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Research Paper Education

# Effectiveness of Problem Solving Strategies for Learning Mathematics to Rural High School Students


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**ABSTRACT**

*The present study highlights the effectiveness of problem solving strategies for learning mathematics to rural high school students. This study aims to contribute to the understanding of how the teaching of problem solving strategies and strategy thinking in mathematics can be organized in a regular classroom setting and how this affects rural students' learning in mathematics. We start by discussing the nature of the concept of strategy in relation to the concepts of method and algorithm. After administering problem solving strategies were implemented for period of one month. Using pre and post tests, we compare the development of the students' conceptual and procedural abilities with a control group. In addition, we use the post test to investigate the students' use of problem solving strategies. The results suggest that these activities improve students' ability to use problem solving strategies. Moreover, significant differences were found in conceptual and procedural abilities in mathematics, the experimental group improving more than the control group.*


**KEYWORDS : Problem Solving Strategies, Learning Mathematics, Rural High School Students.**

## Introduction

Mathematics is a breathing subject which seeks to understand pattern that fill both the world around us and the mind within us. Mathematics is a human activity involving the solution of problematic situations. In finding the solution of outside and inside problems, mathematical objects gradually come out. Mathematics is a symbolic language in which problem situations and the solutions found (or) expressed. Mathematics is a logically organized conceptual system. Once a mathematical object has been accepted as part of this system, it can also be considered as a textual reality and the component of the global structure.

The main reason for studying mathematics is to solve problems. Without the ability to solve problems, the usefulness and effect of mathematical ideas, knowledge and skills are severely limited. The problem solving techniques such as Act it out, draw a diagram, try a simpler case etc are important life skills that our pupils needs in order to function in a modern society.

Teachers play an important role in the development of pupils' problem solving abilities by creating a supportive classroom environment in which pupils are encouraged to 'have a go' at solving problems. In such an environment pupils can develop confidence in tackling unfamiliar situations and problems.

## The problem solving process

The problem solving process can be broken down into three steps:

- Understanding and planning
- Solving
- Communicating and Evaluating

## Understanding and Planning

The first step in solving any problem is to understand it. Pupil should be introduced to the problem, given opportunity to discuss it, decide which information is important and if any vocabulary is unfamiliar. Pupil should then plan how to proceed by considering if they have tackled similar problems and what strategies could be used.

## Solving

- What strategies could I use?
- Write down what you do.
- Check your answer- does it make sense?
- If stuck, try a different method.

## Communicating and Evaluating

When pupils are given the opportunity to explain their solution, to a group or the class, their understanding of the problem will deepen. The class discussion should try to focus on the different methods used and the merits of one strategy compared to another. It would assist retention if the methods used were listed, by the teachers, as the pupil explains them.

## The evaluation could include:

- Does the answer make sense?
- Could more efficient methods be used to tackle the problem?

The teacher should stress that how a problem is solved is important-not just finding a correct answer. An emphasis on the process enables all pupils to experience some success in problem solving. The effort rather than the answer should be recognized as much as possible.

## Need for the Study

Though mathematics constitutes the most important component of school curriculum, majority of our rural students find it often difficult to learn and score high marks in mathematic. Several studies have attempted to unravel the problems pertaining to the factors that may have significant impact over the learning of mathematics.

Problem solving is an important of mathematics education because it is the single vehicle which seems to be able to achieve at school level all three of the values of mathematics listed at the outset of functional, logical and aesthetic. Let us consider how problem solving is a useful medium for each of these. It has already been pointed out that mathematics is an essential discipline because of its practical role to the individual and society. Through a problem – solving approach, this aspect of mathematics can be developed. Presenting a problem and developing the skills needed to solve that problem is more mo-

tivational than teaching the skills without a context. Such motivation gives problem solving special value as a vehicle for learning new concepts and skills or the reinforcement of skills already acquired (Stanic and Kilptrick, 1989; NCTM, 1989). Approaching mathematics through problem solving can create a context which stimulates real life and therefore justifies the mathematics rather than treating it as an end in itself. It has already been pointed out that mathematics is an essential discipline because of its practical role to the individual and society. The National Council of Teachers of Mathematics (NCTM, 1980) recommended that problem solving be the focus of mathematics teaching because, they say, it encompasses skills and functions which are an important part of everyday life. According to Resnick (1987) a problem-solving approach contributes to the practical use of mathematics by helping people to develop the facility to be adaptable when, for instance, technology breaks down. It can thus also help people to transfer into new work environments at this time when most are likely to be faced with several career changes during a working lifetime (NCTM, 1989). Resnick expressed the belief that' school should focus its efforts on preparing people to be good adaptive learners, so that they can perform effectively when situations are unpredictable and task demands change' (p.18). Cockcroft (1982) also advocated problem solving as a means of developing mathematical thinking as a tool for daily living, saying that problem-solving ability lies 'at the heart of mathematics' (p.73) because it is the means by which mathematics can be applied to a variety of unfamiliar situations. In this paper focused on effect of problem solving strategies in learning mathematics to rural high school students.

**Statement of the Problem**

Effectiveness of Problem Solving Strategies for Learning Mathematics to Rural High School Students

**Objectives**

The major purpose of this study was to investigate the effect of problem solving strategies for learning mathematics to rural high school students.

- To determine the role of problem solving strategies in the achievement of rural students in learning mathematics at high school level.
- To compare the achievement of students taught by problem solving strategies and students taught by traditional method.

**Hypothesis**

- There is no significant difference between the achievement of the controlled and experimental group in pre-test.
- There is significant difference between the achievement of the controlled and experimental group in post-test.
- There is no significant difference between the achievement of the pre and post-test scores of control group.
- There is significant difference between the achievement of the pre and post- test scores of experimental group.

**Methodology**

Experimental method was adopted in the present study.

**Tools Used in the Study**

- An achievement test to assess the academic achievement of IX standard Rural Students.
- Develop and implement the Problem Solving Strategies on Learning Mathematics for IX Standard Rural Students.

**Sample of the Study**

The total sample consists of 50 students, studying in IX standard from Dharumai Kayilai Gurumani. Hr. Sec. School Kundrakudi, Sivaganga District.

**Research Design**

A pre test, post test design with matched experimental and control groups were used. A self- developed test was used as an instrument. The researcher developed a test after reviewing the related literature and consolation with experts.

**Results and Discussion**

For acquisition of results quantitative method was used in this study. The data collected were analyzed using mean, standard deviation and t-test. It was found that there was a significant difference between the achievement of the students taught through traditional method and problem solving strategies. It was also found that the achievement of the students was better who were taught through problem solving method as compare to the students who were taught through traditional method. On the basis of these findings in this study, the following conclusions were drawn:

Students taught through problem solving strategies achieved better than those taught by traditional method.

There exists a significant difference in the achievement of mathematics students taught through problem solving strategies and traditional method.

Difference between the achievements level is due to problem based strategy, otherwise both group have equal basic knowledge of mathematics.

**TABLE-1: Pre-test Mean Scores, Standard Deviation and the calculated t - Value of Control Group and Experimental Group**

| Pre Test | Number of students | mean | SD | 't' value |
|---|---|---|---|---|
| Control group | 25 | 50.6 | 12.9 | |
| Experimental group | 25 | 50.4 | 15.9 | 0.04@ |

Note: @- No Significant

From the above table, the obtained t-value is not significant which shows that there is no significant difference in pre-test achievement scores between control group and experimental group. The stated hypothesis 'there is no significant difference between the pre-test mean scores of the control group and experimental group rural students is accepted. Thus statistically, the two groups are homogenous in their academic achievement before treatment.

**TABLE-2: Post-test Mean Scores, Standard Deviation and the calculated t - Value of Control Group and Experimental Group**

| Post Test | Number of students | Mean | SD | 't' value |
|---|---|---|---|---|
| Control group | 25 | 57.4 | 13.8 | |
| Experimental group | 25 | 80.4 | 18.6 | 4.5** |

Note: ** Significant at 0.01 level

The above table evinced that the obtained t- value 4.5 is significant at 0.01 level. Thus the stated hypothesis 'There is a significant difference in post-test mean scores of the control group and the experimental group students taught through problem solving strategies' is accepted. When the mean scores are compared experimental group (80.4) is found to be higher than the control group (57.4). Therefore when students are taught through problem solving strategies they can understand and excel academically rather than teaching through chalk and board method. Cockcroft (1982), Stanic and Kilptrick (1989); NCTM (1989) have also established the effectiveness of problem solving strategies to mathematics in process at various levels. The present study also showed that Effectiveness of Problem Solving Strategies for Learning Mathematics to Rural High School Students.

**TABLE – 3: Pre test and Post-test Mean Scores, Standard Deviation and the calculated t - Value of Control group**

| Control Group | Number of students | Mean | SD | 't' value |
|---|---|---|---|---|
| Pre test | 20 | 50.6 | 12.9 | |
| Post test | 20 | 57.4 | 13.8 | 1.6* |

Note: * Significant at 0.05 level

From the above table, the obtained t-value is not significant which shows that there is no significant difference in pre-test and post-test achievement scores of control group. The stated hypothesis 'there is no significant difference between the pre-test and post-test mean scores of the control group students' is accepted.

**TABLE – 4: Pre test and Post-test Mean Scores, Standard Deviation and the calculated t - Value of Experimental group**

| Exp. Group | Number of students | Mean | SD | 't' value |
|---|---|---|---|---|
| Pre test | 25 | 50.4 | 15.9 | 5.5** |
| Post test | 25 | 80.4 | 18.6 | |

Note: ** Significant at 0.01 level.

The obtained t – value 5.5 is found to be significant at 0.01 levels. Thus the stated hypothesis 'there is a significant difference between pre-test and post-test mean scores of experimental group students taught through problem solving strategies' is accepted. Thus problem solving strategies was found to be effective in teaching mathematics. Teachers have to be encouraged to use such thinking ability based problem solving to improve students' academic achievement.

## EDUCATIONAL IMPLICATIONS OF THE STUDY

A few educational implications for the present study as follows,

1. The results of the study have proved that problem solving strategies is more effective than the traditional method in teaching mathematics to standard IX students. It will be equally effective for the students at all levels.

2. All educational Bodies such as DIET, SCERT, NCERT and NCTE should encourage teachers to use thinking ability in their teaching learning process.

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