Research Article

Mathematics Attitude and Problem Solving Ability Among Secondary School Students of Uttar Dinajpur District of West Bengal: A Study By Gender, Locale And Board

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Abstract:

Various assessments indicate that the mathematical concepts, emotions, and attitudes of secondary-level students influence their problem-solving abilities. A student's attitude encompasses their interest in and curiosity about mathematics, their self-confidence in solving problems, and their perception of the application and utility of mathematics in daily life. The objective of this study is to investigate the relationship between the problem-solving abilities of secondary-level students in the Uttar Dinajpur district of West Bengal and their attitudes toward mathematics. The study sample consists of 230 students from secondary schools in the Uttar Dinajpur district, selected using a stratified sampling method. Data were collected using the 'Problem Solving Ability Test' developed by Dubey and Mathur, and the 'Mathematical Attitude Scale' developed by Ali Imam and Tahira Khatoon. Both descriptive and inferential statistical methods were employed to test the research hypotheses. For inferential statistics, a 't-test' was used to determine whether there were significant differences in the mean scores among sub-samples based on gender, location (rural/urban), and educational board. Pearson's correlation was applied to analyze the relationship between problem-solving ability and attitudes toward mathematics. IBM SPSS Statistics (version 22) software was used for data analysis. The key findings of the study indicate that there is a negative correlation between problem-solving ability and attitudes toward mathematics, and that there is a significant difference between male and female students regarding their attitudes toward mathematics. A notable difference has been observed in the problem-solving skills of rural and urban students; furthermore, a significant difference has also been found in the problem-solving skills of students from the WBBSE and CBSE boards.

Keywords: Mathematics attitude, Academic success, Secondary school students, Creativity, Curiosity, Problem-solving abilities.

INTRODUCTION

Mathematics is an integral part of the school curriculum and plays a crucial role in the intellectual development of students. It is essential not only for academic success but also for fostering logical thinking, creativity, critical analysis, and problem-solving skills. However, significant disparities in students' proficiency levels in mathematics are often observed, largely influenced by factors such as their attitudes toward the subject and their socio-economic backgrounds. A student's attitude toward mathematics can profoundly influence their learning outcomes; this encompasses their feelings, beliefs, level of commitment, and behavioral tendencies regarding the subject. A positive attitude can foster greater engagement and lead to better academic performance, whereas a negative attitude can severely hinder the learning process. Equally important is a student's problem-solving capability, which reflects their grasp of various mathematical concepts, their capacity for retention, and their ability to apply these concepts in practical contexts.

Problem-solving is a critical component of mathematics education. Fundamentally, it involves applying acquired knowledge, practical skills, logical reasoning, and critical thinking to devise solutions for unfamiliar or complex situations. Students who possess strong problem-solving abilities typically demonstrate superior proficiency in mathematics and tend to hold a more positive attitude toward the subject.

This study investigates the interrelationship between secondary school students' attitudes toward mathematics and their problem-solving abilities. By gaining insight into this relationship, educators can formulate strategies designed to cultivate positive attitudes toward mathematics among students and enhance their problem-solving skills; ultimately, this will lead to improved overall academic success and proficiency in mathematics, while simultaneously helping to alleviate students' fear of the subject.

REVIEW OF RELATED LITERATURE

Hussain and Unnisa (2025). Problem Solving Ability in Mathematics Among Secondary School Students: A study. The aim of the study was to find out the problem-solving capability in mathematics among students based on schools, level, and gender. Descriptive survey method was used in this study. Secondary schools of the Samastipur district were included as the population, and one hundred students of class IX from two Government and two private schools of Shahpur Patory were selected as the sample, and convenience sample was adopted in the sampling technique. t-test were used as the statistics in this study. Data obtained from secondary school students were analyzed using SPSS. Conclusion revels that there is no significant difference between males and females in solving problems in mathematics among secondary school students and no significant difference in solving problems in mathematics between students in private schools and public schools.

Devi and Reddi (2023) conducted a comprehensive study titled A Study on Mathematical Attitude of Secondary School Students in Srikakulam, Vizianagaram and Visakhapatnam Districts. The objectives of the study were to examine the level of mathematical attitude among secondary school students with respect to gender The researchers adopted a descriptive survey method and selected a large sample of 6,360 students from 212 secondary school in Srikakulam, Vizianagaram and Visakhapatnam through random sampling. A standardized Mathematical Attitude Scale was developed and used as the research tool and data were collected via questionnaires. Statistical analysis included mean scores, standard deviations, t-tests to interpret the data. The findings indicated that mathematical attitudes were significantly influenced by the variables studied that was gender.

Ramulu (2023) A study was conducted in the Adilabad district focusing on the mathematics problem-solving skills of secondary students in relation to their attitudes toward mathematics. The researchers employed a 'normative survey' method. For the purpose of data collection, a total of 30 schools were selected using a random sampling technique. From among the secondary school student population, a sample group comprising one thousand students was selected through random sampling for this inquiry. The 't-test' was utilized as the statistical method in the present study. The findings of the study revealed that the mathematics problem-solving skills of secondary school students are slightly above average. The results of the study indicated that secondary school students tend to view the subject of mathematics through a negative lens.

Singh (2023) Conducted study on a study on Mathematical Problem-Solving Ability among Secondary School Students in relation to Mathematical Aptitude and Mathematics Self-Concept. Most of the secondary students hold average level of Mathematical Aptitude. The Mathematical Aptitude of Female students was higher than Male secondary students. CBSE-Board students hold higher Mathematical Aptitude than the UP Board students. Rural students hold higher Mathematical Aptitude than Urban secondary students. The present study is a quantitative approach. Descriptive survey (Co relational method) was used in this study. In the present study, a multistage cluster sampling technique was used to select the secondary school students. The sample of the study comprised of 482 secondary school students of CBSE Board and UP Board of Varanasi district. The following tools were used for the purpose of data collection MPSA, MAT and MSC Scale used.

Khan and Agrawal (2021) conducted a study on mathematical attitude of secondary school students in Anantnag district, Jammu and Kashmir. The study aimed to assess attitudes across eight dimensions: wider applicability, skill development, reasoning, objectivity, intellectual and non-intellectual development, individual outlook and universal outlook Using a descriptive survey method, they selected a sample of 200 students with equal gender representation. The tool used was the "Attitude Towards Mathematics Scale" developed by Dr. S.C. Gakhar and Rajani. The data were analyzed using descriptive and comparative statistical techniques. Results showed that male students had a significantly more favorable attitude toward mathematics than female students across all dimensions.

Nayal and Pandey (2018) conducted a study on Mathematical attitudes of Class X students in secondary schools in Bageshwar District of Uttarakhand. The objectives of the study were to analyze the mathematical attitudes of secondary school students in Bageshwar District of Uttarakhand, focusing particularly on differences related to gender. Using a descriptive survey method, the researchers selected a random sample of 243 students from government and private secondary schools across the district. The research instrument used was a standardized tool developed by Dr. Ali Imam and Dr. Tahira Khatoon. For data analysis statistical technique and t-tests were applied. The findings revealed that male students exhibited a significantly more positive attitude toward mathematics than female students.

Hyde et al (2008) Gender differences in attitudes and problem-solving abilities have also been investigated. Some studies suggest that boys exhibit higher confidence in mathematics, while girls may show higher levels of anxiety. However, recent findings indicate that these differences are diminishing with equitable teaching practices.

Farooq and Shah (2008) conducted on the study was students' attitude towards mathematics. The objective of the study was based on a survey of high school students about their attitudes towards mathematics. Sample of the study was 685 students of 10^{th} grade selected conveniently from 10 private and public sector schools. A questionnaire was used to examine the attitudes of male and female students towards mathematics at secondary school level. Descriptive statistics and t-test were used for data analysis. The finding of the study was there is no significant effect of gender on student's attitude towards mathematics at secondary school level.

OBJECTIVES OF THE STUDY

The following objectives have been formulated for present study

- To study the relationship between Mathematics Attitude and Problem Solving Ability of secondary school students of Uttar Dinajpur District of West Bengal.
- To study the Mathematics Attitude of secondary school students of Uttar Dinajpur District of West Bengal in relation to gender variation.
- To study the Problem Solving Ability of secondary school students of Uttar Dinajpur District of West Bengal in relation to locale variation.
- To study the Problem Solving Ability of secondary school students of Uttar Dinajpur District of West Bengal in relation to board variation.

STATEMENT OF HYPOTHESES

The following research hypotheses were constructed to achieve the objectives of the study

HO_1: There is no significant difference between Mathematics Attitude and Problem Solving Ability of secondary school students of Uttar Dinajpur District of West Bengal.

HO_2: There is no significant difference between Male and Female secondary school students in their Mathematics Attitude of Uttar Dinajpur District of West Bengal.

HO_3: There is no significant difference between Rural and Urban secondary school students in their Problem Solving Ability of Uttar Dinajpur District of West Bengal.

HO_4: There is no significant difference between WBBSE and CBSE board of secondary school students in their Problem Solving Ability of Uttar Dinajpur District of West Bengal.

RESEARCH METHODOLOGY

- **RESEARCH DESIGN**

This study employed a descriptive survey method to explore the relationship between mathematics attitude and problem-solving ability among secondary school students.

- **SAMPLE AND SAMPLING TECHNIQUE**

The population included secondary school students in Uttar Dinajpur District from both government and private schools. A sample of 230 students was selected using stratified random sampling to ensure representation from different types of schools.

- **INSTRUMENTS USED**

The tools used by the investigator for the present study were-

1. **Mathematics Attitude Scale** – The standardized tool was 'Mathematical Attitude Scale' Developed by Dr. Ali Imam and Dr. Tahira Khatoon
2. **Problem Solving Ability Test** – The standardized tool was 'Problem Solving Ability Test' Developed by Prof. L. N. Dubey and Dr. C.P. Mathur

- **DATA COLLECTION PROCEDURE**

At first necessary permissions to all school heads, the tools were administered during regular school hours. Students were assured of confidentiality and encouraged to respond reliably.

- **TECHNIQUE USED FOR DATA ANALYSIS**

The data were analysed using descriptive statistics (Mean, SD) and inferential statistics (correlation, t-test) to examine the relationship between groups. Pearson's correlation coefficient to examine the relationship between mathematical interest and problem-solving ability.

ANALYSIS AND INTERPRETATION OF DATA

HO_1: Test of significant difference between Mathematics Attitude and Problem Solving Ability Test of secondary school students of Uttar Dinajpur District of West Bengal. Correlation was adopted and the results were presented in the below table:

Table 1

Correlation			
Mathematics Attitude	Pearson Correlation	1	-0.074
	Sig. (2-tailed)		0.264
	N	230	230
Problem Solving Ability Test	Pearson Correlation	-0.074	1
	Sig. (2-tailed)	0.264	
	N	230	230

The correlation analysis indicates a statistically not significant and negative relationship between Mathematics Attitude and Problem Solving Ability Test (r=-0.074, P> 0.05). The negative sign usually suggests that as one thing goes up and the other goes down.

Gender wise Differential Analysis on Mathematical Attitude of Secondary School Students of Uttar Dinajpur District of West Bengal.

In the present sample 115 students were female and 115 were male. Their score on MAS scale was calculated for determining the significance of difference between the means. The 't' test was adopted and the results were presented in the below table:

Table 2 HO_2: Test of significance of difference between mean scores and SD in relation to gender variation on MAS

Gender	N	Mean	SD	SE_D	df	t	Remarks
Male	115	82.23	14.18	1.83	228	4.10	Significant
Female	115	74.72	13.56				

The calculated value of 't' is 4.10 is much higher than the table value that is 1.97 at 0.05 level of significance and at 228 df, so it is significant. Therefore, the null hypothesis (HO_2) is rejected. Thus, we can conclude that there is significant differ between male and female secondary school students in their mathematics attitude of Uttar Dinajpur District of West Bengal.

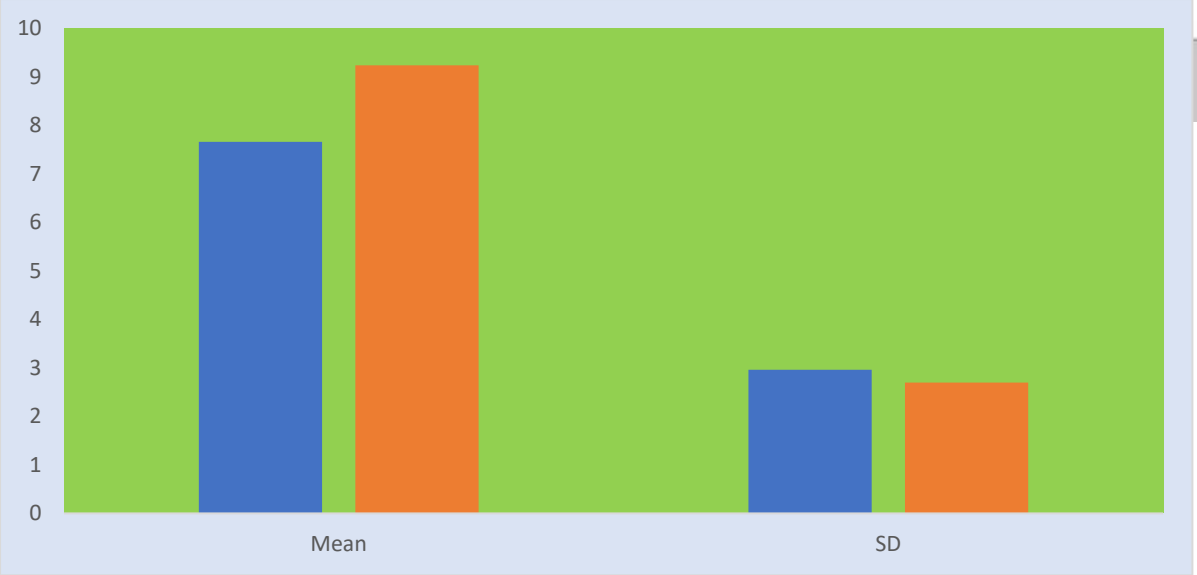


Fig.1: Difference between mean scores and SD in relation to gender variation on MAS

Locale wise Differential Analysis on Problem Solving Ability Test of Secondary School Students of Uttar Dinajpur District of West Bengal.

In the present sample 115 students were rural and 115 were urban Their score on PSAT scale was calculated for determining the significance of difference between the means. The 't' test was adopted and the results were presented in the below table:

Table 3 HO_3: Test of significance of difference between mean scores and SD in relation to locale variation on PSAT

Locale	N	Mean	SD	SE_D	df	t	Remarks
Rural	115	10.21	2.59	0.34	228	4.42	Significant
Urban	115	8.69	2.62				

The calculated value of 't' is 4.42 is much higher than the table value that is 1.97 at 0.05 level of significance and at 228 df, so it is significant differ. Therefore, the null hypothesis (HO_3) is rejected. Thus, we can conclude that there is significant differ between rural and urban secondary school students in their Problem Solving Ability Test of Uttar Dinajpur District of West Bengal.

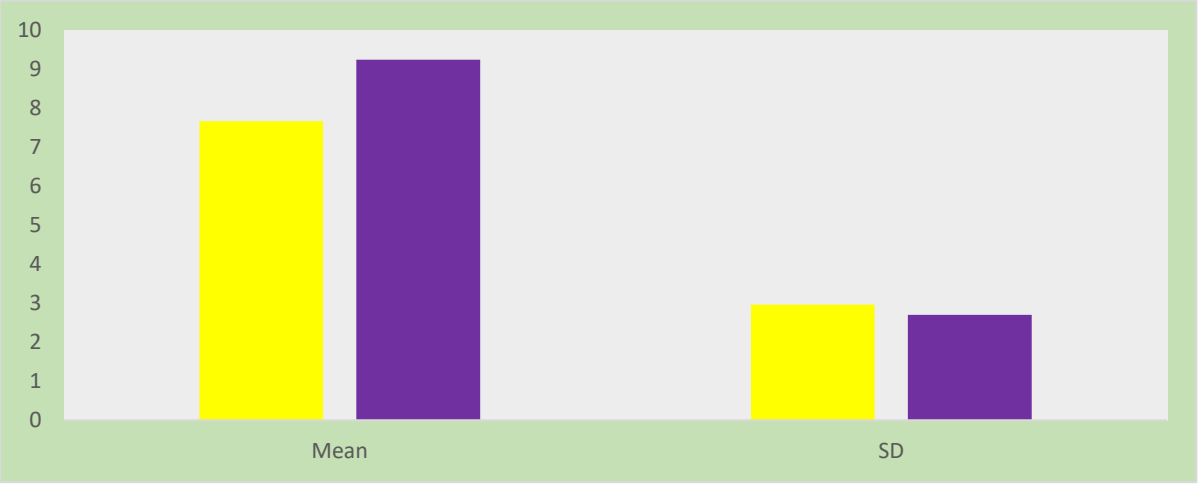


Fig.2: Difference between mean scores and SD in relation to locale variation on PSAT

Board wise Differential Analysis on Problem Solving Ability Test of Secondary School Students of Uttar Dinajpur District of West Bengal.

In the present sample 115 students were WBBSE and 115 were CBSE Their score on PSAT scale was calculated for determining the significance of difference between the means. The 't' test was adopted and the results were presented in the below table:

Table 3 HO_3: Test of significance of difference between mean scores and SD in relation to board variation on PSAT

Board	N	Mean	SD	SE_D	df	t	Remarks
WBBSE	115	11.91	3.13	0.399	228	6.31	Significant
CBSE	115	9.39	2.92				

The calculated value of 't' is 6.31 is much higher than the table value that is 1.97 at 0.05 level of significance and at 228 df, so it is significant differ. Therefore, the null hypothesis (HO_4) is rejected. Thus, we can conclude that there is significant differ between WBBSE and CBSE board of secondary school students in their Problem Solving Ability Test of Uttar Dinajpur District of West Bengal.

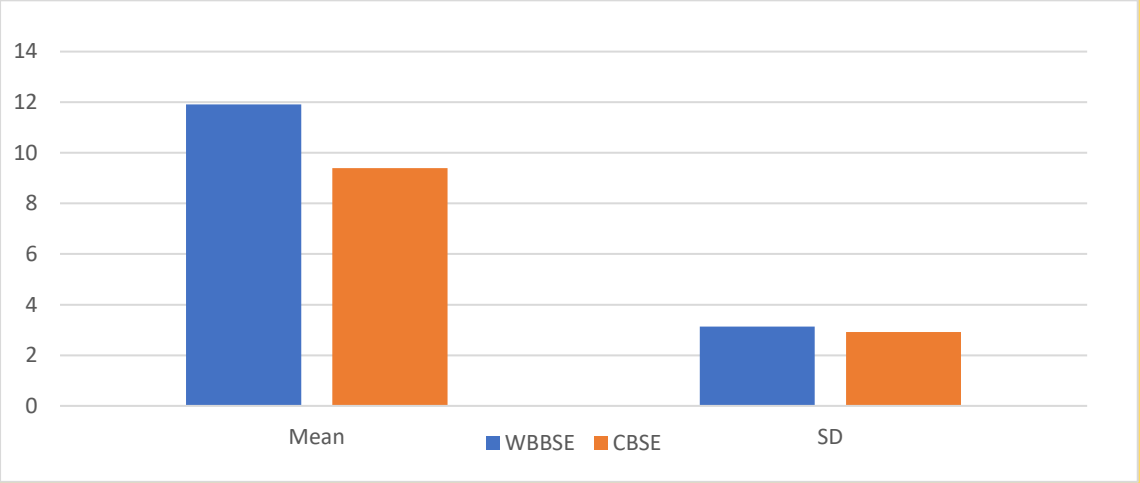


Fig.3: Difference between mean scores and SD in relation to board variation on PSAT

Conclusions:

- There exists a not significant and negligible negative relationship between mathematics attitude and their problem-solving ability. which states that no relationship exists between these two variables in the population.
- It is significant. Therefore, the null hypothesis is rejected. Thus, we can conclude that there is significant differ between male and female secondary school students in their mathematics attitude of Uttar Dinajpur District of West Bengal. This suggests that gender plays a role in shaping the affective disposition of students toward mathematics.
- The analysis revealed a significant difference between rural and urban secondary school students in their Problem Solving Ability Test scores. Therefore, the null hypothesis is rejected, highlighting a performance gap based on geographical location.
- The analysis revealed a significant difference between WBBSE and CBSE board of secondary school students in their Problem Solving Ability Test scores. Therefore, the null hypothesis is rejected, highlighting a performance gap based on board wise.

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