



## **PROBLEM SOLVING ABILITY AND MATHEMATICAL ATTITUDE AS DETERMINANTS OF MATHEMATICS ACHIEVEMENT**

**Surinder Mohan Deep**

*Assistant Professor, Govind National College, Narangwal, Ludhiana (Pb.)*

### ***Abstract***

*The present study is descriptive one and it has been conducted in Jagraon Tehsil of Ludhiana District. The sample comprised 200 students of 10+1 class (100 boys and 100 girls) of Government Senior Secondary Schools of Jagraon Tehsil. The data was obtained by using Problem Solving Ability Test by Dubey, and Mathematical Attitude Scale by Gakhar. The Percentage scores obtained in 10<sup>th</sup> class examination in the subject of mathematics were considered as Mathematics Achievement. The obtained data was analyzed using Persons' correlation and step-up regression. The major findings are (i) There exists significant positive relationship between Problem Solving Ability and Mathematics Achievement (ii) There exists significant positive relationship between Mathematical Attitude and Mathematics Achievement and (iii) Problem Solving Ability and Mathematical Attitude conjointly predict Mathematics Achievement significantly higher as compared to their separate prediction for adolescents.*

**Keywords:** Problem Solving Ability, Mathematical Attitude, Mathematics Achievement

### **Introduction:**

Success, efficiency and happiness in life depend to a large extent on the ability to solve problem. It is obvious enough and equally obvious is the fact that a child is not born with the ability but to develop it in the course of his experience under the guidance of his parents, teachers and elders. Problem solving is one such capacity which is a process of overcoming difficulties that appear to interfere with the attainment of goal. Simple problem can be solved by instructive and habitual behaviour. More difficult problems require degree of understanding, a perception of relationship between the significant factors of a problem. Problem solving occurs in novel or difficult situations in which solution is not attainable by

habitual method of applying concepts and principles derived from past experiences (Woodworth and Marquis, 1948).

Therefore problem solving can be treated as a process where the problem solver must find relationships between past experiences and the problem at hand and then act upon a solution. Another variable which helps in understanding the nature of problem is the mathematical attitude.

The phrase 'mathematical attitude' appears to have a clear meaning until the attempt is made to define it.

Mobilizing a set of different definitions concerning attitudes presented since 1935, Eshun (2004) defines an attitude towards mathematics as “a disposition towards an aspect of mathematics that has been acquired by an individual through his or her beliefs and experiences but which could be changed.” When emphasizing the importance of individual experiences, the contexts where students interact with others and with mathematics become important focal points. Fraser and Kahle (2007) have also highlighted this aspect in research which shows that learning environments at home, at school, and within the peer group accounted for a significant amount of variance in student attitudes and, furthermore, that class ethos had a significant impact on the scores achieved by students for these attitudes

The Mathematical attitude plays a major role in mathematics education and has impact on the Mathematics achievement of the students. Mathematics achievement as the name implies refers to the success or proficiency gained during the student's academic career in the subject mathematics which are assessed by the school authorities with the help of achievement test.

According to Crow and Crow (1956) Achievement may be defined as "the extent to which learner is profiting from instruction in a given area of learning."

### **Emergence of the Problem**

After reviewing the literature, it was found that most of the studies are restrained to foreign countries. Owing to dissimilarities in social norms and cultural values, the findings obtained from these studies may not be really applicable and useful to explain the case of Punjab. Although many researches were already conducted on studying this phenomenon, there are still flaws in our understanding as there is no consensus on the relationship between the three variables: Problem Solving Ability, Mathematical Attitude and Mathematics Achievement. Since there are very few studies studying the direct relationship between 1) Problem Solving Ability and Mathematics Achievement and 2) Mathematical Attitude and Mathematics Achievement, it is hoped that the present study can provide insights on this adequately studied issue

### **Objectives of the Study**

1. To study the relationship between Problem Solving Ability and Mathematics Achievement.
2. To study the relationship between Mathematical Attitude and Mathematics Achievement
3. To predict the Mathematics Achievement on the Basis of Problem Solving Ability and Mathematics Attitude.

### **Hypotheses**

H<sub>0</sub>1 There exists no significant relationship between Problem Solving Ability and Mathematics Achievement.

H<sub>0</sub>2 There exists no significant relationship between Mathematical Attitude and Mathematics Achievement.

H<sub>0</sub>3 The prediction of Mathematics Achievement of adolescents on the basis of conjoint effect of Problem Solving Ability and Mathematical Attitude will not be significantly higher as compared to their separate prediction.

## Sample

The school sample was drawn from the representative senior secondary schools of Jagraon Tehsil. 200 students (100 boys and 100 girls) were selected randomly from the 10+1 class of government senior secondary schools.

## Tools Used

The tools used in the study have been enlisted below:

1. Problem Solving Ability Test (PSAT) by Dubey (2007).
2. Mathematical Attitude Scale (MAS) by Gakhar (2007).
3. Percentage scores obtained in 10<sup>th</sup> class examination in the subject of Mathematics were used as a measure of Mathematics Achievement.

## Statistical Techniques Use

1. To find the relationship between variables, Pearson's Coefficient of Correlation was used.
2. To predict Mathematics Achievement on the basis of Problem Solving Ability and Mathematics Attitude step-up regression was employed.

## Results

**Table1** Coefficient of Correlation between Problem Solving Ability and Mathematics Achievement

<b>Respondent</b>	<b>N</b>	<b>R</b>
Total Sample	200	0.32*
Boys	100	0.36*
Girls	100	0.26*

Table 1 reveals that the value of coefficient of correlation between the Problem Solving ability and Mathematics Achievement for the total sample, boys and girls came out to be 0.32, 0.36 and 0.26 respectively. All the values are significant and 0.01 level of confidence. Therefore we can say that there exists positive significant relationship between Problem Solving Ability and Mathematics Achievement. Hence the hypothesis, "There exists no significant relationship between Problem Solving Ability and Mathematics Achievement" stands rejected. The above results are supported by Battista and Douglas (1986), Rodriguez and Olivares (2000) and Ornek (2009). The above results also seems to be justified because if the students have high Problem Solving Ability then they have good degree of understanding, a perception of relationship between significant factors of problem and reasoning ability. These factors help him to achieve high.

**Table2** Coefficient of Correlation between Mathematical Attitude and Mathematics Achievement

Respondent	N	r
Total Sample	200	0.26*
Boys	100	0.28*
Girls	100	0.25*

Table 2 reveals that the value of coefficient of correlation between the Mathematical Attitude and Mathematics Achievement for the total sample, boys and girls came out to be 0.26, 0.28 and 0.25 respectively. All the values are significant and 0.01 level of confidence. Therefore we can say that there exists positive significant relationship between Mathematical Attitude and Mathematics Achievement. Hence the hypothesis, "There exists no significant relationship between Mathematics Attitude and Mathematics Achievement" stands rejected. The above results are supported by Ddeshmukh (1988), Rosaly (2004) and Linn (2006). The above results also seem to be justified because if the students have high Mathematical Attitude then he is able to think critically and reason out scientifically. By using this ability student can achieve high academically.

**Table3** Step-up Regression Equation showing prediction of Mathematics Achievement on the basis of Problem Solving Ability and Mathematical Attitude of total sample

Variable	$d_f$	$R^2$	R	F	Step-up regression equation
Model I					
Problem Solving Ability	199	0.069	0.262	14.64*	$Y = 69.37 + 0.262X_1$
Model II					
Mathematics attitude	199	0.051	0.225	10.59*	$Y = 73.89 + X_2$
Model III					
Problem Solving Ability + Mathematics attitude	199	0.099	0.315	10.86*	$Y=66.91+0.225X_1+0.178X_2$

Model I and II of table 3 shows that for adolescents the value of  $R^2$  for Problem Solving Ability is 0.069 and that for Mathematical Attitude is 0.051. Thus 6.9% of Mathematics Achievement is predicted by Problem Solving Ability and 5.1 by Mathematical Attitude. Model III shows the combined  $R^2$  which is equal to 0.099. Therefore 9.9% of Mathematics Achievement is predicted by Problem Solving Ability and Mathematical Attitude taken together. The remaining 90.1% of Mathematics Achievement is predicted by the variables not included in the present study. The F for Problem Solving Ability and Mathematical Attitude taken together is 10.86 which is significant at 0.01 level of significance. It leads to the conclusion that Problem Solving Ability and Mathematical Attitude conjointly predict Mathematics Achievement significantly higher as compared to their separate prediction for adolescents. Hence the null hypothesis stating that "the prediction of Mathematics Achievement on the basis of conjoint effect of Problem Solving

Ability and Mathematical Attitude will not be significantly higher as compared to their separate prediction" stands rejected.

### **Educational Implications**

From the above results it can be said that the child should be presented with the solving life problems of significance to him at the moment, rather than problems which have only future significance. Schools must teach the method as well as the habits of problem solving. The problem solving method in all subjects and on all grade levels should be applied so that the children learn the habit of using their superior problem solving abilities in the solution of more mundane problems of living. Also the democratic citizen of this country must be taught to think for himself. He should be taught how to think. For this necessary attitude must be developed among the individuals. For these facilities like library, laboratory, audio-visual aids, exposure to eminent mathematicians, participation in mathematics fairs, exhibitions should be provided by schools. Thus with the development of better Problem Solving Ability and Mathematical Attitude students can score high in academics.

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