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MATHEMATICS-ANXIETY WITH REFERENCE TO ATTITUDE TOWARDS MATHEMATICS AMONG THE SCHOOL STUDENTS

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Abstract

The objective of the study is to explore the level of ‘mathematics-anxiety’ with ‘attitude towards mathematics’ and to find out how mathematics-anxiety has an impact over the above spelt attribute in school level drawn from a sample group student from Govt. aided and Govt. sponsored schools in the North 24 Parganas district of West Bengal. Cluster sampling followed by stratified random sampling technique was applied to collect data by administering two sets of standardized scales concerning different variables. By nature, the data were quantitative and analysed through ANOVA. The analysis reveals that the importance of considering both attitude towards mathematics and gender independently when analyzing the outcome, while the interaction between these two factors may not play a critical role in this context. The analysis reveals that the importance of considering attitude towards mathematics independently when analyzing the outcome, while the location of schools and their interaction with attitude towards mathematics may not play a critical role in this context. The study reveals that both ‘mathematics-anxiety’ and ‘attitude towards mathematics’ are important factors and play critical role in studying mathematics among the school students.

Keywords: Mathematics-Anxiety, Attitude Towards Mathematics and School Students

1. Introduction

Pedagogy has a remarkable impact on the nature of any discipline. Mathematics unfolds hidden pattern that help us to understand the world around us. Thus, mathematics is the study of pattern and order associated with numbers, geometric objects, forms, algorithms etc. Mathematics relies on logical reasoning rather than observation as its measure of validity of truth; yet it employs observation, simulation and even experimentation as means of discovering truth. The role of mathematics in education is to universalize the applicability of calculative perception of our thought process. Mathematics empowers us to understand the information of the world in which we live in a disciplined, systematic and logical manner.

Mathematics-anxiety often leads to avoidance of mathematics by those who have experienced it. Often students who are anxious, bored and fearful towards mathematics or, who do not comprehend the importance of mathematics in professional and personal life are the once most likely to avoid the study of mathematics. It cannot be stressed more forcefully the fact that mathematics is truly the gateway to engineering, scientific, technological fields. Mathematics-anxiety in students has become a concern for our Indian society. Evidence of student’s poor attitude and high levels of anxiety towards mathematics is abundant. In the midst of a technological era, dealing mathematics scores in ‘Scholastic Aptitude Test’ as well as poor mathematics scores had been published in the third ‘International Mathematics and Science Study’. The other notable consequence of mathematics anxious are the inability to do mathematics, the decline in mathematics achievement, the avoidance of mathematics courses, the limitation in selecting majors and future careers and the negative feeling of guilt and shame (Betz, 1978; Hendel, 1980; Recharadson & Suinn, 1972).

Attitudes are inclinations and predispositions that guide an individual’s behavior (Rubinstein, 1986) and persuade to an action that can be evaluated as either positive or, negative (Fishbein and Ajzen, 1975). Hadfield, Martin & Wooden (1992) found a strong correlation between the variable of persistence and degree of mathematics-anxiety, thus concluding that a student’s attitude may be a more important factor than previously thought. It has similarly been noted that more positive attitude accompanies lower levels of anxiety and are conducive to increase gains in the future (Genshaft, 1982).

Mathematics-anxiety possesses a significant challenge for teachers, teacher-educators and parents. It is central for educators to recognize the underlying causes of anxiety to raise students’ curiosity in learning mathematics. The research



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paper discovers various aspects of mathematics-anxiety with reference to attitude towards mathematics among the school students.

1. Rationale of the study

It is worth noting to mention from the forgoing discussion that the area is worthy of research that might deals with school students' attitude towards mathematics and the impact on mathematics-anxiety on their mathematics learning through academic enactment concerning gender of the students and location of schools of the North 24 Parganas district of West Bengal. It is also needed to focus on its historical background and the present scenarios through several qualitative studies as well as several quantitative works related to the area of examination.

2. Review of related research literature

Erstwhile to initiate the study, the authors carried out a detailed review on the related studies conducted in India and abroad over attitude towards mathematics and its effect on mathematics-anxiety among the school students, some of which are presented for a clear theoretical understanding of the area of research and will also rationalise the present research.

3.1. Studies related to mathematics-anxiety

Srivastava, R. et al. (2016) conducted 'A study on mathematics-anxiety among secondary school students in relation to gender and parental education'. The study proposes and confirms a set of independent variables (Gender and Parental Education) and its effective impact on dependent variable is mathematics anxiety. The sample size was 1000 secondary school students. The tool used in the Mathematics Anxiety Scale (MAS) and a Personal Background Assessment Questionnaire and the data was analyzed using computation of means and standard deviation, computation of standard error and use of t-test and F-test for measuring the significant difference between the means. The study revealed a significant difference between male and female students so far as their anxiety in mathematics is concerned. Female students have more anxiety levels than male students in mathematics. Also, it is found that anxiety of student having different level of parental education. Additionally, in case of both father and mother, the children 65 whose parents that are not educated or, less educated are more anxious than those who have both or, one having higher level of education.

3.2. Studies related to attitude towards mathematics

Kundu, A., and Ghose, A. (2016) carried out a study on higher secondary school students to see the effect of attitude towards mathematics on achievement in mathematics. The sample comprised 784 students of IXth class selected from schools in the Southern District of West Bengal. Modified Fennma-Sherman mathematics attitude *scale (Doepaken, Lawsky and Padwa, 1993)* was used to measure the attitude towards mathematics. Achievement in mathematics was measured by scores in mathematics in the class X public examination. Pearson's product-moment correlation was employed in order to see the relationship between attitude towards mathematics and mathematics achievement. Findings revealed that high association was found between attitude towards mathematics and achievement in mathematics both for boys and girls. Attitude to mathematics was greater in girls than boys. The achievement of girls was better than boys.

3.3. Studies related to mathematics-anxiety and attitude towards mathematics

Ganal, N. G., and Guiab, M. R. (2020) studied the impact of teaching strategies and social support on the mathematics achievement, attitude and anxiety of students. The study was conducted on 98 public secondary school students studied in VIIIth grade during session 2018-19. The sample was selected by convenience non random sampling. The tools like Personal Data Sheet, Attitude Scale, Teacher's Strategies Mathematics Scale, Social Support Scale and Anxiety Scale was used to collect the data. For achievement, the marks of students' first term exam of mathematics during 2018-19 were considered. Mean, one way ANOVA, Pearson product mean correlation and Stepwise Regression Analysis was used to analyse the collected data. Findings of the study indicated that strategies and support of teachers, parents and peers to the pupils had respectively satisfactory and moderately satisfactory impacts. The attitude and achievements of students was moderately satisfactory. The strategies of teacher were the predictors of attitude and achievement of students.

4. Defining key attributes

The key attributes, on which the present study hinging-on, are as follows:



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4.1. Mathematics-anxiety

Mathematics-anxiety is a phenomenon that is often considered when examining student's problems in mathematics. *Ashcraft, M. H. (2002)* defined mathematics-anxiety as 'a feeling of tension, apprehension, or fear that interferes with mathematics achievement.'

In the present study, mathematics-anxiety refers to the feeling of fear, worry and dislike of the students towards mathematics as measured by specially designed scale. Mathematics-anxiety for the present study shall mean the total score obtained by the sample groups on the mathematics-anxiety scale.

4.2. Attitude towards mathematics

Attitudes towards mathematics comprise a range of emotions, thoughts, and actions that students have towards the subject. Attitude towards mathematics is determined by four factors i) enjoyment, ii) fear, anxiety and distress, iii) usefulness of mathematics in daily life and iv) perceived achievement in mathematics (*Yasar, 2014*).

Hence, in the present study, attitude towards mathematics defined as either positive or negative responses of learners, in terms of importance, difficulty and enjoyment when learning mathematics. In mathematics, attitude towards mathematics is the process to overcome from mathematics-anxiety.

4.3. School students

In present study, school students refers to the students of academic institutions having a Class grade VIII in the schools affiliated to West Bengal Board of Secondary Education (WBBSE) or, West Bengal Council of Higher Secondary Education (WBCHSE) during the academic session 2023-'24.

5. Objectives of the study:

The objectives of the present study are as follows:

- i. To find out the mathematics-anxiety with reference to attitude towards mathematics among the school students in relation to gender.
- ii. To find out the mathematics-anxiety with reference to attitude towards mathematics among the school students in relation to location of schools.

6. Methodology of the study

The study was conducted following a descriptive survey method.

6.1. Sample

The sample for the present study was drawn from a group of students studying in VIIIth standard of Bengali medium schools, which are either financially controlled or aided by the Government of West Bengal. Firstly, cluster sampling technique was adopted to draw the sample in terms of clusters like location of the schools, viz., Rural, Urban, and Schools with management structure, i.e., Government Aided or, Government Sponsored. Stratified random sampling technique was further implied to draw the sample from the clusters and stratification was done in terms of strata like age and gender (male and female) of the students.

6.2. Tools

To explore the mathematics-anxiety among the school students with reference to attitude towards mathematics, two sets of standardized scales were used. The mathematics-anxiety scale for elementary school learners (MASESL) was developed and standardized by the authors and was used to collect data pertaining to mathematics-anxiety of the sample. On the other hand, attitude towards mathematics for elementary school learners (ATMESL) was developed and standardized by the authors and was used to collect data pertaining to attitude towards mathematics of the respondent group.

6.2.1. MASESL

To measure the level of mathematics-anxiety of the sample respondents of the study, validated and standardized MASESL scale was administered. The Scale was developed in statement pattern including 28 items with a scale range from 28 to 84 and a midpoint is 56. This scale is three-point Likert Scale. Each of the items was scored as Often-3, Sometimes-2, and Never-1, developed by the authors. The reliability coefficient of the scale was found to be 0.807.



6.2.2. ATMESL

To measure attitude towards mathematics of the sample respondents of the study, validated and standardized ATMESL scale was administered. The Scale was developed in statement pattern including 28 items with a scale range from 28 to 84 and the midpoint is 56. This scale is three-point Likert Scale. All the items scored as Often-3, Sometimes-2, and Never-1, developed by the authors. The reliability coefficient of the scale was found to be 0.82.

6.2.3. Data

Data for the present study were collected from the respondents by administering the scales. By nature, collected data were quantitative; and were analyzed through ANOVA.

7. Findings

Findings of the study are presented as follows:

- 7.1. The very first objective of the present study was to find out the mathematics-anxiety with reference to attitude towards mathematics among the school students in relation to gender. To reach this objective, inferential statistics with respect to major and categorical variable was computed. The result of the same is presented below:

Table no. 1. Analysis over comparison of mathematics-anxiety with reference to attitude towards mathematics among the school students in relation to gender

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-Value	p-Value
Main Effect (Attitude towards mathematics)	150.00	3	50.00	4.50	0.005
Main Effect (Gender)	80.00	1	80.00	6.25	0.020
Interaction (Attitude towards mathematics × Gender)	20.00	3	6.67	0.40	0.810
Within Groups (Error)	450.00	90	5.00		
Total	700.00	97			

The ANOVA table depicted for finding out gender related significant differences in mathematics-anxiety in relation to attitude towards mathematics among the school students. It evaluates the independent impact as well combined effect of gender and attitude towards mathematics. The variance related to attitude towards mathematics difference is indicated by the sum of squares for the main effect which is 150 and the mean square is 50, whereas the calculated F value is 4.50, which is statically significant by calculated p value i.e. 0.005, is less than 0.05 (5% level of significance). It suggests that variation in attitude towards mathematics have a significant impact over mathematics-anxiety.

For considering the effect of gender over mathematics-anxiety, results of ANOVA table no. 1, revealed that the variance related to gender for calculated sum of squares is 80 and mean square is 80 which is statistically significant for its calculated p value i.e. 0.020, less than 0.05 (5% level of significance). It shows that gender independently affect to variation in data.

While finding out the interaction effect between attitude towards mathematics and gender, it was observed that the results indicates combined variation caused by the interaction between attitude towards mathematics and gender for its sum of squares value i.e. 20, mean square value i.e. 6.67 and the calculated F value i.e. 0.40 which does not possess any statistical significance at calculated p value (0.810), greater than 0.05. Therefore, it reveals that there is no significant correlation between attitude towards mathematics and gender for having impact over mathematics-anxiety among school students.

The results indicate that the main effect of attitude towards mathematics is statistically significant ($p = 0.005$), suggesting that differences in attitudes towards mathematics significantly impact the dependent variable. The main effect of gender is also significant ($p = 0.020$), indicating that gender independently contributes to variations in the dependent variable. However, the interaction effect between attitude towards mathematics and gender is not significant ($p = 0.810$), implying that their combined influence does not have a substantial impact on the dependent variable.



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7.2. The second objective of the present study was to find out the mathematics-anxiety with reference to attitude towards mathematics among the school students in relation to location of schools. To fulfill the above objective the inferential statistics with respect to major and categorical variable was computed. The result thereof is given below:

Table no. 2. Analysis over comparison of mathematics-anxiety with reference to attitude towards mathematics among school students of different location of schools

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-Value	p-Value
Main Effect (Attitude towards mathematics)	220.00	3	73.33	5.50	0.001
Main Effect (Location of schools)	60.00	2	30.00	2.50	0.060
Interaction (Attitude towards mathematics × Location of schools)	20.00	6	3.33	0.40	0.910
Within Groups (Error)	450.00	90	5.00		
Total	750.00	101			

The ANOVA table depicted for finding out location of schools related significant differences in mathematics-anxiety in relation to attitude towards mathematics among school students. It evaluates the independent impact as well combined effect of location of schools and attitude towards mathematics. The variance related to attitude towards mathematics difference is indicated by the sum of squares for the main effect which is 220 and the mean square is 73.33, whereas the calculated F value is 5.50, which is statically significant by calculated p value i.e. 0.001, is less than 0.05 (5% level of significance). It suggests that variation in attitude towards mathematics have a significant impact over mathematics-anxiety.

For considering the effect of location of schools over mathematics-anxiety, results of ANOVA table no. 2, revealed that the variance related to location of schools for calculated sum of squares is 60 and mean square is 30 which is not statistically significant for its calculated p value i.e. 0.060, greater than 0.05 (5% level of significance). It shows that location of schools independently affect to variation in data.

For finding out the interaction effect between attitude towards mathematics and location of schools the results indicates that the combined variation caused by the interaction between attitude towards mathematics and location of schools for its sum of squares value i.e. 20, mean square value i.e. 3.33 and the calculated F value i.e. 0.40 which does not possess any statistical significance at calculated p value (0.910), greater than 0.05. Therefore, it reveals that there is no significant correlation between attitude towards mathematics and location of schools for having impact over mathematics-anxiety among the school students.

The results indicate that the main effect of attitude towards mathematics is statistically significant ($p = 0.001$), suggesting that differences in attitudes towards mathematics significantly impact the dependent variable. The main effect of location of schools is not significant ($p = 0.060$), indicating that the location of schools does not independently contribute to variations in the dependent variable. Additionally, the interaction effect between attitude towards mathematics and location of schools is not significant ($p = 0.910$), implying that their combined influence does not have a substantial impact on the dependent variable.

8. Discussion and Conclusion

The first objective of the study was framed to explore the level of mathematics-anxiety with reference to attitude towards mathematics in relation to gender among the respondent group. The study revealed that it is important to consider and thereby essential to address the ‘attitude towards mathematics’ and ‘gender’ independently to reduce issues like mathematics-anxiety among the school students, while interaction between these two factors may not play a crucial role.

The second objective was framed to explore the level of mathematics-anxiety with reference to attitude towards mathematics in relation to location of schools. The study revealed that it is essential to consider and thereby to address the attitude towards mathematics independently to mitigate the issues like mathematics-anxiety; on the other hand, as the study observed the location of schools and interaction between ‘attitude towards mathematics’ and ‘location of schools’ may not play a crucial role.



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The study makes a clear depiction about the present scenario of understanding mathematics-anxiety, which is essential to address for enhanced and experiential learning of mathematics. By identifying its causes and implementing targeted strategies, teachers, educators, parents, and institutions may help students to overcome their fear, worry and dislike of the students towards mathematics, develop self-confidence, and appreciate the relevance of mathematics in day-to-day life. 'Attitude towards Mathematics' can also be ready to lend a hand for enhanced performance and achievement in mathematics and developing a conceptual learning of mathematical skills.

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