

# Effectiveness of Mathematical Thinking on Achievement in Mathematics among Secondary School Students of Kerala

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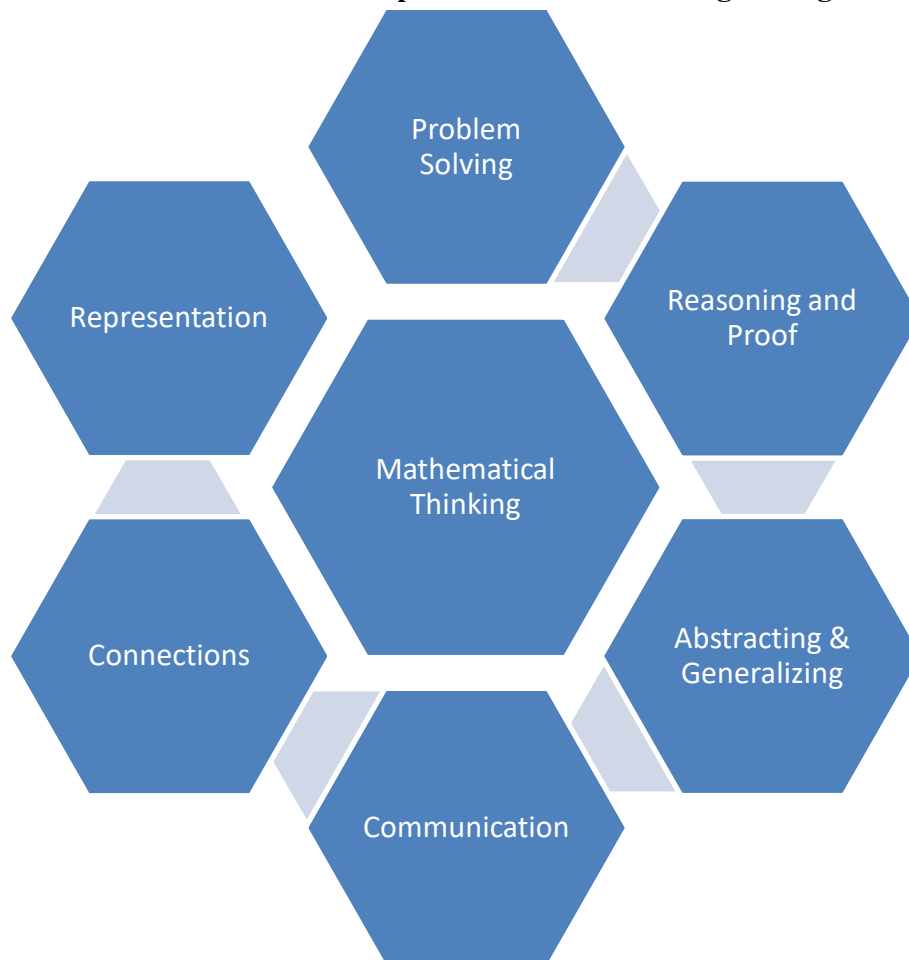
## **Abstract**

The study aimed to test the effectiveness of Mathematical thinking on Achievement in Mathematics at the secondary level. The present study has been conducted on a sample of 90 secondary school students. Lesson transcripts were based on mathematical thinking, Lesson transcripts were based on the traditional method, and Achievement tests on Mathematics were used to collect data. The statistical techniques adopted is 't' test on Achievement in Mathematics. The study revealed that the achievement of secondary school students taught through mathematical thinking is more effective than that of students taught through the traditional method.

**Keywords:** Mathematical Thinking, Achievement in Mathematics, Secondary Level.

## **Introduction**

Mathematics is one of the most important contributing factors to the rapid progress and prosperity of the human race. Mathematics thinking is important for all members of modern society as a habit of mind for its use in the workplace, Business, finance, and personal decision-making. Mathematics is fundamental to national prosperity, providing tools for understanding Science, Engineering, Technology, and Economics. Mathematical Modelling essentially consists of translating real-world problems into Mathematical problems, solving Mathematical issues, and interpreting these solutions in the language of the real world. Mathematical thinking encompasses the ability to approach problems logically and strategically, using mathematical concepts and reasoning to find solutions.

**Figure 1 How Teachers can develop mathematical thinking among the students**

### Key Components of Mathematical Thinking

**Problem-solving:** Breaking down complex problems into smaller, manageable parts and developing strategies to solve them.

**Reasoning and Proof:** Using logic and deductive reasoning to justify conclusions and build mathematical arguments.

**Abstracting and Generalizing:** Identifying patterns and relationships and using them to create abstract models and generalizations.

**Communication:** Expressing mathematical ideas clearly and precisely, both verbally and in writing.

**Connections:** Recognizing how different mathematical concepts relate to each other and to real-world situations.

**Representation:** Using diagrams, graphs, or other visual tools to represent mathematical ideas.

### Objectives of the study

1. To determine the effect of mathematical thinking on the achievement of students at the secondary level of mathematics.
2. To determine the effect of the traditional method on the achievement of students at the secondary level in mathematics.

3. To compare the effectiveness of mathematical thinking and traditional methods on the achievement of mathematics by secondary-level students.
4. To compare the effectiveness of Mathematical Thinking and Traditional Method on Achievement in Mathematics of students of secondary level with respect to Locale.

**Hypotheses of the study**

1. There is a significant difference in the means of scores on Achievement in Mathematics of secondary school students taught through Mathematical Thinking and Traditional Methods.
2. There is a significant difference in the mean scores on Achievement in Mathematics of secondary school Students taught through Mathematical Thinking and Traditional Methods concerning the Locale.

**Methodology in brief**

The experimental method was used to conduct the present study. The design selected was the pre-test, post-test, and experimental group Design. The study was conducted on a sample of 90 students of standard VIII of two divisions of Pallikunnu Government Higher Secondary School Kannur District. One division was randomly selected as the experimental group and the other as the control group.

**Tools used in the study**

The tools used in the study were lesson transcripts based on the Traditional method, lesson transcripts based on Mathematical Thinking, and achievement tests in Mathematics.

**Statistical Techniques used**

The statistical techniques employed are descriptive statistics and tests of the significance of the difference between means.

**Comparison of experimental and control groups on achievement in mathematics**

**Table 1 Test of significance of difference between the mean post-test scores achievement in mathematics of experimental and control groups**

Groups	No.of students	Mean	SD	C.R	Level of significance
Experimental	45	17.24	3.32	7.028	P<0.01
Control	45	11.09	3.97		

Table 1 shows that the critical ratio is 7.028, which is significant at 0.01 level. This shows that the two groups differ significantly with regard to Post-test scores. Therefore, it can be concluded that the two groups selected for the study, the experimental group, have high scores in their knowledge of the topic.

**Comparison of Experimental and Control groups with regards to Achievement in Mathematics with respect to Rural sub-sample**

**Table 2 Test of significance of the difference between the Means of Achievement in Mathematics of Experimental and Control groups with respect to locale Rural.**

Groups	No. of students	Mean	S. D	C.R.	Level of significance
Experimental	24	14.92	2.307	3.76	P< 0.01
Control	24	11.38	4.07		

Table 2 shows that the critical ratio is 3.76, which is significant at both levels. This indicates that the Experimental and Control Groups do differ significantly with regard to their Achievement in Mathematics after the Experimental treatment. Thus, it can be concluded that the Experimental group has higher means than the Control group with regard to their Achievement in Mathematics of students in the local rural.

**Comparison of Experimental and Control groups with regards to Achievement in Mathematics with respect to urban sub-sample**

**Table 3 Test of significance of the difference between the Means of Achievement in Mathematics of Experimental and Control groups with respect to urban sub-sample.**

Groups	No.of students	Mean	S. D	C.R.	Level of significance
Experimental	21	19.90	2.068	9.60	P<0 .01
Control	21	10.76	3.841		

Table 3 shows that the critical ratio is 9.60, which is significant at both levels. This indicates that the Experimental and Control Groups differ significantly in terms of their Achievement in Mathematics before the Experimental treatment. Thus, it can be concluded that the Experimental group has higher means than the Control group with regard to their Achievement in Mathematics of students in the local urban Area.

**Educational Implications**

The study shows that the Mathematical Thinking approach is more effective than the Traditional method of teaching mathematics. The implications of the study were classified as follows. Mathematic thinking improves students' achievement in mathematics and enables students to use mathematical concepts to solve problems. Teachers can use the Mathematical Thinking approach at any level of education.

**Conclusions**

Mathematical thinking Enhances learning and helps students to understand the why behind mathematical procedures rather than just memorizing steps. It develops critical thinking skills and encourages students to analyze information, make inferences, and evaluate arguments. Mathematical thinking Provides a foundation for future learning; a strong foundation in mathematical thinking prepares students for more advanced mathematical concepts and applications. This can be applied to various fields; Mathematical thinking is valuable in many disciplines, including science, engineering, computer science, and Business. The study shows that Mathematical Thinking is more effective than the traditional method of teaching mathematics. It has wide application in teaching basic level to higher level Mathematics. Hence, teachers must be encouraged to apply Mathematical Thinking to enhance Mathematics Education.

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