

Use of Early Semester Student Feedback for Enhancing Effectiveness of Teaching and Learning

Indrajith D. Nissanka (1st Author)
Faculty of Engineering
University of Moratuwa
Katubedda, Sri Lanka
nissankai@uom.lk

Gayani K. Nandasiri (2nd Author)
Faculty of Engineering
University of Moratuwa
Katubedda, Sri Lanka
gayanin@uom.lk

Abstract — Student feedback in basic engineering modules is important, as the module involves the application of theory into practice. The feedback is used to assess the teaching and learning process at the end of the semester, which is the current practice. This mainly focuses on summative assessment through quantitative scores, where feedback is addressed in subsequent academic years. The early semester feedback can be used to improve the teaching and learning process within the semester itself. It can be designed as formative feedback, focusing on meaningful improvement of the teaching and learning. Hence, it is explored whether early semester feedback can be applied for enhancing the effectiveness of teaching and learning process. In this study, early semester feedback was obtained for the Basic Thermal Sciences module from a selected sample size of 122 students representing two engineering disciplines of the same semester of study. The feedback was collected in two stages of the semester using both paper and Moodle based online questioners. The feedback survey was designed in two sections: the first section provided for quantitative evaluation using rating questions while the second included open-ended questions to obtain qualitative feedback. Survey results depicted students' self-assessments on their learning and the suggestions for improving the teaching and learning process. The feedback provided diagnostic information on the key changes to be adopted in teaching, that resulted in improved student engagement and performance. Almost 90% of the students responded that their interest was valued, and they felt inclusive in the class while 80% of students were of the impression that class materials are relevant to their professional practice. Also, the subsequent assessment has shown a 10% increase in the average marks for group assignments. It was evident that the students were appreciative of taking the early semester feedback, and it helped to improve the inclusiveness of the student's requirements into the module.

Keywords — Early semester feedback, teaching and learning, Engineering education

I. INTRODUCTION

Engineering education over the past decades has adopted several pedagogical practices on enhancing the quality of the programmes. The lack of literature in the methods of assessing effective teaching alarms the educational practitioners; even though teaching is the most important role of the faculty members [1]. Currently, student evaluation of teaching in the end semester is considered as the only metric used to evaluate the effectiveness of the teacher's delivery method as well as the student learning [2]. The literature suggests four purposes of collecting feedback: diagnostic feedback to teachers about the effectiveness of their teaching, a measure of teaching effectiveness to be used in administrative decision making, information for the students in selecting course modules, and finally as an outcome or process description for use in research on teaching and learning. Although the student feedback on teaching has proven valid and reliable [3] [4] end semester feedback stands out to be a form of a summative assessment through quantitative scores. Hence, the instructor/ lecturer may use the feedback received to improve teaching and learning in the subsequent years. This form of feedback is not beneficial for students who provided the feedback; as well as teachers if they might not teach the same course next year. The end semester feedback is mainly used for administrative decision making and feedback forms are standardized over different disciplines, thus only providing general information about the module [5]. Hence, the end semester feedback is not the most effective method in evaluating the teaching and learning process [6].

In contrast, early semester feedback provides an opportunity to improve the teaching and learning process within the same semester. It provides the students to raise their concerns within the module, indicating what is and what is not working, while time remains for the adjustments required by the teacher. Hence, it provides a broader and deeper view into one's teaching methods and behaviours than it is likely to gain otherwise. In fact, a critically reflective teacher would cultivate a heightened awareness of their own teaching from as many different perspectives as possible [7]. Thus, early semester feedback is designed as formative feedback focusing on meaningful improvement of teaching and learning during the semester. Such feedback is specific, timely, corrective and positively framed [8] that it motivates the teacher to adopt required changes to their practice, while the student feels

involved. The literature suggests that a disconnect often occurs for first-year students, as their focus tends toward general study skills rather than the development of domain specific or course specific knowledge [9]. This along with less frequent use of feedback creates a gap between what students struggle to learn and how to improve their learning in Engineering education. In fact, this is often observed in first-year undergraduates of the Engineering faculties, where students struggle to improve their learning with regards to the course learning outcomes. The use of early semester feedback could be one way to bridge the gap, as it is considered as an effective dialogue with students. The teacher is required to listen, react, and make changes during the semester for a better learning experience. This constructive dialog with the students makes them feel they are valuable in the learning community thus, they are motivated by the lecturers' concern for their learning [10]. Hence, it improves the overall student learning experience and automatically the ratings of the end semester evaluations will improve.

The early semester feedback can be customized to obtain feedback for an overall module or on certain teaching activities. The lecturer has the flexibility to control the timing, questions, and analysis of these informal surveys, which ensures the best information is collected to contribute to student learning. There are several methods of obtaining early semester feedback depending on the class size and the required information [11]. Classroom assessment quality circles: where teachers regularly meet with the small group of students to get their feedback on the course could be used for large classes, while for small to midsize classes group instructional feedback technique could be adopted: where the external person (other than the teacher) is arranged to interview the students based on prepared open-end questions.

The teacher designed surveys, which is the most common method, could be used for any size class. In designing a feedback survey, it is important to include questions directed to diagnose teaching/ learning aspects that could be addressed during the semester and the aspects that the lecturer is willing to make a change.

An interactive discussion with students is critical in basic Engineering modules, as it requires them to apply the theoretical concepts into practice. The proactive implementation of the changes to address the student feedback is important in improving student satisfaction in their learning in Engineering modules [12].

II. OBJETIVES

This study aims to explore the effectiveness of the use of early semester feedback within a basic Engineering module to enhance the student learning experience, using a teacher designed survey. The key objectives of the study are to: identify the key aspects of early semester feedback, apply early semester feedback techniques in basic engineering modules, evaluate the effectiveness of early semester feedback in improving the teaching and learning experience in Engineering education.

III. METHODOLOGY

In this study, the early semester feedback strategy was implemented for the Basic Thermal Sciences module, which is a compulsory fundamental engineering module offered for both Civil Engineering and Earth Resources Engineering students for the same semester which runs through a total of 14 weeks period. The module had a total of 175 registered students from both engineering disciplines. The module discusses fundamental theoretical concepts, and it is expected from students to identify applications related to their discipline to apply the theories into practice. Thus, it is important that the teacher maintains a continuous dialogue with the students to motivate them while understanding their learning requirements. During this study student feedback was obtained in two stages during the semester: during the 3rd and 8th weeks. The first stage of the feedback was obtained specifically for an in-class group activity, where the students were allowed to provide feedback as a group in a written paper later uploaded to Moodle. This group assessment was focused on fundamentals of Engineering Thermodynamics where students had to self-study a given journal article and submit answers for six questions provided. These questions were designed such that it encourages group discussions and increase the active learning during the classroom. Total time allocated for the group assessment was 30 minutes. The group feedback strategy was implemented to avoid students' reluctance to provide feedback and to allow them to reflect on their learning experience with peers. It was expected that this would impact the student response, while providing a collective reflection on the group activity. The students were divided into 16 groups, and after completing the activity they were asked to complete the feedback forms. The feedback forms included three open ended questions: two questions about the group activity and one question on the learning experience in the class. The obtained qualitative feedback was analyzed to get any common suggestions while avoiding the outliers; based on the analysis it was identified that most of the students suggested to allocate more time for discussions. Hence, more time was allocated for small group discussions to promote active engagement and active learning. Except for this there were no other suggestions provided by the students to improve the learning experience in the class.

In the second stage, it was decided to get individual feedback from the students on their learning experience of the course module. The common method used for student feedback on teaching and learning is the questionnaire-based survey with rating questions. In recent years with the online teaching platforms and learning management systems online based teaching evaluations became much popular. Online teaching evaluation saves time, and cost while providing quick analysis and reporting compared to the traditional paper-based information collection [13]. The online evaluations provide the opportunity for students to complete the questionnaire anytime without the influence of the teacher, which allows the student to provide a better reflection on the learning experience in the class [14] However, the requirement to have access to computer and internet is one of the drawbacks of the online feedback [15], whereas low student response rate, biasness of the student's response due

to unwillingness to participate in the online survey were also highlighted by the previous research [16]. However, the advantages of an online feedback survey are significant than the disadvantages, thus, a Moodle based online feedback survey was selected to adapt to the second stage of collecting the feedback.

Table 1. Different teaching and learning aspects covered in the feedback survey

| Category | Question |
|----------------------------------|--|
| Effectiveness of Teaching | The lecturer explains the material clearly. |
| | The lecturer indicates important points to remember |
| | The lecturer shows genuine interest in students |
| | The lecturer explains the thinking behind statements and theories. |
| | The lecturer seems well-prepared and knowledgeable on the subject. |
| Class Engagement | The lecturer effectively encourages students to ask questions and give answers |
| | The lecturer effectively directs and stimulates discussion. |
| Student Learning experience | The lecturer adjusts the pace of the class to the students' level of understanding |
| | The lecture is effective, overall, in helping me learn |
| | Class materials are adequate to learn, and the lecturer provides enough guidance to learn |
| Student's interest in the module | The lecturer stimulates my interest in the class material |
| | I enjoyed participating in this class |
| | In this class, my learning focuses on issues that interest me and is important for my professional practice. |
| | I enjoy participating in this class online. |

The online feedback was obtained during the 8th week of the semester, which allowed the students to have sufficient time to interact with the teacher, while there is enough time remaining in the semester to address the student comments/concerns.

The feedback survey was designed in two sections: the first section focused on quantitative evaluation using 14 rating questions while the second section included two open-ended questions to obtain qualitative feedback. The rating questions were focused on covering four aspects: effectiveness of teaching, student class engagement, student learning experience in the class, and student's interest in the module, as given in Table 1.

The survey was opened for the students to respond at the beginning of the week and a student could provide their feedback anytime during the same week. There was about a 70% student response rate for the survey, while the provided quantitative questions were analyzed using a grade point scale (ref). A corresponding weighted average grade point for each question was calculated, and the weighted average grade point for four aspects of teaching and learning was also calculated. To evaluate the effectiveness of the early semester feedback,

the student marks for two group assessments with one conducted before and the other conducted after the feedback was compared. The second assessment was designed in the similar manner to the first, where students have to discuss among their groups to answer seven questions designed in the assessment. Furthermore, the end semester feedback of the current year as compared with the previous year to identify the effects of early semester feedback.

IV. RESULTS AND DISCUSSION

Feedback survey results of the stage 1 depicted students' self-assessments on their learning and the suggestions for improving the teaching and learning process of the group assessment. Out of the 16 groups, two groups have opted not to submit the feedback while all the other groups have provided the feedback. The student response statistics for the three open-ended questions are given in Table 1 and the student suggestions are depicted in Fig. 1. In the second stage of the feedback survey, 122 students (almost 70% of the registered students) have responded and the results of the weighted averages grade points of each question are given in Table 1 and the weighted averages of the students' responses for different aspects of teaching and learning are depicted in Fig. 2.

The feedback collected for the group activity in 3rd week of the semester depicted in Table 2 indicates that students were keen on providing feedback on the group activity, where almost 85% of the student's groups provided their reflection on the activity. However, it was clear from the limited responses received for the last question (below 30%) that the students had very little idea on providing overall comments on the module. Also, the received limited responses were also not providing any meaningful information to improve the teaching and learning of the module. This suggested that the students did not have enough interaction in the class to provide overall feedback on their learning experience. Thus, it could be concluded that the time of obtaining the early semester feedback could affect the results of the survey and it should be implemented only after students had enough time to experience the module.

This was further evident from the good student responses received for the second feedback obtained during the 8th week of the semester. Almost 70% of the registered students have responded to this voluntary survey and out of which 90% of them have provided relevant comments to the qualitative questions. The feedback provided diagnostic information on the key changes to be adopted in teaching, that resulted in improved student engagement and performance. One of the key suggestions adapted was to conduct more tutorial sessions, since there were no timetable hours allocated as tutorials, as a first step one lecture was redesigned in tutorial mode to enhance the application of theoretical concepts of thermodynamics in real life scenarios. As can be seen from Table 2, almost 90% of the students responded that their interest was valued, and they felt inclusive in the class while 80% of students were of the impression that class materials are relevant to their professional practice. According to the results

depicted in Figure 2, it was clear that both teaching effectiveness and class engagement/inclusiveness have excellent grade points (9 out of 10), suggesting the students felt inclusive in the class and they have appreciated the teaching pedagogy. However, because this class was conducted completely online student learning has been a little bit hindered and students' interest has clearly declined. This was also evident from the comparatively low average grade point received for the last question: "I enjoyed participating this class online" in Table 3 as well as the student response to the qualitative questions, where 70% of the respondents highlighted the importance of having physical interaction in the classroom. Amid all these difficulties, it was clear from the student responses that obtaining their views has increased their inclusiveness in the classroom. Since the classroom activities were designed in discussion mode it improved the student interaction during the lecture time. This was evident in the second assessment as well as the participation in the second feedback survey. Furthermore, subsequent analysis of the student grades for two group assessments: one conducted before the feedback survey and the other conducted after the survey, has shown that the average student grades have increased by 10%. This confirmed that the early semester feedback has improved the student performance in the class. Also, a comparison of end semester feedback received from the students for this module with the previous year showed that the student response rate for the end semester feedback has increased by 15% showing that the students have felt they were inclusive in the teaching & learning process.

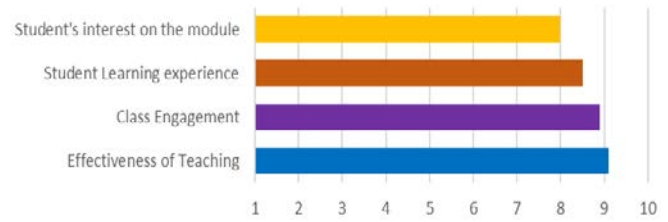


Fig. 2. Student response for different teaching and learning aspects

V. CONCLUSION

This study was conducted to evaluate the effectiveness in This study clearly showed that obtaining early semester feedback and having continuous dialogue with students is important in Engineering education and it resulted in improved class interaction and student performance in the module assessments. Also, it is important to plan ahead on when to obtain the feedback and on what aspects the feedback is required, which ultimately impacts the effectiveness of the feedback process. using early semester feedback to improve the student class engagements in basic Engineering Modules. A teacher designed survey conducted as paper based and the online mode was used to collect the early semester feedback in two stages of the semester.

The collected feedback included both qualitative and quantitative information, which were analyzed to evaluate the student engagement during the semester. The results of the study showed that 90% of the respondents felt their interests were valued and the survey has provided diagnostic information on key changes to teaching which resulted in an improved learning experience in the class. This contributed towards increased grades in the subsequent assessments which proves early semester feedback positively affects student learning. Also, the results showed that correct timing of the feedback is important for success, where the feedback should be collected only after the students had enough time to interact with the teacher and experience the module.

Table 2. Student response statistics of the feedback on group learning activity

| Question | No responses | % |
|--|--------------|------|
| What do you most like about this activity? | 12 | 85.7 |
| What aspects would you like to change to make this activity more useful for your learning? | 9 | 64.3 |
| What suggestions would you give to improve the learning experience in this class? | 4 | 28.6 |

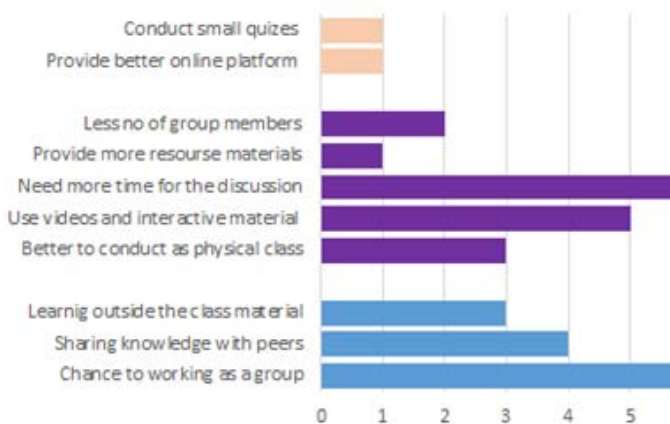


Fig. 1. Student responses for the feedback survey for the group activity

Table 3. Student response details of the survey conducted in 8th week of the semester and grade point values

| Teaching & Learning aspect | Respondents = 122 | Never (2) | score | Rarely (4) | score | Occasionally (6) | score | Frequently (8) | score | Very Frequently (10) | score | Total Marks | Wt. Avg (10 point-scale) | Wt. Avg (10 point scale) |
|--|---|---------------------------|---|------------|-------|------------------|-------|----------------|-------|----------------------|-------|-------------|--------------------------|--------------------------|
| | | Effectiveness of Teaching | The lecturer explains the material clearly. | 0 | 0 | 1 | 4 | 6 | 36 | 42 | 336 | 73 | 730 | 1106 |
| The lecturer indicates important points to remember | 0 | | 0 | 2 | 8 | 7 | 42 | 47 | 376 | 66 | 660 | 1086 | 8.9 | |
| The lecturer shows genuine interest in students | 1 | | 2 | 1 | 4 | 7 | 42 | 34 | 272 | 79 | 790 | 1110 | 9.1 | |
| The lecturer explains thinking behind statements and theories. | 0 | | 0 | 1 | 4 | 8 | 48 | 44 | 352 | 69 | 690 | 1094 | 9.0 | |
| The lecturer seems well-prepared and knowledgeable on the subject. | 1 | | 2 | 0 | 0 | 0 | 0 | 15 | 120 | 106 | 1060 | 1182 | 9.7 | |
| Class Engagement | Lecturer effectively encourages students to ask questions and give answers | 1 | 2 | 2 | 8 | 9 | 54 | 19 | 152 | 91 | 910 | 1126 | 9.2 | 8.9 |
| | The lecturer effectively directs and stimulates discussion. | 0 | 0 | 2 | 8 | 11 | 66 | 58 | 464 | 51 | 510 | 1048 | 8.6 | |
| Student Learning experience | The lecturer adjusts the pace of the class to the students' level of understanding | 0 | 0 | 3 | 12 | 16 | 96 | 50 | 400 | 52 | 520 | 1028 | 8.4 | 8.6 |
| | Class materials are adequate to learn and lecturer provide enough guidance to learn | 2 | 4 | 2 | 8 | 12 | 72 | 44 | 352 | 62 | 620 | 1056 | 8.7 | |
| | The Lecturer stimulates my interest in the class material | 1 | 2 | 2 | 8 | 18 | 108 | 52 | 416 | 49 | 490 | 1024 | 8.4 | |
| | The lecture is effective, overall, in helping me learn | 0 | 0 | 3 | 12 | 11 | 66 | 40 | 320 | 68 | 680 | 1078 | 8.8 | |
| Student's interest on the module | I enjoyed participating in this class | 1 | 2 | 3 | 12 | 22 | 132 | 51 | 408 | 45 | 450 | 1004 | 8.2 | 8.0 |
| | interest me and is important for my professional practice. | 0 | 0 | 3 | 12 | 19 | 114 | 60 | 480 | 40 | 400 | 1006 | 8.2 | |
| | I enjoy participating in this class online. | 7 | 14 | 8 | 32 | 29 | 174 | 40 | 320 | 38 | 380 | 920 | 7.5 | |

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