



# Effectiveness of Mathematics Laboratory Based Teaching Learning Programme with reference to Achievement of Standard VIII Students in Mathematics

VARUNKUMAR D. RATHOD

Ph.D. Scholar,  
HNGU, Patan

DR. JAYENDRA N. AMIN

Ph.D. Supervisor, Associate Professor,  
School of Education, CUG, Gandhinagar

## Abstract:

*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. One of the objectives of this study was to explore the effectiveness of the mathematics laboratory-based teaching learning programme meant for understanding the quadrilaterals unit 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 attainment 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 quadrilaterals unit of mathematics for standard -VIII was more effective in developing mathematical concepts than the traditional method.*

---

**Keywords:** Mathematics, Mathematics laboratory-based teaching

---

## 1. Introduction

The development and progress of a country depends on its education system. The development of the country along with science can put the country at the forefront of the global spectrum. It is imperative that children of the country become proficient in mathematics to progress in science. It is not possible to study science without knowledge of mathematics, which is why mathematics is called the queen of science. Teaching mathematics and mathematical reasoning are two things which are interrelated and cannot be separated because the material is understood through reasoning and mathematical reasoning to understand and drilled through learning mathematics (Depdiknas, 2002).

Mathematics is an inherent method to research and analysis to accomplish a way out to mathematical problems. Mathematics is a fundamental subject tutored at all stages. The scientific research entails many skills in sports, which help in the development of studies and progress, for example, the study of physics or chemistry depends heavily on mathematics, including mathematical skills and mathematical matters. It helps mathematics in the development and refinement of personality, through the organization and accuracy, research and investigation and study, and helps to detect. Like other sciences, mathematics influences civilization's development.

Mathematics is an interesting topic. Often students' success or intelligence is assessed through the marks they have earned in mathematics. How can something like mathematics be made interesting and

easy that has been a topic of concern for academics. Although the mathematics subject is interesting, some students show disillusionment with the mathematics subject as the teaching of traditional methods in the classroom leads the students to dullness.

In presented study researcher decided to develop mathematics laboratory-based teaching learning programme for understanding the concept of quadrilaterals in mathematics of standard -VIII and to investigate the effectiveness of the programme.

## 2. Title of the Problem

Title of the study undertaken was as follow:

*“Effectiveness of Mathematics Laboratory Based Teaching Learning Programme with reference to Achievement of Standard VIII Students in Mathematics”*

## 3. Statement of the Problem

It was the main objective of the study to develop mathematics laboratory-based teaching learning programme for teaching the quadrilaterals unit in mathematics in standard-VIII. Effectiveness of the developed program was to be ascertained with reference to the achievement attained by the standard—VIII students studying in Gujarati medium school. To measure the effectiveness of the programme developed, it was decided to implement pretest-posttest controlled group experimental design.

## 4. Definition of The Key Terms

### 4.1 Effectiveness

Effective means ‘power to be effective; the quality of being able to bring about an effect.’

In the study carried out, the term ‘effectiveness’ indicates that after providing a treatment with mathematics laboratory-based teaching programme to one group and teaching the other group with traditional method and finding a significant difference in the mean score obtained by students in pre-test and post-test. If this difference is significant in favor of one of the teaching methods through which the students were taught, it can be said that the method is effective.

### 4.2 Mathematics laboratory

The mathematics laboratory is a place where anybody can experiment and explore pattern and ideas. It is a place where one can find a collection of games, puzzles, and other teaching and learning material. In the presented study, the researcher developed the mathematics laboratory-based teaching learning programme for teaching the ‘quadrilaterals’ unit in mathematics for standard -VIII.

### 4.3 Mathematics laboratory-based teaching learning programme

The mathematics laboratory-based teaching learning programme here in this study contains some specific tools and techniques for teaching ‘quadrilaterals’ unit of mathematics for standard—VIII. The programme aims to improve mathematical understanding of students in the unit ‘quadrilaterals.’

## 5. Objectives of the study

The objectives outlined for the study were as follows:

1. To develop mathematics laboratory-based teaching learning programme for quadrilaterals unit in mathematics for standard -VIII.
2. To study the effectiveness of mathematics laboratory-based teaching learning programme.
3. To study the effect of gender, if any.

## 6. Hypotheses of the study

In order to study the effectiveness of the mathematics laboratory-based teaching learning programme, the following null hypotheses were formulated:

- Ho<sub>1</sub>** There is no significant difference between obtained mean of pre-test score and post-test score of experimental groups of standards VIII students.
- Ho<sub>2</sub>** There is no significant difference between obtained mean of achievement of controlled group and experimental group of standard VIII students.
- Ho<sub>3</sub>** There is no significant difference between obtained mean of achievement of girls and boys of experimental group of standard VIII students.

## 7. Variables of the Study

The variables in the study presented were as follows:

### Independent variable

1. Learning through math laboratory-based learning program
2. Teaching through traditional method

### Dependent variables

1. Achievement score obtained by student in post test

### Controlled variable

1. Standard: standard - VIII
2. Medium of instruction: Gujarati
3. Subject: Mathematics (Quadrilaterals)

### Moderator variable

1. Gender: Boys and Girls

### Intervening variables

1. Interest in subject
2. Novelty of study
3. Interaction among students

## 8. Type of Research

The study was focused on effectiveness of mathematics laboratory-based teaching learning programme for the understanding quadrilaterals unit of mathematics of standard -VIII. To serve the purpose, researcher conducted experiment to ascertain effectiveness of developed program. The findings of the study can be applied to mathematical teaching in Gujarati medium schools. Hence, the study falls under the applied research.

## 9. Significance of research

Taking into consideration the national aspirations and expectations reflected in the recommendations of the National Curriculum Framework developed by NCERT, the Central Board of Secondary Education had initiated a number of steps to make teaching and learning of mathematics at school stage activity-based and experimentation oriented. The central board of secondary education has brought out a document on 'Mathematics Laboratory in Schools – towards joyful learning' and made available to all the schools. The document primarily aimed at sensitizing the schools and teachers to the concept of Mathematics Laboratory and creating awareness among schools as to how the introduction of Mathematics Laboratory will help in enhancing teaching-learning process in the subject from the very beginning of school education.

Mathematics Laboratory is a place where students can learn and explore mathematical concepts and verify mathematical facts and theorems through a variety of activities using different materials. These activities may be carried out by the teacher or the students to explore, to learn, to stimulate interest and develop favourable attitude towards mathematics (CBSE).

The major focus of the study was to measure the effectiveness of the Mathematics Laboratory-Based Teaching Learning Programme for the 'quadrilaterals' in mathematics. The study would help the students to learn the mathematical concepts effectively and in a play way context.

Teachers can execute this programme for enhancing the interest of the students in learning the math's concepts which may eventually help the students to improve their performance in mathematics.

In the classroom, students require occasions to apply different methods of learning. Employing a range of different methods of learning has the resulting advantages:

- a. it inspires students
- b. it enriches their learning skills
- c. it offers variety
- d. it empowers them to find out ideas in mathematics more quickly.

Using games can make mathematics classes very enjoyable, exciting, and interesting. Mathematical games provide opportunities for students to be actively involved in learning. Games allow students to experience success and satisfaction, thereby building their enthusiasm and self-confidence (Portman and Richardson).

If the teacher transacts the content of mathematical concepts through this programme, it has the excellent power to provide the students with an ambience for understanding in cooperative learning settings in which they have ample space for interaction with their peers. As the working with peers creates a more conducive environment rather than teaching by teachers, this programme proves to be more student friendly in mastering basic concepts of mathematics.

## 10. Methodology

For measuring effectiveness of the mathematics laboratory-based teaching learning programme for standard-VIII students, a systematic execution of experimental procedure is quite important. The population of the study included the students studying in standard-VIII in Gujarati medium school in Ahwa. The formation of the groups was completed by assigning students randomly. The researchers employed following tools and technique as per aim and objectives of the study.

Self developed tools:

1. Pretest
2. Post test
3. Math laboratory-based teaching learning program

The pretest was based on the basic concepts in mathematics relevant to the unit 'quadrilaterals.' The post test was designed to measure the achievement in mathematics i.e., quadrilaterals. The mathematics laboratory-based teaching learning programme were prepared comprising several games and activities with cards for understanding the content—quadrilaterals. The entire programme was first demonstrated by the teacher to the students having the games and activities using different cards in varied shapes. The students were exposed to the games in which they learnt the types of quadrilaterals in laboratory settings. The cards of different shapes for better understanding of the concept 'quadrilaterals' were circulated to the students in groups and they were asked to compare and identify the exact shapes relevant to the concept of the unit.

To solve problem, it is very essential to collect information. Data consolidation is a very important step for any research. The students were assigned randomly in each group from the Taluka sala Ahwa.

## 11. Research Design

The study was an experimental research in nature. It holds much significant in the process of selection of sample and an appropriate research design for the experimental study. Internal validity is the higher priority of the experimental research and random assignment of the participants to treatment condition plays a crucial role (Cross and Belli, 2004).

The study employed a strong experimental design that offered relatively solid evidence about cause and effect. Experimental Design Comparison group pretest-posttest

o	x	o
o		o

Where:

O: Students' measurement of achievement in mathematics (pretest and posttest)

X: Treatment- learning through laboratory-based teaching learning programme

After providing treatment to two groups with two different methods, data was collected from the controlled group and experimental group to test the effectiveness of mathematics laboratory-based teaching learning programme, where students of experimental group were taught through mathematics laboratory-based teaching learning programme and the controlled group students were taught through conventional method of teaching. Upon completion of teaching work, the post test was administered to both the groups to collect data.

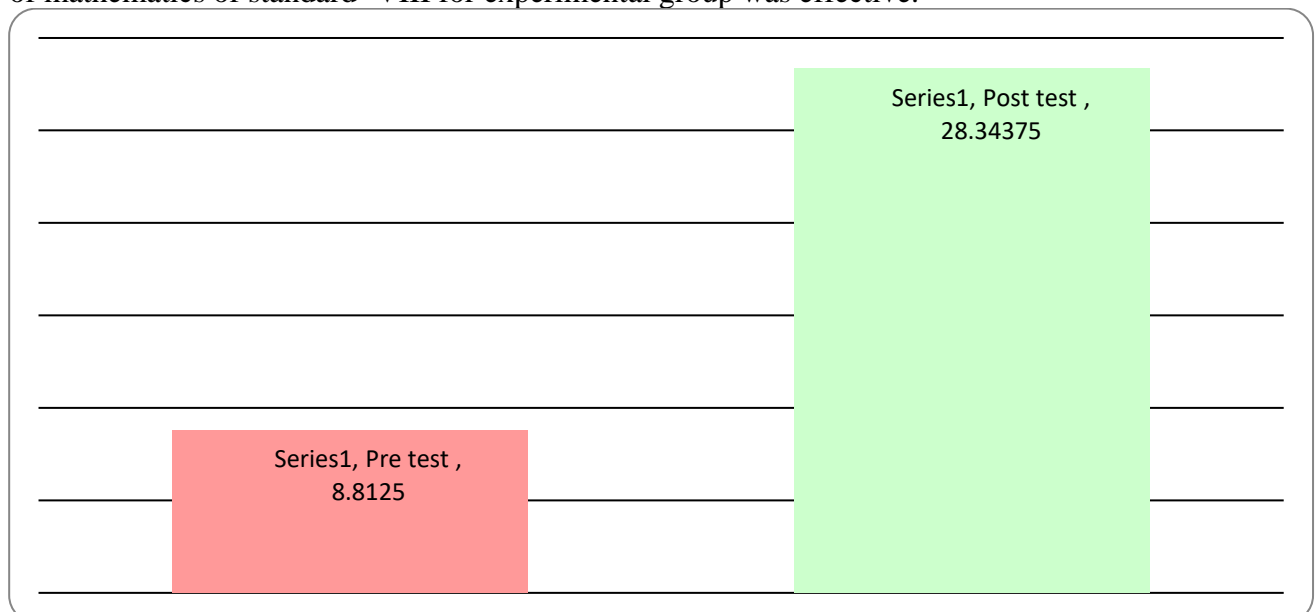
## 12. Data Analysis

The purpose of the research is not only to collect information but also to draw conclusion from it. Researchers cannot solve problem only by collecting data. Organization and analysis of collected data is very essential part of any research. Researcher had used t test analysis for hypothesis testing.

**Table 1: Effect of mathematics laboratory-based teaching learning programme on experimental group**

Group	Experimental	N	Mean	Var.	SED	M. Diff.	t
	Pretest	32	8.8125	5.45	0.927	19.53125	21.07
	Posttest	32	28.34375	22.04			

The calculated  $t$  value for the  $H_{01}$  hypothesis is 21.07, which is significant at 0.01 level. So, mathematics laboratory-based teaching learning programme for the understanding quadrilaterals unit of mathematics of standard -VIII for experimental group was effective.

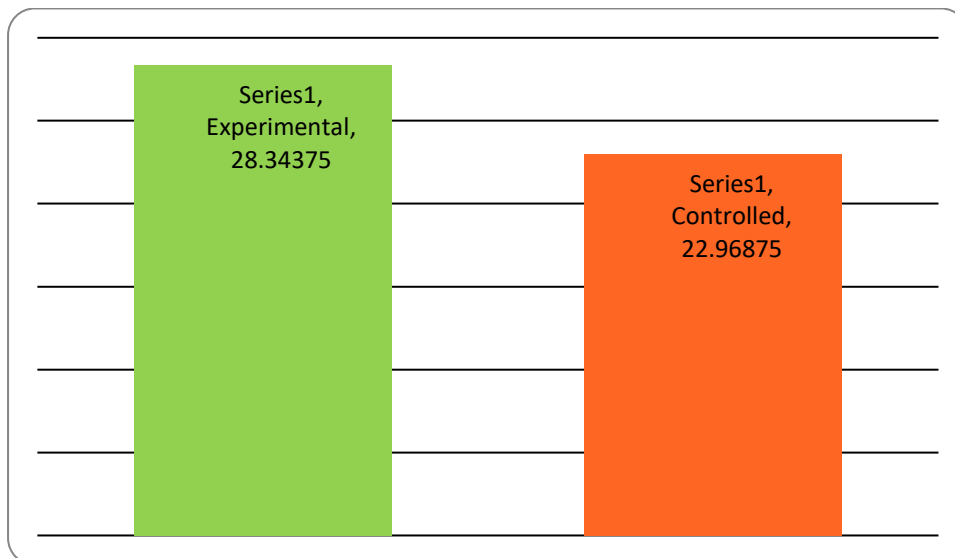


**Graph 1: Comparison of pretest and posttest mean scores of experimental group**

**Table 2: Comparison of Effect of traditional method and mathematics laboratory-based teaching learning programme**

Group	N	Mean	Var.	SED	M. Diff.	t
Controlled	32	22.96	18.16	1.121	5.375	4.80
Experimental	32	28.34	22.04			

The value of 't' for the hypothesis H<sub>02</sub> is 4.80 which is significant at 0.05 level. So, mathematics laboratory-based teaching learning programme for the understanding quadrilaterals unit of mathematics of standard -VIII was more effective in comparison to the traditional method.

**Graph 2: Comparison of posttest mean score of experimental and controlled group**

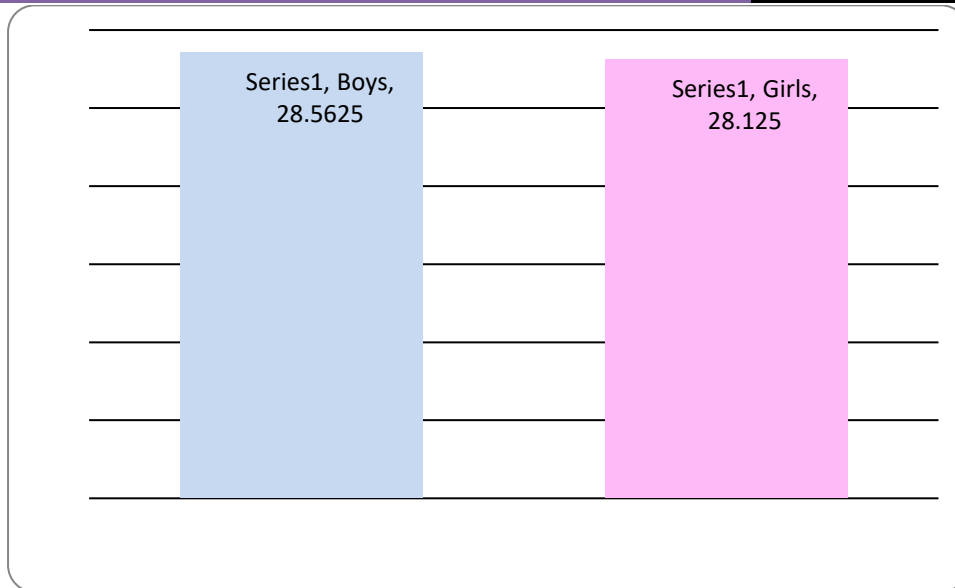
An independent-samples t-test was conducted to compare the effectiveness of mathematics laboratory-based teaching learning programme and traditional method. There was a significant difference in the mean scores for experimental group (M=28.34) and controlled group (M=22.96);  $t = 4.80$ . These results suggest that 'the mathematics laboratory-based teaching learning programme' really does have an effect on the achievement of students in mathematics. Specifically, our results suggest that when the students are taught with the mathematics laboratory-based teaching learning programme, their achievement in mathematics increases."

**Table 3: Effect of gender on effectiveness of mathematics laboratory-based teaching learning programme for controlled group**

Group	Gender	N	Mean	Var.	SED	M. Diff.	t
Experimental	Boys	16	28.5625	24.529	1.685	0.438	0.26
	Girls	16	28.13	20.917			

The value of 't' for the hypothesis H<sub>04</sub> is 0.26 which is not significant at 0.01 level. Hence, the mathematics laboratory-based teaching learning programme for the understanding quadrilaterals unit of mathematics of standard -VIII for the boys and girls of experimental group was equally effective.





**Graph 3: comparison of posttest mean score of boys and girls in experimental group**

### 13. Major Findings

- Mathematics laboratory-based teaching learning programme proved to be effective for the students of standard -VIII for understanding the concepts in quadrilaterals unit in mathematics
- In comparison to the traditional method of teaching, the Mathematics laboratory-based teaching learning programme showed that it is more effective in learning the concepts of quadrilaterals.
- The mathematics laboratory-based teaching learning programme proved equally effective for the boys and girls in gaining the concepts of quadrilaterals in mathematics.

### 14. Conclusion

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

- Students taught through the mathematics laboratory-based teaching learning programme achieved better than those taught by traditional method.
- 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 mathematics.

### References

1. Best, J. & Kahn, J. (2010). Research in Education. (10<sup>th</sup> ed.). New Delhi: Prentice – Hall of India.
2. Buch, M.B. (Ed.). (1987). Third survey of Research in Education. New Delhi: NCERT.
3. Carolina S. Ayal and Yaya s. kusuma (2016). The Enhancement of Mathematical Reasoning Ability of Junior High School Students by Applying Mind Mapping Strategy. Research Paper, Journal of Education and practice. ISSN 2222-1735, Vol7, No.25,2016
4. Central Board of Secondary Education. (n.d.). Guidelines for Mathematics Laboratory in Schools. Delhi: CBSE.
5. Cross & Belli (2004). Experimental research to inform educational policy. In Kethaleen and Lapan (Eds) (2004). Methods of enquiry in education and the social science.
6. Dhand, H. (1990). Techniques of Teaching. New Delhi: Ashish Publishing house.
7. Ebele C. Okigbo and Abigail M. Osuafor (200VIII). Effect of Using Mathematics Laboratory in Teaching on Achivement of Mathematics Students. Reasearch Paper, Dept. of Sci. Edu., Nnamdi Azkiwe Uni. P.M.B.5035, Awha, Anambra State, Nigeria.

8. Garret, H. & Woodworth, R. (1973). *Statistics in Psychology and Education*. (Seventh ed.). Bombay: Vakils, Feffer and Simons.
9. Meera, Raj S. (2007). *A Study on the Effectiveness of Advance Organizer Model in the Teaching of Mathematics Among Secondary School Pupils at Differing Levels of Intelligence*. Unpublished Doctoral Dissertation, Department of Education, Mahatma Gandhi University, Kottayam
10. Parekh, B.U. & Trivedi, M. D. (1994). *Statistics in Education* (4<sup>th</sup> ed.). Ahmedabad: University Granth Nirman Board.
11. Patel, A.B. (2009). *Study of effectiveness of laboratory teaching program on the achievements of standard - VIII in Mathematics*. An unpublished Ph.D. thesis, Gujarat University, Ahmedabad.
12. Portman, & Richardson (n.d.). *The maths teacher's handbook*. VSO Books. Retrieved from <https://ia800206.us.archive.org/19/items/TheMathsTeachersHandbook-Vso/vsomaths.pdf>
13. Sarangapani, Padma and Husain, Shama, (2004). *Evaluation of Maths Lab at Samuha-Plan, Deodurg*. Report, National Institute of Advanced Studies, Bangalore, April 2004.
14. Shah, G. C. (2011). *A Study of the Effect of Creative Teaching Programme on the Achievement of the Student of standard VII in Mathematics*. Unpublished Doctoral Dissertation, Dept. of Education, Gujarat University, Ahmedabad.