

Role of Laboratories in Technical Education

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Abstract

The significance and necessity of the laboratory practice to the engineering students as a major substance of their curriculum is described. Some improvements that can be imposed on the students' learning process through the appropriate utilization of a set of innovative methods designed for stimulation of the enthusiastic feelings of the students are also discussed.

The necessity of Laboratory Courses

The engineers engaged in such affairs as production, sales' process, development, and research activities are frequently faced with the results of the laboratory tests. They need to be familiar with interpretations, uses and limitations of these results. An appropriate knowledge of the laboratory techniques and their successful implementations as achieved during various laboratory sessions scheduled for experimentation, project work, data analysis, error finding and data presentation provide the engineers with a basis for confidence in making professional judgements on the job.

There are many technical systems, micro-structural relationships, and complex mechanisms in the engineering fields that their

precise meanings can hardly be expressed in terms of the mathematical or logical expressions. A proper perception of such system or phenomena requires a close touch and observation made on their basic features and results. A close study of actual specimens, laboratory techniques and experimental findings enables the students and the research workers to develop a real understanding of the complex processes and phenomena as they occur in the nature. Further development of such understanding can be obtained by discussing the precepted materials on a personal basis with the course instructors, laboratory supervisors, or other laboratory co-workers. Working in the laboratory provides the students with a unique chance of assessment of the accuracy to be associated with the experimental results. Utilization of the statistical

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and computational techniques for analyzing and synthesizing the laboratory results are of the instructive exercises practiced during a laboratory program, too.

The syllabus of the laboratory courses and the methods employed for their instruction can be designed so that they may stimulate the curiosity of the students for learning about the associated materials and the associated subjects. Once the students are motivated to know about a process, a physical model, a scientific law, a well developed methodology, etc., they will easily look for the facts and ideas and will work them out through a rigorous individual search and study program. The laboratory courses can thus be employed by the teachers as a means of facilitating the teaching process of the complicated materials whether of the theoretical or of the practical nature.

How to Instruct

There are different methods for instructing theoretical and practical subjects. A simple way is to address directly the to students all what they should learn and test their absorption rate by introducing few questions on the subject. A better method is to start with carefully designed stimulating questions that make the students curious about the subject and then discussing on the possible answers which may be the

actual materials to be taught. The continuation of such a question and answer process carried out under the direction and co-ordination of the course instructors would result in the continual development of the students' understanding of the subject and a step-by-step progression achieved in the learning process.

It is desirable that the theoretical and the involving laboratory courses be taught simultaneously and by the same instructors. This would provide the instructors a valuable opportunity to schedule the class and the laboratory sessions in accordance with a program that may optimize the rate of progression of the teaching or learning processes. An instructor may raise a few conceivable questions concerning to the observations made or result obtained during accomplishment of a laboratory experiment. The answers to such questions may be studied in a class session and moreover be discussed in a recitation meeting.

Presentation of selected laboratory reports and their appearance in the weekly school publications can be employed by laboratory instructors to increase the students enthusiasm on the laboratory subject. Innovations suggested and practiced by students may also be encouraged by instructors as a means of increasing their learning efficiency and interest.