

Teaching Methods and Methodologies Used in Laboratories

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Abstract: Now a days the issue of student motivation and self-interest in practical work in laboratory is a great challenge in the engineering colleges. Laboratory environment gives hands-on experience to the students which is related to the industrial work or the research work after graduation. This paper shows the description about the laboratories activity in most of the engineering colleges. In most cases, it is just a formality rather than knowing the importance of the such experience. To overcome this status, this study suggests an alternative method for conducting laboratory classes. The hands-on practical work in laboratory method effectively boosted the state of motivation with optimistic effects on situational competence, situational interest, and reduced dullness.

Index Teaching Methods and methodologies; Engineering; Laboratories.

I. INTRODUCTION

Achievement, task values, interests, perceived competence and motivation of students for science in college going down over the years [1]. The science in engineering college is motivated based on the prediction of achievement and performance [2]. Consequently, only a minimum number of engineering students target their career in their respective professional field. Meanwhile, the research has also shown that if the class lecture is directly aligning with their day to day life experience, students become more interested in the particular class lecture [3]. The college students can explore questions due the implementation of projects and or application oriented practical classes [4]. Moreover these activity can enhance their interest in the particular topic and they can relate these activity with the personal live contexts [5]. But in case of science teaching in schools might not providing enough knowledge to build their research idea and is not enough to experiment individually and independently [6].

In recent years, a number of investigation study is conducted to analysis the results outcome of student's experience in laboratory work [7]. But these studies lack in providing more clarity of evidence to prove the effectiveness of laboratory classes and or the problems facing in these classes [8]. Moreover the outcome conclusion of these existing study are restricted and not providing enough detail and not suggested a correct dimension to improve the quality of laboratory study and some conclusion are not easy to include in the regular laboratory classes [9].

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II. METHODOLOGY

The motivated study is under gone, based on the survey conducted among the students of engineering college. Hence a questionnaire is prepared and is circulated to more than half a dozen of engineering colleges in Tamil Nadu, India. The questionnaire is effectively filled by engineering student and is collected back. The students responses collected from the different colleges are categorized based on their disciplines. Along with the student response, feedback from more than a dozen of experienced professors were collected to produce the valuable conclusion for the improvement. The summary of the collected responses is listed as follows:

- Based on the feedback from the professors: the concept following in the laboratories is old and most of the disciplines equipped with old age equipment and the students are practicing conventional techniques or laws.
- Based on the students response, it is observed that around 70% to 80% of students feels the experimental procedure is old and is bore to spend time in laboratory without doing interesting work.
- An around 79% of students from some disciplines mentioned that the colleges are equipped with enough equipment. So they were not able to practice the experiment individually and instead more than 20 students are formed in to a group to practice an experiment and rest of the students a spend their time for writing procedure.
- Around 85% of students from various colleges are not aware about the actual objective of the practical works they are practicing in the laboratories and they have doubt about how these experiments will helpful after the education?
- Around 65% of students indicated that laboratory classes are only conducted by the technicians not by the respective subject professor.
- Finally around 95% of students are not satisfied with the current procedure followed in the final assessment. Because it is conducted by organizing a group of 10 to 15 students and the mark for the students is mainly depends on the viva answers.

Based on these student, and professor feedback, we can clear that the laboratory in most of the colleges is conducted only focusing the curricular activity and they are not bothering about the actual need to grow a professional in particular disciplines.

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Laboratory exercise is added as a supplementary or complimentary to the theoretical classes and its aim is listed as follows:

- a) To clarify the principle, concepts and operational procedure of a technique or algorithm, which is taught in recent theory classes.
- b) Aims to built the students skill to solve experimentation problem.
- c) Effectively understand the test procedure of an experiment and encourage the ability to interpret the test result.
- d) Enhance the skill to write the report.
- e) Motivate student to concentration on safety precaution and to maintain the clean environment.
- f) Motivate to develop attitude, and interpersonal relation among students.

III. DISCUSSION

Concentrate to understand the importance of existing scenario and laboratory work, following are some suggestions to make laboratory experiences meaningful and motivating:

- 1) Current laboratory experiences need radical changes. Teachers have suggested that there should not be more than 20 students in a practical class at a time so as to handle them effectively.
- 2) Universities may appoint Task Groups for revising the curricula of engineering courses on scientific lines and not by cut and paste method. Curriculum of theory and practice, in some disciplines needs radical changes. Curriculum of practical classes should match with theoretical instructions as well as with professional life of students. For example: Assign a task 'Design Concrete Mixes' to student to conduct test to grade the concrete mix. In common the students involved in the activity built the concrete mix and conduct text. Along with these activity they may involve to estimate the cost, and prepare tender documents. Hence these exercise can enhance the confidence of students to build professional skill and enhance practical skill.
- 3) While designing practical tasks, the coordinator should gather a group of 20 students to effectively engage in the task. Providing disassemble/assemble experiences of the equipment used etc. as the part of doing practical work to enhance concentration.
- 4) Universities may take considerable time in revising the curricula. Each department may include additional laboratory task to be executed by students as laboratory experiences.
- 5) It is essential that all teachers taking practical classes should conduct all the practical by themselves and subsequently prepare a laboratory manual for the guidance of students. Teachers may also work out plans/ strategies to provide meaning practical experiences to 20 students at a time and not more than 4-5 students in a sub group. Laboratory technician/ Supervisor and the teacher should ensure that proper equipment/consumables/software etc are made available to students.

- 6) While students are busy in conducting practical work, teacher as well as lab technician/ supervisor should ensure/check that students follow proper procedure/precautions.
- 7) After finishing a practical assignment, teachers are required to ensure that the students are able to draw conclusions of the practical work done by them. The teachers may also administer viva-voce questions to ensure that students understand the concepts and principles involved in conducting a practical assignment.
- 8) Record of attendance and practical work done by an individual student may be maintained. A student not attending practical classes regularly should be warned and defaulters may not allowed to sit in the semester examination.
- 9) Criteria for assessment of practical work should be well defined.
- 10) While conducting final practical examination, external examiner may ensure that a student has attended practical classes regularly, ensure conduct of practical work, check the record of observations and administer viva- voce questions based on involving all experiments on individual students and for a group of 20 students in a time span of three hours.

IV. CONCLUSIONS

Through this study, it can be concluded that the students are not doing the laboratory experiments to develop their knowledge but to become just a graduate, due to which lots of students are miserably fail in their professional career. It is therefore, essential to redesign laboratory experiences and link these with professional life of students. Since this research investigate the problems or the issues in conducting laboratory experiments in engineering colleges, future research will explore the way to formulate the laboratory experiments and to motivate the students in such a way that, the knowledge can be applied in their career.

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