

MODERNISATION OF LABORATORY BASED INSTRUCTIONS

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ABSTRACT

In the present day scenario of technical education, it has been observed that Laboratory based instructions play an important role in making the process of teaching learning more effective and challenging. Experience and research have shown that many of the instructional objectives related to skill learning, concept learning, principle learning and problem-solving can be achieved through laboratory work rather than classroom teaching. For an educational system to be successful, laboratories must be well equipped not only with the latest equipment but also its staff should be well acquainted with their operation and maintenance. This paper deals with the different aims and objectives of laboratory based instructions including its planning and present status. The paper describes certain methods by which laboratory work can bring about excellence in technical education.

1. INTRODUCTION

Laboratory instructions now-a-days are considered to be one of the most important aspects of institutions process in technical institutions. It aims at development of certain practical skills related to a particular subject matter, understanding of concepts, principles, procedures etc. which are studied in the classrooms. In addition, these are quite useful to the students in developing capability of making observations and right kind of attitudes towards practical work.

The success of any laboratory based instruction depends not on the number of times the equipment has been used but depends on the proper planning of the laboratory class. The linkage between theory and practical work is thus better achieved through systematic conduct of experiments and demonstration in laboratories. A student feels lot more

satisfied by actually conducting the experiments on their own in the laboratory class. Thus a carefully planned instructions and updated laboratories are very much essential for improving the quality of technical education system.

2 OBJECTIVES OF LABORATORY CLASS

The various objectives that can be achieved through laboratory based instruction are listed as :-

- (i) Laboratory work should enable students to correlate the theoretical knowledge acquired in the class room with the results obtained from the practical experience so as to verify and illustrate the various theoretical concepts and principles.
- (ii) From laboratory experiences, students are able to understand the problem to be investigated, thereby enabling them

to select appropriate line of attack and the equipment.

- (iii) Through laboratory work, students should be able to carry out number of manipulative skills which includes : setting, handling and adjusting of equipment; knowledge of different components/ parts of equipment; knowledge of different components/ parts of equipment; observing safety rules; knowledge of specialised testing and measuring techniques; locating and removing of faults etc.
- (iv) Laboratory work should enable the students in bridging the gap between theoretical models and actual world of work.
- (v) A laboratory program should not emphasize much on the higher order cognitive skills such as planning and investigation and analysis of design.
- (vi) Laboratory work should aim at developing a sense of judgement amongst the students so that they can strike a balance between theoretical knowledge and various techniques of analysis and design. This will enable them to use the less complicated approach and reduce burden on curriculum time.
- (vii) From laboratory experiences, students are able to record the observations and measurements in more accurate and systematic manner so that these could be read and easily understood by their colleagues.
- (viii) Laboratory work should enable students to determine relationships, interpret the data, draw conclusions and then formulate set of questions based upon test results.
- (ix) Laboratory work aims at developing certain affective skills amongst the students. This includes : sense of initiative and resourcefulness; ability to cooperate as team member and act as team leader, inter personal communication/relationships.

- (x) Laboratory experiences also enable students in developing their confidence to solve new problems and promote independent thinking.

3 REVIEW OF PRESENT SITUATION

Review of present scenario of laboratory based instruction reveals that out of the total capital investment, more than 60% is invested on setting up of laboratories. In addition to this, it highlights many more facts which are enlisted below:-

- (i) Practical work in the laboratory is presently used for understanding the subject matter but without any quest for advancement in that particular area.
- (ii) Students are hardly aware of the purpose and significance of experiments they are conducting in the laboratories.
- (iii) Students are conducting experiments in the laboratory just to complete the formality and conditions laid down in the syllabus.
- (iv) Majority of students have tendency to resort to unfair means by going in for readymade material of their senior colleagues so as to avoid doing laboratory work.
- (v) For the last over 20-30 years, laboratory activities have been going on without any change.
- (vi) Instructional material available in the laboratory for the students is not upto date and highly unreliable.
- (vii) Due to scarcity of funds most of the time laboratory equipments are not properly maintained and latest equipment is not procured.
- (viii) Sometimes teachers are unable to use the equipment thereby posing problem for students.
- (ix) Due to shortage of staff and also due to untrained staff, laboratories are not paid due attention.

- (x) There is lack of coordination between the teachers taking theory classes and the teachers involved in conducting and managing of laboratories.
- (xi) Examination in case of laboratory work is done through verbal questions which is considered as means to complete the required aggregate of marks.

4 SUGGESTED METHODS OF IMPROVEMENT

With the prevailing state of affairs of laboratory based instructions, certain methods of improvement have been suggested which are listed as:-

- i) **Physical Arrangements :**
Proper physical arrangements consisting of adequate space for seating, demonstration, working place, furniture, power supply etc. are to be made prior to the start of laboratory class.
- ii) **Preparation :**
Teacher has to prepare beforehand the list of consumables and other materials required for the conduct of experiment. In addition the serviceability of an equipment has also to be checked well in advance.
- iii) Using appropriate method to conduct laboratory experiment : The use of appropriate method for conducting experiment in a laboratory depends upon variety of factors which includes objectives to be achieved, availability of equipment in the laboratory or nearby institution, learner's characteristic and ability and lastly the size of class.

The experiments in a laboratory can be conducted in different ways such as asking students to conduct experiments independently by reading laboratory manual or in groups of 3 to 4 students due to scarcity of equipment or by demonstration involving complex equipment. So depending upon the situation a judicious choice must be made to effectively conduct the experiments.

- iv) Preparation of instructional manual : Instructional manual containing details of objectives/expected outcomes, instructional sheets, procedural details, observation sheets etc. must be prepared well in advance. This will facilitate in smooth conduct of laboratory class.
- v) Teachers must identify the skills and expected outcomes to be achieved and ensure that they are actually achieved. For this purpose, teachers should pose questions to students during and after the conduct of experiment in order to check their understanding of procedural steps, reasoning ability etc.
- vi) While students are performing experiments in the laboratory, the teacher should ensure that each student takes independent observations, especially when they are assigned experiment in groups.
- vii) While performing experiments, teacher should provide immediate feedback to the students in order to improve their performance.
- viii) For preparing students before actually going to the laboratory, an attempt must be made to devise a suitable method in this direction. One way of doing it is by showing video film to the students which provide necessary information regarding the equipment or experimental set up or procedure as a part of instruction. Another way is the use of computers for this purpose. Computers can be effectively used for post treatment of laboratory investigation and analysis of results.
- ix) Lastly an attempt should be made to improve the industry- institute interaction. This will enable the teachers to utilize the facilities available at the industries during field visits and can also seek their guidance for development of laboratories.

CONCLUSION

The ideas discussed above reflect that laboratory instructions are quite useful for teaching certain strategies such as formulating of hypothesis, making operational designing models and interpretation of results. Laboratory based instructions provide contiguity, practice and reinforcement. They are extremely useful in motivating the students and enriching them with valuable real life problems. Thus the use of laboratory based instructions plays an important role in modern day teaching and when these are integrated with other modes of instruction, they prove to be

highly effective in achieving better results in the teaching learning process.

REFERENCES

1. Bedi, S.P. 'Objectives of Laboratory Class', ISTE Primer, July 1991.
2. Kulkarni P.D. 'Planning and organisation for teaching and learning', TTTI Chandigarh, 1985.
3. Raina K.B. Radhakrishan M., Ray A.K., Bhattacharya S.K., 'Improved Methods and Technology for Teaching', TTTI Chandigarh 1985.
4. Tulsi P.K. 'Planning, Conducting and Evaluating a Laboratory Class', ISTE Primer, August 1991.

