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MATHEMATICS LABORATORY –A BEFITTING PLATFORM FOR MATHEMATICS TEACHERS TO MAKE IMPACT IN THE KNOWLEDGE CONSTRUCTION OF THE LEARNERS

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ABSTRACT

Mathematics is embedded deeply into the life and culture of people in the Indian subcontinent, attested by a long history of engagement with art, craft, work and abstract disciplines of thought. The use of mathematics laboratory was found to improve student understanding and of concept of basics of Mathematics. Students who were taught using demonstration with Mathematics laboratory approach outperformed in terms of understanding of concepts. It developed through the use of abstraction and logical reasoning from counting, calculation, measurement. In this paper the author proposed to present a paper based on his findings over the study which investigated the possible effect of mathematics laboratory in enhancing students' conception. This paper has thrown a light on the use of appropriate strategy which can be viewed as an integration of the three methods namely Expository, Cooperative and Problem solving coupled with modeling. The main aim of the author is to expose the fact that traditional methods of teaching Mathematics do not facilitate the learners to relate their knowledge with real life. With this motto the author made an attempt to explore various methods being used in teaching Mathematics in regular classes of both school and college levels. Hope these will help the author to analyze the views of teachers about Practical in Mathematics which enables to develop a strategy for Mathematics teaching in laboratory. At the same time the paper will be helpful to the Mathematics Teachers to observe a significant correlation between the academic achievement of their students and the use of different teaching methods in Mathematics laboratory atmosphere. The full paper suggests that the Mathematics teachers shall use the Mathematics laboratory as a platform to make a significant impact in the knowledge construction so as to improve the learner performance.

Key words: Traditional Mathematics Teaching, Mathematics Laboratory, Knowledge, Construction, Learner Performance.

INTRODUCTION

Learning always treated as best when students have opportunity to express their ideas through interaction and get feedback from the peers. The National Education Policy 1986 (NEP 1986) has brought many thoughts in the education system. These thoughts are the milestones to bring development into the system. Coming to the teaching of Mathematics as it is the queen of all sciences has a vital role to play in diversified fields. Innovations in medicine, digital encryption and communication technology, modeling real life phenomena, predicting disasters, organization of enterprises, business and transport are some worth mentioning here.

Teaching Mathematics in Laboratory: The Mathematics Laboratory is a unique concept in the field of mathematics education that was introduced in the year 1994. It has come a long way in enriching



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mathematics at primary, secondary and senior secondary level. The concept of practical in Mathematics at undergraduate level was extended in Andhra University area from 2004. In developed countries the Mathematics Laboratory is an integral part of regular curriculum. However, in India the teachers, researchers, experts and scholars of mathematics education have been giving thought to the present system of teaching of mathematics and to change it to Learner Centered, but the efforts have proved to be futile as they are tending towards Teacher Centered.

Mathematics Laboratory has now become an inevitable component to be absorbed as one of the mainstream methods of teaching of mathematics, which might make the learning of mathematics Learner Centered. In spite of the fact the Mathematics Laboratories are established in some of the schools, still the method of teaching in Mathematics Laboratory is at large Teacher Centered. The Mathematics is an inseparable part of education. Many people are not aware of its practical utility. This has happened because of sheer phobia of educators and learners of mathematics. Mathematics is not born skeptical but made skeptical due to heterogeneous factors. The policy makers had studied the heterogeneous factors that have over the years made mathematics skeptical thoroughly and recommended a few suggestions towards improvising mathematics education in the country. Further National Curriculum Framework 2005 (NCF 2005) also called for Mathematization of the learner's mind. Mathematics being an important subject and occupying a central position since the ancient period till date has to attract the attention and interest of many students. The reason behind the phobia of aspirants of Mathematical learners is it being highly abstract it is concerned with interrelated ideas and with the manipulation of digits and symbols. Teaching of mathematics is not only concerned with the computational knowledge about the subject but is also concerned with the selection of the mathematical content and communication leading to its understanding and application. So while teaching mathematics one should use the teaching methods, strategies and pedagogic resources that are much more fruitful in gaining adequate responses from the students. Teaching and learning mathematics involves complexities which can be overcome if certain rules are followed. The nature and quality of instructional material, the presentation of content, the pedagogic skills of the teacher, the learning environment, the motivation of the students are all important and must be kept in view in any effort to ensure quality in teaching-learning of mathematics. At the heart of mathematics education lies undergraduate mathematics education. It would be impossible to tackle any of the problems associated with mathematics education, at any level without intervention at the undergraduate level. Hence it is necessary that we examine the doctrines that govern mathematics education in India.

Objectives of the Paper: After a perfect study of ample of literature and its review, in this paper the author made an attempt to explore and discuss some innovative practices in teaching mathematics in general and at the undergraduate level. The process of innovation is generally described as consisting of three essential steps namely starting with the conception of an idea, which is then proposed and is finally adopted. Though many ideas have been conceived to bring about change in the teaching of Mathematics it is yet to be proposed and adopted. So the innovations discussed may not be new in terms of the idea but is new in terms of practice.

Teaching method is a style of presentation of a teacher which he or she proposes to convey the content to the learner in the classroom. Apart from the conventional teaching of mathematics some



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methods are to be adopted for effective enhancement of teaching-learning process.

Inducto-Deductive Method Inductive method is to move from specific examples to generalization. Which means that it is based on induction like proving a universal truth by showing that it is true for a single case and so it is true for adequate number of cases. Deductive method is to move from generalization to specific examples. In classrooms, usually instructions start with the abstract concepts which are beyond the understanding of the students. Formulas, theorems, examples, results are derived, proved and used. But teacher needs to start with specific examples and concrete things and then move to generalizations and abstract things. Then teacher again needs to show how generalization can be derived and it holds true through specific examples. This Inductive and Deductive Method helps students for better understanding.

A simple illustration to Inductive and Deductive Methods:

Inductive Method: This method is based on proving a universal thing by showing that it is true for a particular case and further it is true for reasonable number of cases.

Assignment : Ask the students to draw and construct some number of triangles. Ask them to find the sum of angles in two or three of them. They will find the sum in all those cases as same. Thus they can conclude that sum of the angles in a triangle is same.

Deductive method : It is exactly of opposite to inductive method, here the Teacher will give a topic and relevant formula and explain it by solving number of problems on blackboard. It creates awareness among the students how the formula could be applied. After that they will be given with some more problems to solve by using the provided formula.

Coupling the two process the students are made to understand a concept inductively and apply it deductively.

Many researchers opined that the optimal strategy of teaching Mathematics in laboratory should consists of a sequence of three methods namely

- 1.Expository Method:** In this phase the teacher has an active role in explaining the content.
- 2.Co-operative Method:** Both the Teacher and learner have a role to play with mutual involvement.
- 3.Problem solving Method:** In this phase the Teacher has a role as facilitator of learning only but with assured learning outcome coupled with social relevance.

Numerical Illustration: It is observed that the above three steps can be illustrated well by choosing an example in which two combo methods can be involved entitled Analytic and Synthetic methods

Example: If $\frac{a}{b} = \frac{c}{d}$ then prove that $\frac{ac - 2b^2}{b} = \frac{c^2 - 2bd}{d}$

Solution by Analytic Method: In this method we start from unknown to known. After the final step of the solution the learner will be able to connect both known and unknown.

We have to prove $\frac{ac - 2b^2}{b} = \frac{c^2 - 2bd}{d}$ which the unknown part is.

This is true if $acd - 2b^2d = bc^2 - 2b^2d$ is true

$$\text{If } acd = bc^2$$

$$\text{If } ad = bc$$



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Which means that ,if $\frac{a}{b} = \frac{c}{d}$ is true, which is known.

Solution by Synthetic Method: Exactly in contrary to this method synthetic method starts from known to attain unknown.

Example: If $\frac{a}{b} = \frac{c}{d}$ then prove that $\frac{ac - 2b^2}{b} = \frac{c^2 - 2bd}{d}$

The known part is $\frac{a}{b} = \frac{c}{d}$

$$\text{Implies } \frac{a}{b} - 2\frac{b}{c} = \frac{c}{d} - 2\frac{b}{c}$$

$$\text{Implies } \frac{ac - 2b^2}{bc} = \frac{c^2 - 2bd}{cd}$$

$$\text{Implies } \frac{ac - 2b^2}{b} = \frac{c^2 - 2bd}{d} \text{ which is unknown.}$$

General Finding: As we know that with the advent of technology a large number of methods are available for our use. A good teacher is one who/she did not depend on just one method. Keeping in mind all the knowledge of different methods up to date and will explore all the possibilities and optimize the shortcomings which he/she encounters in the his way. With this experience one can evolve and implement his own style.

Conclusion

Hence, it is preferred to have a professional outlook for a Mathematics Laboratory, which interacts with students to conceptualize the mathematical ideas that stimulate the growth of analytic thinking and develops research attitude amongst. Furthermore, a Mathematics Laboratory equipped with latest technological aids is sure to provide a platform to students develop the higher-order thinking skills that include reasoning, proof, solving complex problems and making connections that enable one to see mathematics as an integrated whole, and communicating clearly and effectively about one's own and others' mathematical thinking. Thus Mathematics laboratory is a platform to make a significant impact in the knowledge construction so as to improve the learner performance.

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