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Effectiveness of Mathematics Laboratory Based Teaching Learning Programme on Academic Achievement In Mathematics of Secondary School Students

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Abstract:

This study was aimed to investigate the effectiveness of the mathematics laboratory based teaching learning programme meant for understanding the Areas of Plane Figures of mathematics of standard-VIII. The pre-test post-test control group design was used for the study. The experimental group was treated with mathematics laboratory-based teaching learning programme and the controlled group was taught by conventional method. After teaching, the achievement test in mathematics was administered to measure their achievement in mathematics. The mathematical achievement was measured using t-test to test the effectiveness of the treatment. The findings of the research revealed that the achievement of the experimental group was higher than that of the conventional group. It can be ascertained that the laboratory-based teaching learning programme in content delivery of Areas of Plane Figures of mathematics for standard -VIII was more effective in developing mathematical concepts than the traditional method.

Key words: Mathematics, Mathematics laboratory-based teaching, effectiveness, achievement.

Introduction

The destiny of India is now being shaped in the class room". One of the assertions of Kothari Commission finds ample use by all who want to talk or write on education. Mathematics is all around us, it has an important role in our life. Mathematics is important in all the sphere of science, technology, and economics. No field is untouched from mathematical involvements. Knowledge of Mathematical concepts and phenomena is essential for an increasingly complex global society. It is crucial to impart mathematics education to the students in a simple and interesting way. Mathematics is an important subject of curriculum at every stage of school education due to its numerous applications in all walks of life. The importance of mathematics is recognized by each commission and policy after independence of India. The National Policy on Education (NPE,1986) stated that "Mathematics should be visualized as the vehicle to train a child to think, reason, analyze and to articulate logically". Similarly, proposed National Education Policy (NEP, 2020) recognized importance of mathematics and mathematical thinking in upcoming researchoriented fields such as artificial intelligence, machine learning and data science. Mathematics is considered as a science of numeracy and calculation which is surrounded by tyranny of one right answer whereas in broader sense it is a subject of assumptions that produce logical conclusion. It is the study of abstract system built of abstract elements Mathematics, therefore, is not only 'number work' or 'computation', but is more about forming generalizations, seeing relationships, and developing logical thinking and reasoning.

Laboratory method is based on the principles of "learning by doing" and "learning by observation" and proceeding from concrete to abstract. Students do not just listen to the information given but do something practically also. Principles have to be discovered, generalized and established by the students in this method. Students learn through hands on experience. This method leads the student to discover mathematical facts. After discovering something by his own efforts, the student starts taking pride in his achievement, it gives him happiness, mental satisfaction and encourages him towards further achievement. Example: Making and observing models, paper folding, paper cutting and construction work in geometry.The use of Mathematics laboratory approach by teachers to teach Mathematics, transforms the teachers' role from an active narrator to a facilitator (Alshsafey&Aldosary, 2021). Igwe (2018) defined Mathematics laboratory as a special room that contains teaching materials that are used to teach and develop students' performance and perception in Mathematics respectively. Olakunle (2019) defined Mathematics laboratory as a place that is rich with tools and equipment for teaching and learning Mathematics. The usage of a Mathematics laboratory instructional strategy, according to Das (2020), is highly important in the teaching and learning of Mathematics.

Title of the study

The title of the study is "Effectiveness of Mathematics Laboratory Based Teaching Learning Programme on Academic Achievement in Mathematics of Secondary school students"

Objectives of the study

The following objectives have been formulated for the present study.

1. To develop mathematics laboratory-based teaching learning programme for Standard viii Students in Mathematics
2. To develop an Achievement Test in Mathematics
3. To find out the level of Achievement Pre and Post Test in Mathematics.

Hypotheses of the study

1 There is significance of difference between Mean Achievement scores of the Control group on Pretest and Posttest is presented

2 There is no significance difference between Mean Achievement scores of the Experimental group on Pretest and Posttest

3 There is significance difference between Mean Achievement scores of the Control and the Experimental group on Posttest

Variables of the study

The variables in the study presented were as follows:

Independent variable

1. Teaching Learning through math laboratory
2. Teaching Learning through traditional/Conventional method

Dependent variables

1. Achievement score obtained by student in test

Design of the study

The present Research is Experimental in nature involving Pretest Posttest Design. The goal of this Research was to find out "Effectiveness of Mathematics Laboratory Based Teaching Learning Programme with reference to Achievement of Standard VIII Students in Mathematics". The study is pretest-posttest Control group design where in a pretest-posttest experimental group design was employed. The pretest posttest experimental group design is often used in classroom experiments when experimental and control groups are such naturally assembled groups as intact classes, which may be similar. The study was adopted a pretest-posttest experimental and control group design. Pretests on Achievement in Matheamtics were administered to both the experimental and control group.

Sampling procedure

Higher primary students was Choosen as population. Random sampling technique was employed in selecting the schools. One School two sections was selected, one section as an experimental and other one section as a control group from the selected school for the purpose of the study. The intact group of 32 Eighth standard students was regarded as the experimental group. And 32 for control group.

Tools of the study

1. An Achievement Pre and Post-test on Mathematics for VIII Class, was developed by researcher herself.
2. Lesson Plans for Mathematics laboratory-based teaching learning program was developed by researcher herself.

Statistical methods adopted

The pretest and posttest scores of the experimental and control groups were consolidated for statistical analysis. Since the aim of the investigator was to test the effectiveness of Mathematics Laboratory Based Teaching Learning Programme over the conventional method of teaching, it was necessary to find out whether there is any significant difference between the mean scores of the two (experimental and control) groups. Descriptive statistics, 't' test.

Data Analysis

Hypothesis 1: "There is no significant difference between the Control group and the Experimental group students in their mean scores in Mathematics during pre- experimentation**"**

Table 1

Significance of difference between mean scores of theexperimental group and control group

Group	N	Mean	SD	't' Value	Level of significance
Control	32	10.54	6.81	0.39	Significant at 0.05 level.
Experimental	32	10.06	5.92		

The above table shows that the obtained 't' value 0.39 is less than the table value 1.96 at 0.05 level and hence it is not significant. Therefore the hypothesis 1 is accepted. So it can be said that there is no significant difference between the Control group and the Experimental group students in their mean scores in Mathematics during pre-experimentation**.**

Hypothesis 2: "There is no significance difference between Mean Achievement scores of the Experimental group on Pretest and Posttest"

Table 2

Significance of difference between mean achievement scores of the experimental group on pretest and posttest

Group	N	Mean	SD	't' Value	Level of significance
Experimental (Pretest)	32	5.76	3.22	18.94	Significant at 0.05 level.
Experimental (Posttest)	32	27.13	8.72		

The above table shows that the obtained 't' value 18.94 is greater than the table value 1.96 at 0.05 level so there is a significant difference between the Mean Achievement scores on pretest and posttest of the Experimental group. Therefore the hypothesis 4 is rejected. Also the Mean Achievement scores of the Experimental Group on posttest (M=27.13) is greater than the Mean Achievement scores of the

Experimental group on pretest (M=5.76) which shows that the Experimental group students have achieved better after being exposed to mathematics Laboratory -based teaching -learning programme.

Results and discussion

The obtained‘t’ value 12.09 is greater than the table value 1.96 at 0.05 level so there is a significant difference between the Mean Achievement scores on pretest and posttest of the Control group. Therefore the hypothesis 3 is accepted. Also the Mean Achievement scores of the Control Group on posttest (M=15.62) is greater than the Mean Achievement scores of the Control group on pretest (M=5.26) which shows that the Control group students have achieved better after being exposed to Conventional Method.

The obtained ‘t’ value 18.94 is greater than the table value 1.96 at 0.05 level so there is a significant difference between the Mean Achievement scores on pretest and posttest of the Experimental group. Therefore the hypothesis 4 is rejected. Also the Mean Achievement scores of the Experimental Group on posttest (M=27.13) is greater than the Mean Achievement scores of the Experimental group on pretest (M=5.76) which shows that the Experimental group students have achieved better after being exposed to mathematics Laboratory -based teaching -learning programme.

For the High and Average levels for the area Area of a Trapezium the obtained ‘t’ values are 3.26 and 5.11 respectively which are greater than the table value 1.96 at 0.05 level but for the Low level for the area of a Trapezium, the obtained ‘t’ values are 1.02 which is lesser than the table value 1.96 at 0.05 level so there is a significant difference between the Control group and the Experimental group students in their Mean Achievement scores on post test with respect to the High and Average levels in the area of a Trapezium but there is no significant difference between the Control group and the Experimental group students in their Mean Achievement scores on post test with respect to the Low level in the area of a Trapezium. The Mean Achievement scores of the Experimental Group on posttest (M=9.6) is greater than the Mean Achievement scores of the Control group on posttest (M=5.4) in case of the High level in the area of a Trapezium. The Mean Achievement scores of the Experimental Group on posttest (M=7.8) is greater than the Mean Achievement scores of the Control group on posttest (M=4.8) in case of the Average level in the area of a Trapezium and The Mean Achievement scores of the Experimental Group on posttest (M=3.86) is greater than the Mean Achievement scores of the Control group on posttest (M=3.04) in case of the Low level in the area of a Trapezium. The results indicate that the students belonging to the High and the Average levels exposed to Mathematics Laboratory Based Teaching Learning Programme have achieved more in the area of a Trapezium when compared to the students exposed to the Conventional Method whereas the students belonging to the Low level exposed to Mathematics Laboratory Based Teaching Learning Programme have not been able to achieve more in the area of a Trapezium when compared to the students exposed to the Conventional Method.

Conclusion Based on the findings, the following conclusion can be drawn:

There is a significant difference in the achievement of students in mathematics who were taught through the mathematics laboratory-based teaching learning programme and traditional method. Difference between the achievements level is due to 'the mathematics laboratory-based teaching learning programme', else, both the group have equal basic knowledge of mathema tics. Students taught through the mathematics laboratory-based teaching learning programme achieved better than those taught by traditional method.

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