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# MATHEMATICAL OUTCOMES: INTEREST AND ATTITUDE AS PREDICTORS OF PROBLEM SOLVING ABILITY IN MATHEMATICS

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***Abstract*** : Problem solving is an essential life skill which everyone needs in their day to day lives, whether at home, school, workplace or in the community. Mathematics education focuses on certain cognitive and affective outcomes, Problem solving ability, Reasoning, interest and positive attitude to list some. These outcomes may be interrelated and contributing to each other. The purpose of this study is to find out the relationship of Attitude towards Mathematics and Interest in Mathematics with Problem solving ability in Mathematics and efficiency of these variables to predict it. The study was conducted on 200, ninth standard students from Thrissur District in Kerala. The data was analyzed using Pearson's Correlation coefficient and linear regression. The findings revealed that Problem solving ability is positively and moderately related to Interest and Attitude, also they are significant predictors of Problem Solving ability in Mathematics.

***Key Words***: Mathematical outcomes, Problem Solving Ability in Mathematics, Attitude towards Mathematics, Interest in Mathematics

## INTRODUCTION

Mathematics has played a vital role in education from ancient times itself owing to its unique nature and extensive application. Mathematics is the only subject, tuned with all other subjects and vocational fields. The outcomes of Mathematics learning are many: reasoning, problem solving ability, interest in learning Mathematics and positive attitude towards the subject are some among them. Educationists agree upon the adeptness of Mathematics education in developing a better understanding and ability to logically analyze real life problems. Problem solving is at heart in the study of Mathematics and is a target to be achieved through learning Mathematics as well as a means of Mathematics learning. The learning of Mathematics through Problem-solving has infused Mathematics curricula around the world.

Despite its global acceptance, the student community in general discard Mathematics due to many reasons, the major ones identified by researchers in the area being the nature of the subject, faulty methods of teaching, unscientific curriculum, rote learning, lack of conceptual clarity, limited resources, exam oriented education and certain personal and environmental factors (Acharya, 2017; Akhter, 2018; Mulwa, 2015, Shukla, 2023).

Many of its stakeholders concentrate only on a 'numeric pass' in Mathematics leading to the domination of dogmatic method in teaching Mathematics. Many research studies reported on the effectiveness of various innovative methods like metacognitive strategies (Vijayakumari, 2023); cooperative learning (Capar & Tarim,2015) and inquiry-based, context-based, computer-based, collaborative learning strategies, and extracurricular activities ((Savelsbergh et al., 2016). But our classrooms still focus on memorizing mathematical facts without any meaning for the learners. A meaningful and enjoyable learning of Mathematics can make a difference in the cognitive and affective part of the learner. Blanco et al. (2013) highlighted the need of integrating cognitive and affective aspects of Mathematics teaching and learning at different levels.

Among the outcomes of Mathematics learning, Problem solving ability and attitudes are well explored both as an independent variable and a dependent variable. McLeod (1988) emphasized research on the role of affects in realizing one of the major goals of Mathematics education, development of problem solving ability among students. Problem solving beliefs, Attitude towards Mathematics, Anxiety about Mathematics and Self-efficacy perception for Mathematics, are reported as influential on problem solving ability. Even though these concepts cannot be completely separated from one another, they do have certain distinctive features also (Guven & Cabakcor, 2013). Mathematics problem solving success has an intermediate positive relationship with course grade point average and it is affected by students' attitude (Memnun, et al., 2012). Significant contribution of attitude to problem solving and Mathematics achievement is reported by Mohd, et al. (2011).

Review of related studies shows the importance of affective variables on achievement in Mathematics as well as problem solving ability. While teaching students cognitive abilities are more stressed compared to affective variables. But affective variables also need attention as these variables have a role in the development of cognitive abilities. Mathematics teachers can be more focused on their attempts to develop cognitive abilities, if the role of attitudes and interest, the major affective outcomes of Mathematics learning is explored. The present study attempts to find out the relationship of Attitude towards Mathematics and Interest in Mathematics with Problem solving ability in Mathematics and the efficiency of these variables to predict Problem solving ability in Mathematics.

## OBJECTIVES

1. To find out the extent of Problem solving ability in Mathematics among secondary school students.

2. To find out whether there is any significant relationship between Problem solving ability in Mathematics and Attitude towards Mathematics of secondary school students.

3. To find out whether there is any significant relationship between Problem solving ability in Mathematics and Interest in Mathematics of secondary school students.

4. To find out the efficiency of Attitude and Interest in predicting Problem solving ability in Mathematics.

## METHODOLOGY

### *Participants*

The population under study is secondary school students of Kerala. A sample of 200 ninth standard students from Thrissur district of Kerala state was selected using stratified sampling technique.

### *Tools used for the study*

- Test of Problem solving ability in Mathematics (Rinsa & Sumangala, 2008) was used to measure Problem solving ability in Mathematics. The test is reported to have high validity and reliability.
- Attitude towards Mathematics was measured using Scale of Attitude Towards Mathematics developed by Saheedali and Vijayakumari (2013) with eight dimensions of Attitude towards mathematics viz., value of learning Mathematics, practicality of Mathematics in life, anxiety and motivation in Mathematics, attitude towards Mathematics teachers, mathematicians, use of Mathematics to learn other subjects, universalization of Mathematics and aesthetics of Mathematics.
- Interest in Mathematics was measured using an adapted version of Mathematics Interest Inventory developed by Vijayakumari and Sumangala (2000) (re-standardized by Saritha and Vijayakumari , 2019).

## RESULTS AND DISCUSSION

To know the extent of the variables Problem solving ability in Mathematics, Attitude towards Mathematics and Interest in Mathematics among secondary school students, Mean, Median, Mode, Standard Deviation, Skewness and Kurtosis were computed and is presented in table 1.

**Table1** Descriptive statistics of the variables Problem solving ability in Mathematics, Attitude towards Mathematics, and Interest in Mathematics

| Variables | Mean | Median | Mode | Standard Deviation | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Problem solving ability in Mathematics | 10.72 | 9 | 10 | 4.64 | 0.13 | -0.83 |
| Attitude towards Mathematics | 91.41 | 94 | 96 | 13.33 | -0.24 | -0.13 |
| Interest in Mathematics | 8.48 | 8 | 10 | 5.76 | -0.96 | 0.60 |

Table 1 shows that the mean, median, and mode of the variable Problem solving ability in Mathematics are almost equal (mean =10.72, median =9, mode =10). The standard deviation of the variable (4.64) shows that the scores are not much dispersed from the mean. But the value of skewness shows a slight positive skewness in the distribution of Problem solving ability in Mathematics. A negative value of kurtosis shows that the distribution is slightly platykurtic, but small values of skewness and kurtosis show that the distribution can be considered as symmetric and mesokurtic. Hence the distribution of Problem solving ability in Mathematics scores are approximately normal. The maximum score obtainable for Problem solving ability in

Mathematics is 25, a mean score of 10.72 shows that the Secondary school students are having a low level of Problem solving ability in Mathematics.

The mean, median and mode of Attitude towards Mathematics are 91.41, 94, and 96, the values indicate a slight negative skewness of distribution. The negative value of skewness (-0.24) also indicates the distribution as slightly negatively skewed, and a small value of kurtosis (-0.13) shows that the distribution is mesokurtic. The maximum score obtainable for Attitude towards Mathematics is 160, a mean score of 91.41 with standard deviation 13.33 indicates that the students are not having a favorable Attitude towards Mathematics.

The distribution of scores on Interest in Mathematics has Mean, Median and Mode as 8.48, 8 and 10 respectively. The Standard Deviation of the scores is 5.76, Skewness and Kurtosis of the distribution are -0.96 and 0.60 respectively. This indicates the distribution is slightly negatively skewed but mesokurtic. The maximum score obtainable in the inventory is 33, and minimum zero. A mean score of 8.48 shows that the students are not at all interested in learning Mathematics.

The correlation coefficients calculated for Problem solving ability in Mathematics with Attitude towards Mathematics and Interest in Mathematics are given in Table 2.

**Table 2** Pearson's correlation coefficient for Problem solving ability in Mathematics with Attitude towards Mathematics and Interest in Mathematics

| Variable | Problem solving ability in Mathematics | |
|---|---|---|
| | r | $r^2 \times 100$ |
| Attitude towards Mathematics | 0.52 | 26.79 |
| Interest in Mathematics | 0.502 | 25.17 |

The correlation coefficients obtained show that significant positive relationship exists between the variables Problem solving ability in Mathematics and Attitude towards Mathematics, as well as Problem solving ability in Mathematics and Interest in Mathematics. The extent of the relationship is moderate in both cases. It can be seen that 26.79 percent of variation in Problem solving ability in Mathematics can be explained by variance in Attitude towards Mathematics and 25.17 percent of the variation is explained by variance in Interest in Mathematics

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Multiple linear regression analysis was done to test whether Attitude towards Mathematics and Interest in Mathematics are significant predictors of Problem-solving ability in Mathematics. The fitted regression model was

$Y^1 = -4.879 + 0.128\ X_1 + 0.274\ X_2$ where $Y^1$ is the predicted value of Problem solving ability in Mathematics, $X_1$ score on Attitude towards Mathematics, and $X_2$ score on Interest in Mathematics.

This model is statistically significant ($R^2 = .361$, $F(2,197) = 55.7$, $p<.01$), also Attitude towards Mathematics and Interest in Mathematics significantly predict Problem-solving ability in Mathematics ($\beta = .369$, & .34, $t=5.82$ & 5.37, $p< .01$)

Attitude towards Mathematics is accounted for 86% of variance in Problem solving ability in Mathematics explained by the model ($\frac{r}{R} = .86$) and that for Interest in Mathematics is 83%. The contribution of Attitude towards Mathematics to the model predicting Problem solving ability in Mathematics is 19.19 ($\beta \times r \times 100$) and that for Interest in Mathematics is 17.07.

## CONCLUSION

The study's findings suggest a positive, moderate relationship for Problem Solving ability in Mathematics with Attitude towards Mathematics and Interest in Mathematics which are significant predictors of Problem solving ability. This findings support the findings of Mohd, et al. (2011) and Sturm and Bohndick (2021), but not concomitant with the finding of Ocak, et al.(2022) that attitudes are not significant predictors of Problem solving ability. As 36 percent of variance in Problem solving ability is explained by the two affective variables, the study implies that fostering a positive attitude towards Mathematics and cultivating interest in the subject will contribute positively to problem solving ability among secondary school students. Educators can integrate activities that enhance Problem solving ability, develop positive attitude towards Mathematics and promote interest. The teaching methods that address both cognitive and affective aspects could contribute to a more holistic and engaging learning experience, potentially improving overall mathematical performance and fostering a lasting appreciation for the subject. By incorporating these findings into educational practices, the goal of improving students' Problem-solving abilities is not just an aspiration but an achievable outcome that resonates not only within the subject but also in the broader spectrum of students' lives.

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