in the survey for clarity as follows. [17] [18]

Formative assessments feedback: these assessments aim to monitor student learning experience for ongoing feedback that can be used by both instructors, as a tool to improve their teaching, and by students for learning improvement. Examples of formative assessments include homework, quizzes, surveys, and in-class discussions or group work.

Summative assessments feedback: these assessments aim to measure student learning at the end of an instructional unit by comparing their performance against a standard or a benchmark. Examples of summative assessments include midterms, finals, papers, projects, and portfolios.

The initial section of the survey assessed students' experiences with both formative and summative assessments feedback. Students were asked to indicate on a 5-point Likert scale their level of agreement or disagreement about several statements that aim to understand if students perceive formative and summative assessments and feedback as helpful to their learning. In addition, students were asked if they like the two types of assessments, and if they had a preference. The rationale behind these questions was to establish a baseline about students' attitudes and perceptions about the two types of assessments and feedback. This baseline will then be used to evaluate how students respond to other questions in the survey. The assumption is that students that have a more favorable attitude to the baseline questions are more likely to have positive experience regarding feedback they received in their degree program. On the other hand, it is assumed that students that indicate a negative attitude about assessment are more likely to indicate a negative experience with the feedback that they received. Some statements in this group are shown below:

- *Formative (or summative) assessments help me learn.*
- *Feedback received from formative assessment (or summative) helped me learn.*
- *I like formative (or summative) assessments.*

The second part of the survey assessed the sources of feedback students have received over the course of their studies including the sources within the university, such as instructors, peers, and teaching assistants, as well as sources outside the university, such as employers and family members. These questions were intended to determine the range of sources of feedback that students receive and how helpful they perceive this feedback. Furthermore, students were asked

about the forms of feedback that they receive including written, oral, discussion forums. Additional questions asked students to rank the forms of feedback in order of usefulness. This information is important as it provides elucidation on the perceived usefulness and perhaps importance of the modes of feedback they receive.

The third part of the survey evaluated the adequacy of the feedback received and the degree to which students reflect upon and incorporate the feedback into future work. Students were asked to indicate the degree to which they agree or disagree with representative statements. As previously stated, a key feature of formative assessment is that it enables students to self-assess and to improve on their learning. These survey questions assess the effectiveness of the feedback received by students to achieve these objectives. Example statements are included below:

- *I incorporate the feedback received in future work.*
- *I reflect on the feedback received.*

Lastly, the survey asked for the demographic information of the survey respondents. The demographic information is used to determine if there are variations in survey responses based on gender and ethnicity.

Survey Results

The survey was administered to students in their first- and second-year engineering programs. Sixty-two responses were collected when this paper was written. However, this paper is a work in progress where more data is still to be collected to reach more definitive conclusions. The paper reports on the results of the preliminary data collected only. The aim is to understand the initial perception from the students on the feedback received and its effect in their education.

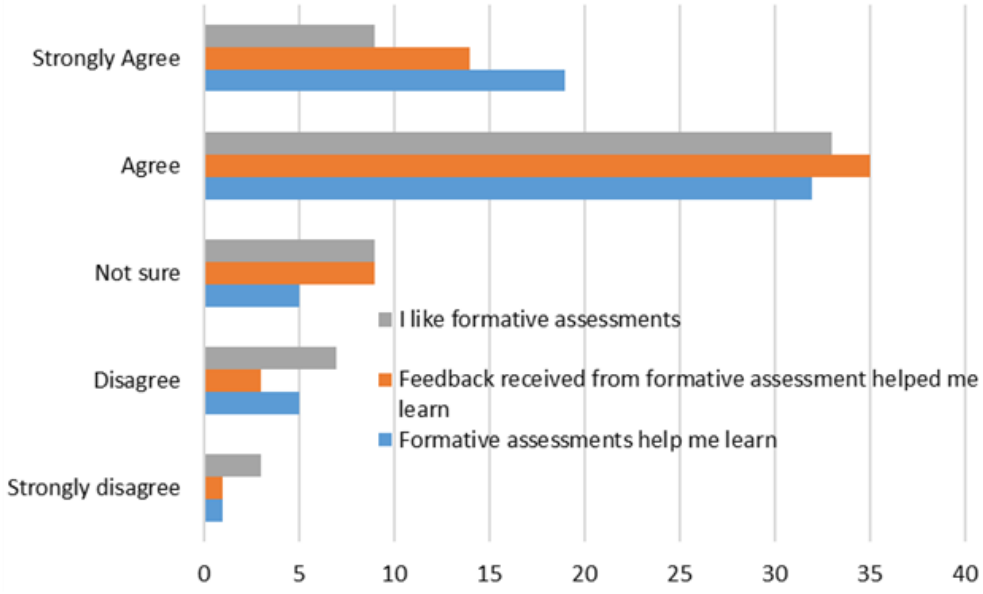

Figure 1 Students' experience with formative assessments; Likert scale versus number of students

Figure 1 shows the results of the students' experience with feedback received from formative assessments. Most of the students agree and/or strongly agree that formative assessment (82%)

as well as the feedback received on formative assessment (79%) helped them learn. 69% of the respondents like formative assessments compared to 16% who do not like formative assessments.

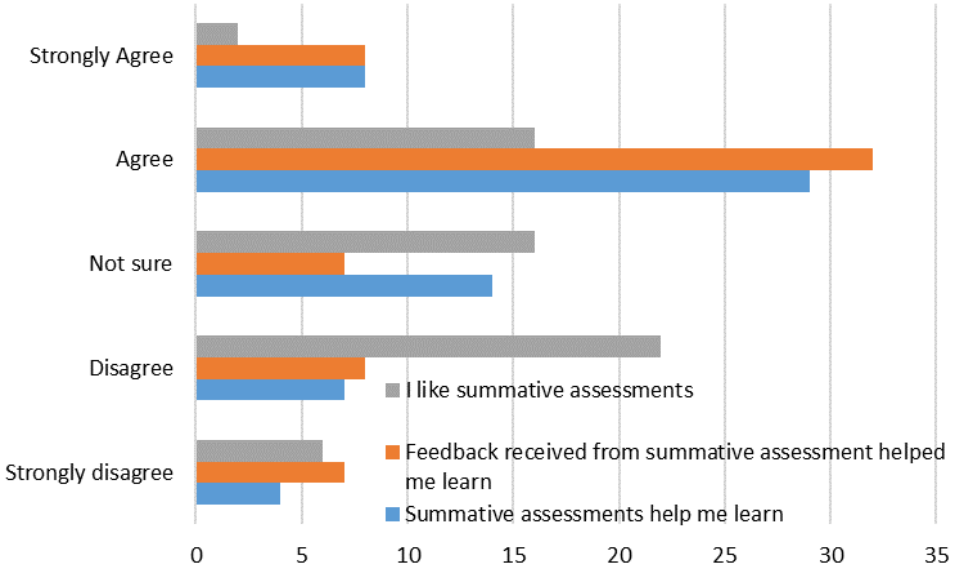

Figure 2 Students' experience with summative assessments; Likert scale versus number of students

Figure 2 shows the results of the students' experience with feedback received from summative assessments. Students in general agree that summative assessments (60%) as well as the feedback received from summative assessments (65%) helped them learn. However, 45% of the respondents do not like summative assessments (strongly disagree and disagree), 26 % are not sure and only 29% like summative assessments. This is much lower than the 69% of students who like formative assessment.

The results were then compared by demographics to check if demographics had any effect on students' perceptions as seen in Table 1. 69% of the students prefer formative assessments while only 31% prefer summative assessments. This result did not change by race or gender as the majority still preferred formative assessment over summative assessment as seen in Table 1.

Table 1 Assessment type preference with respect to race

	Total	***Indigenous***	***Black***	***East Asian***	***Latino/a,***	***Middle Eastern***	***South Asian***	***Southeast Asian***	***White***	***Another race/ethnic category***	***Prefer not to answer***
Formative assessment	69.3 %	0.0 %	66.7 %	66.7 %	50.0 %	83.3 %	62.5 %	75.0 %	69.0 %	100.0 %	75.0 %
Summative assessment	30.7 %	0.0 %	33.3 %	33.3 %	50.0 %	16.7 %	37.5 %	25.0 %	31.0 %	0.0%	25.0 %

Students were then asked to choose the sources they have received feedback from. They were allowed to have multiple choices. Table 2 reports the choices done by the students and their percentages. Students acknowledge receiving feedback from different sources. The lowest percentages are from family members and employers, while the highest percentage feedback was received from peers.

Table 2 Sources of feedback received by students

Answer	%	Count
Peers	92.06%	58
Instructors	84.13%	53
Teaching assistant	73.02%	46
Employers	53.97%	34
Family member	52.38%	33
Other (please specify)	0.00%	0

Table 3 reports the helpfulness of the feedback received from the different sources as perceived by the students. Most students reported that they found the feedback received by instructors to be helpful or very helpful (78%) as well as feedback received from peers (75%). This is consistent with where students receive most feedback as reported earlier from Table 2.

Table 3 Helpfulness of feedback received from different sources

Question	Not applicable		Very unhelpful		Unhelpful		Not sure		Helpful		Very helpful	
Peers	1.59%	1	3.17%	2	6.35%	4	12.70%	8	53.97%	34	20.63%	13
Employers	19.05%	12	0.00%	0	1.59%	1	15.87%	10	34.92%	22	23.81%	15
Family member	22.22%	14	0.00%	0	6.35%	4	11.11%	7	41.27%	26	15.87%	10
Teaching assistant	7.94%	5	1.59%	1	6.35%	4	22.22%	14	44.44%	28	14.29%	9
Instructors	3.17%	2	3.17%	2	3.17%	2	11.11%	7	41.27%	26	36.51%	23
Other	41.27%	26	0.00%	0	0.00%	0	14.29%	9	1.59%	1	3.17%	2

Figure 3 shows the reflection of the students on the feedback received. Ninety percent and 94% of the students reported agree or strongly agree to reflecting and incorporating the feedback received respectively. Seventy-seven percent of the students agree or strongly agree that the feedback they received during their undergraduate studies was helpful. 53% only of the respondents agreed or strongly agree that the level of feedback received during their undergraduate studies was adequate. Further discussion is requested here to understand from the students what constitutes adequate feedback.

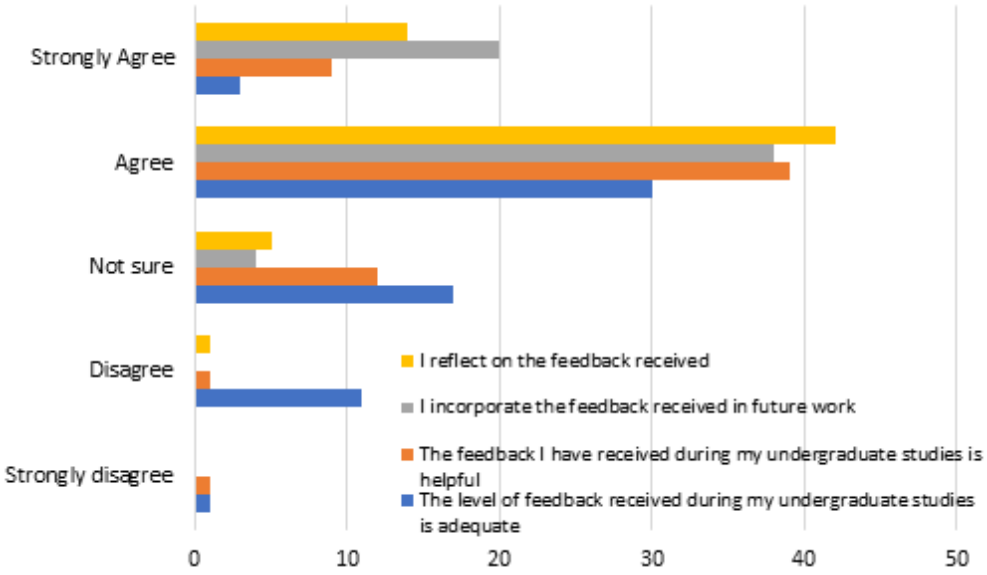

Figure 3 Reflection by students on received feedback; Likert scale versus number of students

Most of the students reported receiving written and oral feedback. About 35% of the students chose discussion forums and none registered receiving other types of feedback as shown in Table 4. Note that the students were allowed to choose multiple answers for this question.

Table 4 Types of feedback received

Feedback received	Percentage %	Count
Written feedback	87.30%	55
Oral feedback	85.71%	54
Discussion forums	34.92%	22
Others (specify)	0.00%	0

Table 5 Ranking of the type of feedback received

Rank	1	2	3	4	Total
Written feedback	25.00%	17.86%	33.93%	23.21%	56
Oral feedback	21.15%	34.62%	15.38%	28.85%	52
Discussion forum	18.18%	34.09%	40.91%	6.82%	44
Others	33.33%	19.05%	4.76%	42.86%	21

The students were then asked to rank the feedback received (Table 5). Most of the students ranked written feedback as their number one received feedback followed by oral feedback. This

preference may be because students mostly recognize written and oral feedback compared to other types of feedback. It is important to note that students ranked “other” feedback, however they did not state what “others” are and did not choose “others” as a type of feedback received in the previous question.

Conclusions and Recommendations

This paper is a work in progress with an initial stage completed where students were asked to clarify their preferences of feedback and reflect in their helpfulness. While students value the feedback received from their peers and instructors, they value the feedback received from instructors better than those received from their peers. Most students surveyed perceive the level of feedback received from their instructors at the undergraduate level to be adequate. However, it is unclear what students perceive as adequate feedback and how do they use feedback in their learning process.

A suggestion for follow up is to explicitly ask students in a written assessment what helped them learn, how did they interpret the feedback. This could be a reflection exercise after feedback is provided on one or more assessments, thus ensuring that students look back at the feedback received. Asking students to reflect on the purpose of the instructor’s feedback and how the feedback can be used to improve their learning can help instructors become more aware of how their feedback is being interpreted by students. Furthermore, such feedback from students would provide an opportunity for discussion and can help instructors to revise their future assessment feedback.

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