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# EFFECTIVENESS OF PATH SMOOTHING MODEL ON PROBLEM-SOLVING SKILLS IN MATHEMATICS AMONG STUDENTS AT SECONDARY LEVEL

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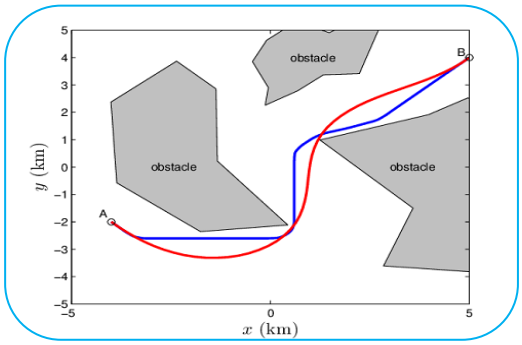
**ABSTRACT :**

*Path Smoothing Model is a model which emphasizes repetitive rather than insightful activities to make the subject in curriculum easier and smoother (Alan Wigley, 1992). Path Smoothing is when the teacher selects the type of problem, guides students through a procedure to solve it, and provides repetitive practice exercises until students can solve the problems with minimal mistakes.*




*An experimental design was used, where experimental group which was taught using Path Smoothing Model and control group was taught using prevailing activity-oriented methods. The Tools used for the study were Lesson Transcript based on Path Smoothing Model, Lesson Transcript based on Prevailing Activity Oriented Method and Test on Problem-Solving Skills in Mathematics. The sample for the study was Seventy Students of Eighth Standard of Pope Pius XI HSS, Kattanam, Alappuzha District, Kerala State. The selected samples were the students of standard VIII B and VIII D. The Experimental group were 35 students of VIII D and Control group were 35 students of VIII B. Arithmetic Mean, Standard Deviation, t-test were the statistical technique used for the study. The results of the study revealed the t value to be 5.31 ($p<0.01$), which indicated that Path Smoothing Model is effective than Prevailing Activity Oriented Method on enhancing Problem-Solving Skills in Mathematics among students at Secondary Level.*

**KEYWORDS :** *Path Smoothing Model, Problem-Solving Skills in Mathematics.*

## INTRODUCTION:

Education is the foundation of all learning and intellectual growth. It helps us to ask questions, think critically, and find solutions. Problem solving is a cognitive process that comprises of discovering, analyzing and solving problems. Problem solving helps in overcoming obstacles and resolves the issue. Problem solving is the higher level of cognitive process that necessitates the modulation and control of fundamental skills. Problem solving is an inevitable part of life. In our day-to-day activity we solve the problems. Sometimes problems are easy sometimes they are difficult. Problem-Solving Skills becomes important for students in meeting their future career demands. Mathematics is an area where Problem-Solving Skills are very important. Mathematics is one of the subjects that can develop these skills effectively. Problem-Solving Skills in Mathematics not only help the learner to tackle mathematical problems but also develops the logical thinking among the learner to solve problems beyond the mathematics. The Path Smoothing Model enhances the teaching and learning processes by fostering critical thinking and practical application skills in students. This innovative teaching approach will greatly benefit our educational system. It addresses the challenges faced in Mathematics learning,

making the subject more engaging and enjoyable for students. Developing Problem-Solving Skills within this model equips students with essential competencies for success in life. These skills are valuable for everyday situations, community involvement, self-assessment, problem solving in life, and leading a quality life.

## NEED AND SIGNIFICANCE OF THE STUDY

Mathematics is crucial to human progress, especially in our increasingly science and technology-driven world. The world of today, which learn more and more heavily on science and technology, demands more and more mathematical knowledge and part of more and more people. Mathematics thinking is important of modern society as habit of mind for its use in the workplace, business and finance and for personal decision making. The current education system, especially in mathematics, often focuses more on scoring high marks in exams rather than enhancing students' Problem-Solving Skills. This emphasis on marks can undermine the development of critical thinking and practical skills, which are essential for truly understanding and applying mathematical concepts. Teachers and schools, driven by the pressure to perform well on standardized tests, mostly prepare students to succeed in exams. However, this often leads to rote learning and memorization, rather than fostering a deep understanding of the subject.

A significant problem with this approach is that it does not consider the individual learning needs and Problem-Solving Skills of students. Mathematics, which relies on the ability to analyze and solve problems, should be taught in a way that encourages students to think logically and creatively. Instead, the current system often reduces mathematics to a series of steps to be memorized for the sake of obtaining correct answers on tests. This method stifles curiosity and creativity and leaves students unprepared for real-world applications of mathematical knowledge.

The long-term effects of a marks-focused education system can be harmful to students' future success. Employers and higher education institutions increasingly value individuals with strong analytical and Problem-Solving Skills. Therefore, it is essential for the education system to shift its focus from merely preparing students to excel in exams to fostering a more holistic development of skills and knowledge.

## OBJECTIVES OF THE STUDY

1. To prepare Lesson Transcript based on Path Smoothing Model.
2. To compare the mean scores of Problem-Solving Skills in Mathematics of Secondary School Students taught using Path Smoothing Model and Prevailing Activity Oriented Method.

## HYPOTHESIS OF THE STUDY

The mean scores of Problem-Solving Skills in Mathematics of Secondary School Students taught Using Path Smoothing Model is significantly higher than that of those taught using Prevailing Activity Oriented Method.

## METHODOLOGY IN BRIEF

An experimental approach is taken to investigate the effectiveness of Path Smoothing Model on Secondary School Students' Problem-Solving Skills in Mathematics in this study. To test the effectiveness of Path Smoothing Model, students will be assessed individually on their Problem-Solving Skills in Mathematics before and afterwards the applied intervention.

Population is the whole group of individuals or items that a researcher is interested in studying, with shared characteristics. The population of the study consists of 8th-grade students, who are studying in secondary schools associated with the Kerala State syllabus. A sample is a portion or a manageable group of the population that is chosen for the study. It is a selection intended to serve as representative of the population with an effort so that the findings are applicable. For this analysis, the sample comprises a selected group of Seventy Students of Eighth Standard of Pope Pius XI HSS, Kattanam, Alappuzha District, Kerala State. The selected samples were the students of standard VIII B

and VIII D. The Experimental group were 35 students of VIII D and were taught using Path Smoothing Model and Control group of 35 students of VIII B were taught using Activity Oriented Methods.

Tools are the instruments employed for gathering the necessary data. A tool is an instrument used for measuring, with widely accepted units of measurement. According to Aggarwal (1966), a tool is defined as "the instruments employed as a means to gather new factors to explore new fields." The Tools and Materials used for the study was Lesson Transcript based on Path Smoothing Model, Lesson Transcript based on Prevailing Activity Oriented Method and Test on Problem-Solving Skills in Mathematics.

The process can be broken into three steps. A pre-test to test the Problem Solving Skill in Mathematics. Secondly, the intervention phase involving the use of Path Smoothing Model over three weeks of mathematics lessons. In the post-test stage, after the intervention, the same test on Problem Solving Skill in Mathematics is administered to the students to measure the amount of impact of the Path Smoothing Model.

Data are collected in the form of pre-test and post-test scores, and qualitative observations from the intervention phase. Descriptive and inferential statistics are then employed to analyze the data. The mean and standard deviation give you an overall picture of the results, and the t-test tells you how significant the difference you see between the groups is.

## RESULTS AND DISCUSSION OF THE STUDY

The investigator assesses how effective Path Smoothing Model is in enhancing Problem Solving Skills among secondary school students. In the context of this research, data were collected through a standardized test on Problem Solving Skills in Mathematics given to experimental and control groups, with pre- and post-test scores used as the basis for analysis. The data were summarized through descriptive statistics, including mean and standard deviation, while inferential statistics, particularly the t-test, were used to test the hypotheses regarding the performance of both groups.

### SECTION - 1

### Comparison of mean scores of Test on Problem-Solving Skills in Mathematics among Students in Experimental Group and Control Group Based on Pre-test

The significance of the difference between the mean scores of Pre-test obtained by Experimental and Control group were found by calculating t-test.

**Table 1:**

***Data and Result of Test of Significance between the Pre-test scores of Experimental and Control group.***

| Group | Number of pupils | Mean | Standard Deviation | T value | Level of significance |
|---|---|---|---|---|---|
| Experimental group | 35 | 15.71 | 3.45 | 0.035 | $p > 0.05$ |
| Control group | 35 | 13.77 | 4.07 | | |

The mean value of Experimental group is 15.71 and the mean value of Control group is 13.77. The Standard Deviation of Experimental group is 3.45 and the Standard Deviation of Control group is 4.07. The t- value 0.035 is not significant. So, the Experimental group and Control group do not differ significantly in their Pre- test scores.

The table above statistically proved that there is no significant difference between Pretest scores of Experimental group and Control group.

## SECTION - 2

### Comparison of mean scores of Test on Problem-Solving Skills in Mathematics among students of Experimental group and Control group based on Post-test

The investigator collected the post-test scores of Experimental group and Control group and the data were analyzed using critical ratio. Details of the comparison of Test on Problem-Solving Skills in Mathematics of Experimental group and Control group based on post-test are given below.

**Table 2:**
***Significance of Post test scores of Problem-Solving Skills in Mathematics of Experimental group and Control group***

| Group | Number of pupils | Mean | Standard Deviation | T value | Level of significance |
|---|---|---|---|---|---|
| Experimental group | 35 | 20.34 | 2.31 | 5.31 | $p < 0.01$ |
| Control group | 35 | 15.89 | 4.39 | | |

It is inferred from the above table that the Mean of the Experimental group is 20.34, which is higher than that of the Control group, whose Mean is 15.89. The Standard Deviation of the Experimental group is 2.31, and the Standard Deviation of the Control group is 4.39. The t-value is 5.31, which is greater than the table value at the 0.01 level of significance ($p<0.01$). Thus, there is a significant difference between the means of the post-test scores of the Experimental group and the Control group.

A significant difference was also found between the mean Problem-Solving scores of the Experimental Group and the Control Group. The investigator concluded that the Experimental Group taught using the Path Smoothing Model gained more than the Control Group taught using the Prevailing Activity-Oriented Method with respect to Problem-Solving. Therefore, it can be stated that the Path Smoothing Model is more effective than the existing Activity-Oriented Method in enhancing Problem-Solving Skills in Mathematics among secondary school students.

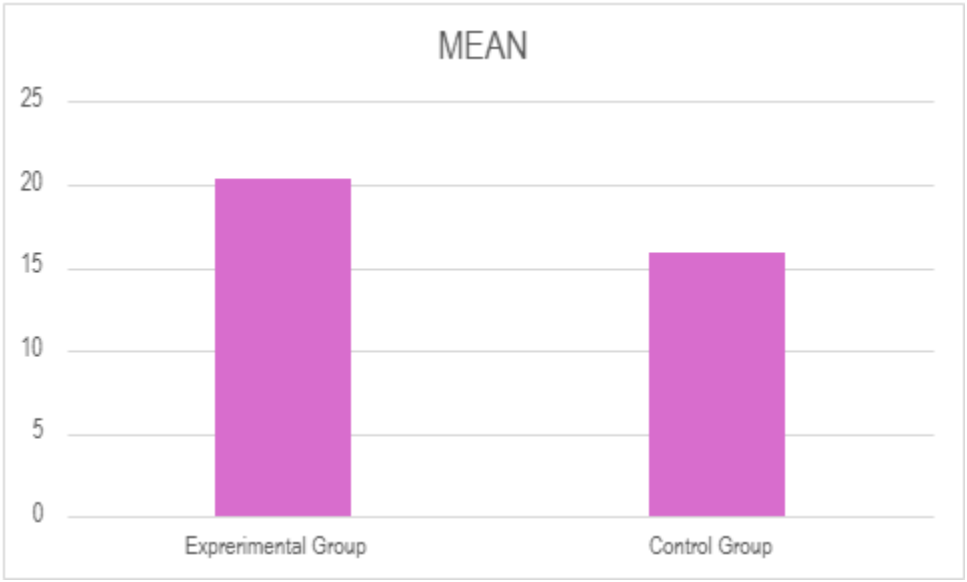



***Figure 1:*** **Graphical representation of comparison of Test on Problem-Solving Skills in Mathematics of Experimental group and Control group based on post-test**

The above graph gives the detail about the mean of post-test of Test on Problem-Solving Skills in Mathematics conducted to the experimental group and control group in Mathematics. It is seen that the graph possesses a significant amount of difference.

## EDUCATIONAL IMPLICATIONS OF THE STUDY

i. The Problem-Solving Skills in Mathematics of students can be improved through continuous practice and application of the skills.
ii. Problem-Solving Skills in Mathematics are considered the foundation of all learning, especially in Mathematics. Therefore, it is the duty of curriculum planners to incorporate suitable activities in the curriculum for the improvement of Problem-Solving Skills in Mathematics of their students.
iii. The result of the study revealed that the Path Smoothing Model enhances the Problem-Solving Skills in Mathematics of students.
iv. Since the instructional strategy based on the Path Smoothing Model is more effective than the Ordinary Activity-Oriented method, faculty improvement programs like orientation classes, refresher courses, seminars, and workshops should be organized for teachers to familiarize themselves with various instructional strategies. This helps Secondary School teachers to develop novel strategies.
v. The importance of learning models should be emphasized in the Teacher Education Curriculum, and teacher educators should be equipped to translate the importance of learning models into their practice.

## CONCLUSION

Path Smoothing Model is an instructional approach designed to enhance problem-solving skills in mathematics by emphasizing structured, repetitive practice under guided teacher supervision, ensuring students achieve procedural fluency with minimal errors. This study was undertaken to evaluate the effectiveness of the Path Smoothing Model among secondary school students, and the findings clearly demonstrated its significant positive impact when compared to the prevailing activity-oriented methods. Students who were taught using the Path Smoothing Model showed notable improvement in their ability to solve mathematical problems, highlighting the strength of a method that focuses on stepwise guidance, focused practice, and mastery through repetition. Unlike traditional activity-based teaching that often results in surface-level learning, the Path Smoothing Model systematically addresses learners' weaknesses by reinforcing core concepts until students develop the confidence and efficiency needed for higher-level problem-solving. The study, therefore, suggests adopting modern, learner-centered teaching methods that help students develop strong reasoning, analytical, and adaptive skills, preparing them to perform successfully in a complex and competitive world.

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