Section A-Research paper

Analysis and Reflection of class feedback in Engineering Education

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doi: 10.48047/ecb/2023.12.si4.1173

Abstract: There are two important teaching aspects in any kind of education, feedback and reflection. Though many of the concerned professionals don't bother about feedback. Generally, engineering education does not appreciate the role of feedback as a fundamental engineering teaching tool and loose many feasible opportunities for employing this tool. In this paper, the author discusses different issues and the importance of these methodologies in engineering education. The intervention has been used in the case of one small group consisting of thirty students (postgraduate) and another large group of strength ninety undergraduate students. The subject for UG and PG students was Power Electronics and Advanced Power Electronics. To analyze the effect and improve the understanding of concerned students, fifteen minutes in class feedback is taken based on the material taught to both groups of students. The results are presented in the form of tables and graphs. These intervention results are analyzed to improve the course delivery.

Index terms: learning outcomes, authentic assessments, formative assessment, summative assessment

1. Introduction

There are two important teaching aspects in any kind of education, feedback and reflection. Though many of the concerned professionals don't bother about feedback. We assume that engineering education does not appreciate the role of feedback as a fundamental engineering teaching tool, and loose many op- opportunities for employing this tool. [1-3], Reflection is probably implemented even less in engineering teaching, though it is too a fundamental and truly powerful teaching tool. Moreover, the faculty may want to make a selection between implementing feedback or reflection during engineering teaching encounters. This paper explores the distinctions between them and the potential impacts of feedback and reflection in engineering teaching. [4],Ende's paper presented the ideologies for implementing feedback in medical teaching. We generally consider three different categories of feedback. Brief feedback is the type which faculty can give while performing any lab experiment or during any presentation on any topic. In this kind of feedback, the faculty makes highly focused and useful suggestions. The second type of feedback is Formal feedback is given when two or more person meets for some time generally around 10 to 30 minutes.

The concern useful feedback is received by the learner. For example, formal feedback can be given to a student working towards any project. The third type of feedback is known as major feedback. For this, we arrange sessions to give useful feedback. It can be given in a pre-thesis presentation This is generally given in private and typically lies in 30-50 minutes. The concerned student knows that major feedback will be given so the concerned person's performance is affected. Reflection is referred to as ''a thought, idea, or opinion formed, or a remark made, as a result of meditation.''[5] We call reflection in engineering to comprise consideration of the larger framework, and the outcomes of the experience. So, reflection permits the integration and reorganization of concepts, expertise, information, and ideals into pre-existing knowledge frames Newly learned technologies become integrated into one's collection, [6-10].

2. Analysis of existing approaches

Analysis and reflection of class feedback in engineering education is a critical process that involves reviewing and evaluating feedback received from students or other stakeholders and reflecting on the implications for improving the quality of education [1-10]. Here are some steps that are followed for effective analysis and reflection of class feedback in any education:

2.1 Collect and organize feedback: Feedback can come from various sources, such as course evaluations, student surveys, peer reviews, or other forms of assessment. Collect all the feedback received during the course or at the end of the semester, and organize it in a systematic manner for analysis. This may involve compiling quantitative data (e.g., ratings, scores) and qualitative data (e.g., comments, suggestions) separately for analysis [2-4].

2.2 Analyze feedback: Once the feedback is collected, analyze it to identify patterns, trends, and common themes. Look for both positive and negative feedback, as well as areas where students may have expressed confusion, dissatisfaction, or suggestions for improvement. Use data analysis techniques, such as statistical analysis or qualitative coding, to identify key insights and trends from the feedback [1-10].

2.3 Reflect on feedback: Reflect on the feedback by critically evaluating the implications for the quality of education in your engineering program. Consider the feedback in light of the intended learning outcomes, instructional strategies, and assessment methods of the course or program. Reflect on how the feedback aligns with the goals and objectives of the engineering education program and consider the potential impact on student learning and achievement [4].

2.4 Identify strengths and weaknesses: Based on the analysis and reflection of feedback, identify the strengths and weaknesses of the course or program. Recognize the areas where the

feedback indicates success and areas that need improvement. This could include identifying instructional strategies or assessments that were effective in promoting student learning, as well as areas that require modifications or enhancements [1-10].

2.5 Generate action plans: Based on the identified strengths and weaknesses, generate action plans to address the areas that need improvement. These action plans could include specific strategies, interventions, or changes that can be implemented to enhance the quality of education in the engineering program. Consider practical and feasible solutions that can be implemented within the constraints of the program, such as available resources, time, and budget[4-8].

2.6 Implement changes: Put the action plans into practice by implementing the changes identified. This could involve modifying instructional materials, revising assessment methods, incorporating new instructional strategies, or providing additional support for students. Implement the changes systematically and monitor their effectiveness through ongoing assessment and feedback [1-10].

2.7 Evaluate outcomes: After implementing the changes, evaluate the outcomes to assess the effectiveness of the improvements made based on the class feedback. Collect and analyze data to determine if the changes have resulted in positive outcomes, such as improved student performance, increased satisfaction, or better alignment with the intended learning outcomes. Reflect on the outcomes and use them to inform further improvements as needed [1-10].

2.8 Continuous improvement: It is observed that analysis and reflection of class feedback is an ongoing process. It is important to continuously collect and analyze feedback, reflect on the findings, and implement improvements to ensure that the engineering education program is continuously evolving and improving based on the needs of the students and stakeholders [5-8].

To sum up: In conclusion, analysis and reflection of class feedback in engineering education is a systematic and continuous process that involves collecting, analyzing, and reflecting on feedback, identifying strengths and weaknesses, generating action plans, implementing changes, and evaluating outcomes. It is a critical component of quality assurance and continuous improvement in engineering education, aiming to enhance the effectiveness of instructional practices, promote student learning, and improve the overall quality of education in the engineering program.

3. The methodology used for the proposed study

A set of questions was prepared for a large and small group of students. Fifteen minutes of class feedback was taken. The intervention has been used in the case of one small group consisting of thirty students(PG) and another large group of strength ninety. The course for UG is "POWER ELECTRONICS-(UEE504), Btech Electrical Engineering, the third year" and for PG "ADVANCED POWER ELECTRONICS (PPE-105), ME, power System Ist year". The author of this paper has taught both courses in one semester. It was announced in the class that nobody should write their name on the sheet.

The feedback questionnaire given to students is,

Table 1. Feedback questionnaire,1-Never, 5- Frequently

Sl No Questions	Tick mark				
(1) The instructor effectively encourages students to ask questions and give answers.	1	2	3	4	5
(2) The instructor effectively directs and stimulates discussion.	1	2	3	4	5
(3) The Instructor Indicates important points to remember	1	2	3	4	5
(4) Adjusts pace of class to the students' level of understanding	1	2	3	4	5
(5) Stimulates interest in material	1	2	3	4	5
(6) Explains thinking behind statements	1	2	3	4	5

4. Analysis of the feedback collected

The response of the large group and smaller group students are presented in Table 2 and Table 3 respectively.

. **Table 2 :Feedback collected from the large group of students**

Question No	% of Students in each score(Large Group)					Average Score
	1	2	3	4	5	
1	0.00	8.33	33.33	50.00	8.33	**3.58**

2	0.00	50.00	33.33	8.33	8.33	**2.75**
3	8.33	16.67	58.33	8.33	8.33	**2.83**
4	8.33	58.33	16.67	16.67	0.00	**2.33**
5	58.33	16.67	25.00	0.00	0.00	**1.08**
6	16.67	25.00	41.67	8.33	8.33	**2.5**

Table3: Feedback collected from the smaller group of students

Question No	**% of Students in each score(Small Group)**					**Average Score**
	1	**2**	**3**	**4**	**5**	
1	0.00	0.00	0.00	33.33	66.67	**4.67**
2	0.00	0.00	0.00	66.67	33.33	**4.33**
3	0.00	0.00	11.11	44.44	44.44	**4.33**
4	0.00	0.00	11.11	55.56	33.33	**4.22**
5	0.00	0.00	11.11	55.56	33.33	**4.22**
6	0.00	0.00	22.22	44.44	33.33	**4.11**

A qualifying bar is set by the author as 2. It indicates that the UG students could not find the course material or syllabus interesting. At the same time, a similar course is interesting to PG students as presented in Table.3.The reason may be that the UG student's level of understanding is inferior compared to PG students.At the same time UG students are involved in various academic activities/societies.

5. Summary and conclusions

In this paper, two important aspects of teaching feedback and reflection are presented. Different issues and the importance of these methodologies in engineering education are presented. The intervention has been used in the case of one small group consisting of thirty students (postgraduate) and another large group of strength ninety undergraduate students. To analyze the effect and improve the understanding of concerned students, fifteen minutes in class feedback is taken based on the material taught to both groups of students. It is observed that a similar course at higher level PG students found more interesting than UG students.

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