

Attainment of Learning Outcomes through Need Based Training Programs for Engineering Students

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ABSTRACT

The growth of any nation depends on the quality of higher education system and skill-dissemination. The premier institutes in India are imparting requisite skills to make the students industry-ready products. In private, unaided and university affiliated engineering institutes, it becomes a challenging task to identify and impart necessary skills to the students. This paper comes up with a proposal that can enhance the learning outcomes of an engineering student by attending industry-need based training programs with the support of the institute management and industry-experts. A case study based on the similar lines is carried out to see the level of enhancement of learning outcomes of engineering students.

Keywords: Outcomes, Engineering, Training Program, Attainment, Private.

INTRODUCTION

The engineering education system in India is passing through a difficult phase in 21st century. The authorities involved in the management of engineering education system in India like UGC, AICTE, NBA, NAAC are making serious efforts to enhance the quality education. It is known fact that the future of economic system directly depends on the quality of higher education system [1]. The growth of any country is based on the development of cutting edge technology and its successful deployment. The government-aided and autonomous institutes are practicing the updated skills imparted upon their graduates by providing stimulating environment. Because of the autonomy (flexibility) of academic curriculum, highly qualified faculties, excellent teaching-learning environment, industry-linkages, it is possible for these institutes to groom the students and prepare them to cater to the current needs of industries [2]. The reputation of these premier institutes attracts the recruiters resulting in the substantial percent of placement with very high pay packages offered to the graduates.

The scenario in private, un-aided institutes is not the same. In the last decade, it is showing a decreasing trend in the number of admissions. The liberal policy of government in terms of the relaxation in the eligibility criteria for entry in technical education has also reduced the quality of intake students. On the other side, the apex body of technical education in India, AICTE, has permitted a large number of institutes to run various programs. The number of colleges registered increase 74 times with just 500 in 1950 growing to 37,204, as on 31st March, 2013 [3]. Added to

that, these private engineering institutes are affiliated to state universities. The current engineering curriculum should be designed such that by the end of graduation, students should be able to apply their knowledge to issues related to interdisciplinary areas, reliability, efficiency, manufacturing new gadgets, devices or structures, etc. which can help raising the standards of living of society [4]. The survey shows that less than 20% of the engineering students are employable in industries. This reveals the fact that today's engineering institutes are hardly producing students that are meeting the prerequisite standards of industries. Added to that, the employers complain saying that the students employed are not trained properly and the companies are forced to offer these employees some sort of training programs before they induct them gainfully. The conclusion is- The unaided institutes affiliated to the university curricula lack the essential skills be imparted on the graduates. Hence, it is of paramount importance to identify the skill gaps and train the students with specific set of skills suitable to their aptitude. In such situations, it becomes very difficult for faculties (being moderately qualified and having weak linkages with industries) to identify the skill gap and train students and make them industry ready products [5].

To achieve this goal of producing qualified and trained technocrats, all stakeholders of an institute have to endeavour towards imparting technical competence to the student [6]. In this paper, the authors have come up with a proposal that can enhance the learning outcomes of an engineering student by attending industry-need based training programs. This proposal suggests conducting such training programs for faculties with the support of management by inviting the industry experts. The faculties later are expected to float similar training programs for students in the institute premises itself and generate revenue. It is possible to implement this concept as all the stakeholders including the students, management, and faculty will be getting benefits of this activity. This activity will also strengthen the relationship with industries. This ultimately leads to the win-win situation for all. A case study based on the similar lines is carried out to see the level of enhancement of learning outcomes of under-graduate engineering students. The methodology of the entire activity is elaborated next.

IMPLEMENTATION METHODOLOGY

Identification of Skill Gap: The university affiliated technical institutes are bound to follow the prescribed curricula. The conservative approach followed by the universities in revision of syllabi lacks the inclusion of essentials skills at required pace. This ultimately results in the graduates falling short to satisfy the needs of globally competing industrial sector. Partially to solve this issue the industries are initiating the on campus training programs like Infosys campus connect. Yet in core mechanical engineering sector, many skills demanded by industries are neglected in traditional technical education system. One of the ways utilized in this case study to track the neglected skills was the feedback from the Departmental Academic Advisory Committee. The committee members were the professionals and experts from the industry. It was suggested by the members of committee that the introduction of a short term workshop of an analysis and simulation tool ANSYS to the students would enable them to enhance the employability.

Ways of Bridging the Gap: The faculties with design engineering background were trained by the experts from industry. The management has financially supported the training program along with necessary hardware and software support. These trained faculties conducted a short term workshop

to impart ANAYS tool to the students. The faculties thus act as the bridge in between industry and students enhancing the student employability.

Selection of Students: The selection of students for imparting the ANSYS training was carried out in two steps. The performance of student in specific allied courses at various levels like applied mechanics, strength of materials, theory of machines, machine design was monitored. The students are informed one month prior for a revision of basic courses for an objective test. Finally based on the performance in allied basic course and score in objective test the final enrolled students are declared.

Actual Training to Third Year Students: The summer vacation slot was selected for the training of students after third year second semester examination. The fifteen days schedule was prepared and was successfully completed by the students.

RESULTS AND DISCUSSION

The detailed analysis of the attainment of learning outcomes was carried out after successful completion of the workshop. The following learning outcomes were defined.

Learning Outcome 1: Understand the fundamentals of various allied courses in mechanical engineering.

Assessment Tools: Objective Tests. The set of objective tests were prepared based on the fundamentals of various courses. The tests were conducted at the entry and exit of the workshop.

Attainment: It was found that during the entry test as the students were informed one month prior were able to perform in a better manner. It was substantial to note that after spending the time span of fifteen day on the ANSYS platform, at the exit test the performance of students was showing the increasing trend denoting the better understanding of the basics of various allied courses based on which the tests were designed.

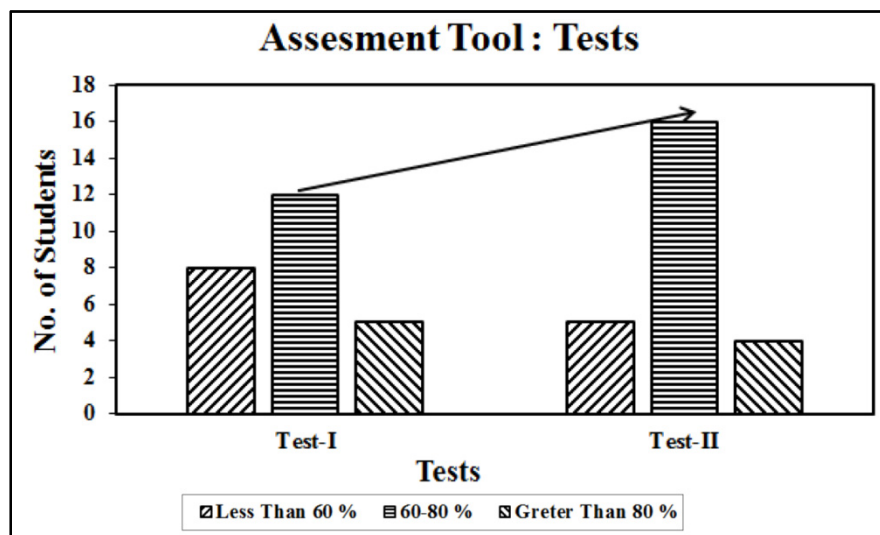


Fig. 1: Analysis of Objective Tests

Learning Outcome 2: Apply the ANSYS tool for solving engineering problems.

Assessment Tool: *A case study.* The university curriculum at third year prescribes the in plant training at winter vacation. The students are encouraged to find one case study during their training in industry for analysis using ANSYS.

Table 1: Case Study Rubric

Question	Levels				
	Very Good	Good	Average	Poor	Worst
Q1. Was the student able to model a given component?					
Q2. Are the boundary conditions defined appropriately?					
Q3. Does the discretization was adequate?					
Q4. Was the solving and interpretation proper?					
Q5. Was the student able to consolidate and suggest the optimization for given set of problem?					

Attainment: The questionnaire was prepared to test the level of understanding and the level of skills proficiency shown by students.

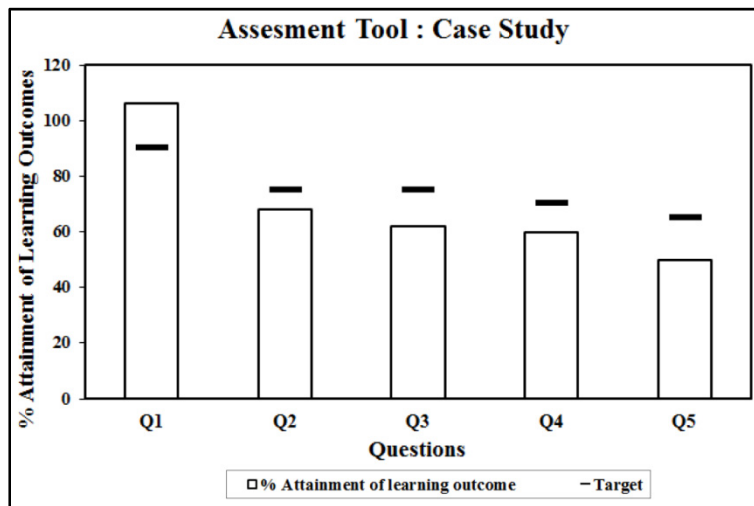


Fig. 2: Analysis of Case Study Rubric

It was observed that due to the exposure to modeling software CATIA, students were performing exceedingly well in modeling the components. Hence, the target level of attainment was set at a higher level for question 1. It was observed that the student's performance was exceptionally good and exceeded the target level by margin. The application of boundary conditions requires the complete knowledge of statics, dynamics and mechanics. Hence the target level was set at a relatively low level for question 2. It was observed that student's performance fall short to target level. The meshing requires the basics of finite element analysis which would be covered in final year. Hence

the target level was again set at low level for question 3. It was observed that students relatively fall short to target level. The interpretation and post processing of solution would require the practice and ample problems being handled by the students. Hence the target level was set at low level for question 4. It was observed that students fall short to target level. The suggestions and optimized solutions provided by the students would require considerable exposure to diverse problems, which is limited in training programs. Hence the target set was average for question 5. It was observed that the students fall short to target levels.

Learning Outcome 3: Analyze the specific problem for design validation.

Assessment Tool: *Industry sponsored project.* The students completing the workshop undertake the industry sponsored project at final year under the guidance of expert faculty.

Table 2: Industry Sponsored Project Rubric

Question	Levels				
	Very Good	Good	Average	Poor	Worst
Q1. Were the students able to collect literature after problem definition?					
Q2. Have they modeled a component/assembly?					
Q3. Were the boundary conditions applied with realistic constraints?					
Q4. The students have come up with an alternative solution better than existing one?					
Q5. Rate the employability skill of students.					

Attainment: The effectiveness of the training program was checked by forming a rubric. The rubric was filled by the employer who sponsored a project.

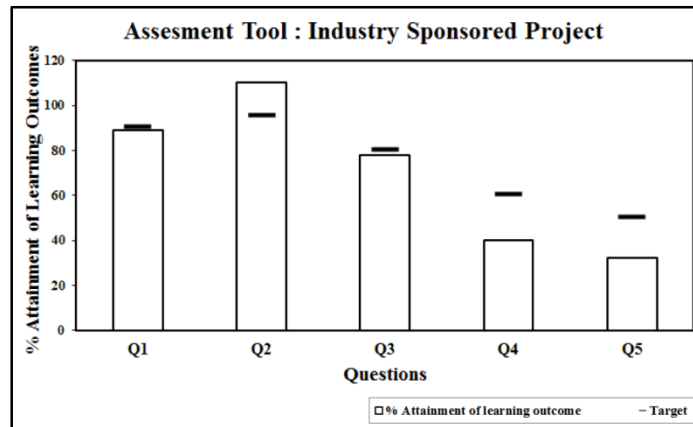


Fig. 3: Analysis of Industry Sponsored Project

The complete transformation of a student to a professional can be captured with ability to work on a project. Hence the effectiveness of the skill imparted was captured by monitoring the student’s performance over a project period. The students were allotted the sponsored projects and their

performance was closely observed and quantified by forming and analyzing a questionnaire in the form of a rubric. The first phase of the project was to define the problem which was done by the sponsoring industry. The literature survey in the area of work was carried out by students. The students were encouraged to access the online resources to be in synchronization with current practices followed. The target level of attainment was set at higher level for question 1. As the questions 2, 3 and 4 are on similar line to Table 2, it was expected that after working on the case study and subsequently on project the students would show improvement. Hence the target levels to these similar questions were set to a higher value than for Figure 2. It was observed that the students performance shown improving trend as expected. Finally the success of process of imparting the ANAYS skills to students was rated by the potential employers in term of employability skills. The target level was set at average level for question 5. It was observed that the feedback from the potential employer was average.

CONCLUSION

The lacuna in the traditional technical education system was highlighted in this paper and a mechanism for identifying skill gap was proposed. One such potential skill gap in the domain of mechanical engineering was identified and bridged. The probabilistic outcomes of the activity carried out with the support of all stakeholders of the institute are:

1. The students: The students would be imparted with the knowledge of latest tools and techniques.
2. Potential skill gaps: Many such potential skill gaps are identified and will be imparted with the help of institute management and experts form industries in near future. It includes the areas of PLC and Automation, modeling tools like CATIA, CAM tools like Master-CAM / Del-CAM, Mould-flow analysis tools like ANYCAST.
3. The faculties: The acquisition of skills by the faculties will improve their confidence level. This will help them undertake the consultancy work and generate revenue for parent organization.
4. The Institute: The institute will generate revenue by utilization of its resources. Such activites will also fetch accreditations from NBA, and NAAC.
5. The industry: Ultimately the industries will get benefitted by the ample availability of the skilled, trained and confident human resource.

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