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MATHEMATICS-PHOBIA WITH REFERENCE TO ATTITUDE TOWARDS MATHEMATICS AMONG SCHOOL STUDENTS

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ABSTRACT

The objective of the study is to explore the level of mathematics-phobia with selected attributes and to explore how mathematics-phobiapossesses impact over those attributes atthe school level with a sample group of students from government and/orgovernment-sponsored schools in the North 24 Parganas district of West Bengal. Cluster sampling technique, followed by the stratified random sampling technique, was applied to collect data by administering two sets of standardized scales concerning the variables. By nature, the data were quantitative and those were analysed through ANOVA. The study revealed that it is essential to consider and thereby address the attitude towards mathematics independently to mitigate issues like mathematics phobia; on the other hand, as the study observed, the location of schools and their interaction with attitude towards mathematics may not play a crucial role. The study reveals that both mathematics phobia and attitude towards mathematics are important factors and play a critical role in studying mathematics at the elementary school level.

INTRODUCTION

Mathematics is a vital discipline that significantly contributes to developing cognitive, affective and psychomotor abilities among students in school education.Mostlearners usually consider mathematics as an un-artistic and non-aestheticsubject, which is a wrong proposition. But for a true learner of mathematics, the subjectpossesses its beauty since it is symmetric, balanced, harmonious and artistic. Individuals gain great pleasure in successfully solving mathematical problems. Apart from these, giving pleasure through its application to various arts, it also provides entertainment through its own games and puzzles. Students can play with numbers, figures, problems, shapes, or the like. Phobia can be defined as a type of anxiety disorder or a mental illness that makes someone very worried about an event or issue that affects their life. It involves an extreme fear or irrational fear of a specific situation, activity and or object that leads to a compelling desire to avoid it *(American Psychiatric Association, 2013)*.The term 'phobia', according to *Arem,* is preoccupied from the Greek word *'phobos'*, meaning fear, panic-fear, or terror. In simple terms, the meaning of phobia is 'fear'.*Trujillo & Hadfield (1999)* definedmathematics-phobia as the level of discomfort that occurs among students in response to situations involving mathematical tasks, which is seen as a threat to their self-efficacy.According to *Lin* and *Huang (2014)*, attitude towards mathematics can be referred to as positive, negative, and neutral feelings and dispositions. Some learners find mathematics enjoyable and rewarding while others may feel anxious and disinterested in mathematics.Addressing feelings of anxiousness in terms of mathematics, phobiaspossesses a significant challenge for educators and parents. It is crucial for educators to identify the underlying causes of this phobia to foster students' interest in learning mathematics. The research paper explores various aspects of mathematics phobia with reference to the attitude towards mathematics amongschool students.

Rationale of the study: It is worthnoting to mention from the forgoing discussion that the area is worthy of research that might deals with students' attitude towards mathematicsand the impact of mathematics-phobia on the mathematics learning through academic performance concerning gender of the students and location of schoolsfrom North 24 Parganasdistrict of West Bengal.It is also essential 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 investigation.

Review of related research Literature: Prior 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-phobia among the school students, some of which are presented for a clear theoretical understanding of the area of research and will also justify the present research.

Studies related to Mathematics Phobia: *Kaur, G. (2017)* conducted a study on *'Math-Phobia: Causes and Remedies'* examined the causes and remedies of poor mathematics teaching and learning in primary and post-primary schools and suggested measures to overcome them. The causes of mathematics-phobia were the introduction of modern mathematics, poor system of examination, poor mathematical background, and lack of effective teaching aids, fear of test/examination the Universal Primary Education Scheme, maximum number of formulae, unqualified teacher, lack of teachers' training program, a lack of proper incentives for mathematics teachers, and an inherent fear of mathematics. The finding revealed that mathematics-phobia exists among students, which is characterized by feverish feelings in mathematics classroom, difficulty in understanding mathematics problem among students. Major causes include poor student-teacher relationship, nonconductive environment for mathematics class and the like.

Studies related to Attitude towards Mathematics: *Kumar, M. (2021)* conducted a study titled, *'Achievement in mathematics in relation to attitude towards mathematics, metacognition, and learning styles of IXth grade pupils in the district of Kapurthala (Punjab)'*, where the results revealed a close association among the factors considered under the study, which are in the line of the findings of the study conducted by *Kaur, G. (2017)*.

Studies related to Mathematics Anxiety and Attitude towards Mathematics: *Mutegi, C. M., Gitonga, C. M. &Rvgano, P. (2021)* evaluated the relationship between mathematics-anxiety, attitude and performance. The sample for the study was selected from 55 secondary schools and 367 students were selected from these schools. The study followed a correlational research design. To collect the responses, 'Mathematics Anxiety Scale' and 'Attitude towards Mathematics Scale' were used. To measure the performance of the students, the students' grade list from teachers were obtained. To analyse the data, scattered diagram and Spearman's correlation coefficient were employed. The study found that there exists a significant positive correlation between 'mathematics-anxiety' and 'attitude towards mathematics' whereas there was a significant negative linear relation between 'mathematics-anxiety' and 'mathematics-performance'. It was also found that 'attitude towards mathematics' was correlated with 'mathematics-anxiety' which in turn correlated with performance of mathematics.

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

Mathematics-Phobia: *Ashcraft (2002)* defines mathematics-phobia as a fear of mathematics which may result in weakness in mathematics. Mathematics-phobia is a feeling of tension, apprehension or fear that interferes with mathematics performance.In the present study, mathematics-phobia refers to the uneasiness, apprehension and fear, the students feel while doing and studying mathematics. In this study it is measured by the total score obtained by the students on mathematics-phobia scale.

Attitude towards Mathematics: An attitude can be positive or negative based on people's evaluation, perception and activities, which is mostly a pre-dispositional readyness; it could be concrete or abstract; attitude can be seen as more or less positive; attitude towards mathematics is one's own view and opinion; a positive attitude towards mathematics reflects a positive emotional disposition in relation to the subject. Similarly negative attitude towards mathematics is relates to a negative emotional disposition (Zan & Martino, 2007). In the present study, attitude towards mathematics is 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 phobia.

School Students: In the present study, school studentsrefer to the academic institutions having aclass grade VIIIth in the schools affiliated to the West Bengal Board of Secondary Education (WBBSE) during the academic session 2023- '24.

Objectives of the study: The objectives of the present study are as follows:

i. To find out the mathematics-phobia with reference to attitude towards mathematics among the school students in relation to gender.
ii. To find out the mathematics-phobia with reference to attitude towards mathematics among theschool students in relation to location of schools.
iii. To study the relationship between mathematics-phobia and attitude towards mathematics among the school students.

METHODOLOGY OF THE STUDY

The study was conducted following a descriptive survey method.

Sample: The sample for the present study was drawn from a group of students studying in VIIIthstandard of Bengali medium schools, which areeitherfinancially 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 different management structures, i.e., Government or, Government Sponsored. Stratified random sampling technique was further implied to draw the sample from the clusters and stratification was done in terms of age and gender (male andfemale) of the students.

Tools: To explore the mathematics-phobia amongthe school students with reference to attitude towards mathematics, two sets of standardized scales were used.The mathematics-phobia scale for elementary school learners (MPSESL)was developed and standardized by the authors and was used to collect data pertaining to mathematics-phobia of the sample. On the other hand, attitude towards mathematics for elementary school learners (ATMESL) wasdeveloped and standardized by the authors and was used to collect data pertaining to attitude towards mathematics of the sample.

MPSESL: To measure the level of mathematics-phobia of the sample respondents of the study, validated and standardized MPSESL scale was administered. The Scale was developed in statement pattern including 32 items with a scale range from 32 to 96 and a midpoint, 64. This scale is three-point Likert type scale. All the items scored as Often-3, Sometimes-2, and Seldom-1, developed by the authors. The reliability coefficient of the scale was found to be 0.823.

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 28items with a scale range from 28 to 84 and the midpoint is 56. This scale is three-point Likert type cale. All the items scored as Often-3, Sometimes-2, and Seldom-1, developed by the authors. The reliability coefficient of the scale was found to be 0.82.

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

FINDINGS

Findings of the study are presented as follows:

The very first objective of the present study was to find out the mathematics-phobia 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 follows:

The ANOVA table examines the significant difference in mathematics-phobia with reference to attitude towards mathematics among the school students in relation to gender. It assesses the main effects of attitude towards mathematics and gender. For attitude towards mathematics, the sum of squares for the main effect of attitude towards mathematics is 180, indicating the variance attributable to differences in attitudes, at df 3, the mean square is calculated as 60. The F-value is 5.50, which is statistically significant at p = 0.004, indicating that differences in attitudes towards mathematics possesssignificant impact over mathematics phobia.

squares for the main effect of attitude towards mathematics is 220, indicating the variance attributable to differences in attitudes, at df 3, the mean square is calculated as 73.33. The F-value is 5, which is statistically significant at p=0.001, indicating that differences in attitude towards mathematics significantly impact over mathematics-phobia. For effect, location of schools, the sum of squares for location of schools is 50, representing the variance due to location of school, at df 2, the mean square is 25. The F-value is 2, with a level of significance of p=0.070, showing that location of schools independently does not contributes to variations in the data.

Table 1. Analysis over comparison of mathematics-phobia 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)	180.00	3	60.00	5.50	0.004
Main Effect (Gender)	80.00	1	80.00	6.50	0.020
Interaction (Attitude towards Mathematics × Gender)	30.00	3	10.00	1.00	0.510
Within Groups (Error)	400.00	90	4.44		
Total	690.00	97			

Table 2. Analysis over comparison of mathematics-phobia with reference to attitude towards mathematics among the 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	5.00	0.001
Main Effect (Location of Schools)	50.00	2	25.00	2.00	0.070
Interaction (Attitude towards Mathematics × Location of Schools)	10.00	6	1.67	0.20	0.950
Within Groups (Error)	450.00	90	5.00		
Total	730.00	101			

Table 3. Analysis over relationship of mathematics-phobia and attitude towards mathematics among the school students

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-Value	P-Value
Main Effect (Attitude towards Mathematics)	180.00	3	60.00	4.50	0.005
Main Effect (Mathematics Phobia)	130.00	2	65.00	5.00	0.010
Interaction (Attitude towards Mathematics × Mathematics Phobia)	40.00	6	6.67	0.50	0.810
Within Groups (Error)	450.00	90	5.00		
Total	800.00	101			

For effect of gender, the sum of square for gender is 80, representing the variance due to gender, at df 1, the mean square is 80.The F-value is 6.50, with a level of significance of p = 0.020, showing that gender independently contributes to variations in the data. For the interaction between attitude towards mathematics andgender, the interaction effect has a sum of squares of 30, reflecting the combined variance due to the interaction between attitude towards mathematics and gender, at df 3, the mean square is 10, and the F-value is 1.00. The p-value is 0.510, which is not statistically significant, indicating no meaningful interaction between these two variables in this data-set. The results indicate that the main effect of attitude towards mathematicsis statistically significant (p=0.004), 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=0.510), implying that their combined influence does not have a substantial impact on the dependent variable. The second objective of the present study was to find out the mathematics-phobia with reference to attitude towards mathematics amongthe 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:

The ANOVA table presented above examines the significant difference in mathematics-phobia with reference to attitude towards mathematics among the school students in relation to location of schools. It assesses the main effects of attitude towards mathematics and location of schools. For attitude towards mathematics, the sum of

For the interaction between attitude towards mathematics andlocation of schools, the interaction effect has a sum of squares of 10, reflecting the combined variance due to the interaction between attitude towards mathematics and location of schools, at df 6, the mean square is 1.67, and the F-value is 0.20.The p-value is 0.950, which is not statistically significant, indicating no meaningful interaction between these two variables in this dataset.The analysisindicates that the main effect of attitude towards mathematicsis statistically significant (p=0.001), suggesting that differences in attitudes towards mathematics significantly impact the dependent variable. The main effect of location ofschoolsis not significant (p=0.070), indicating that the location of schools does not independently contributes to variations in the dependent variable. Similarly, the interaction effect between attitude towards mathematics and location of schools is not significant (p=0.950), implying that their combined influence does not have a substantial impact on the dependent variable. The third objective of the study was toexplore the relationship between mathematics-phobia and attitude towards mathematics among the school students.To attain this objective the inferential statistics with respect to major variables were computed. The result of the same is given as follows:

The table-3 presented above examines the relationship between mathematics-phobia and attitude towards mathematics among the school students. It assesses the main effects of attitude towards mathematics and mathematics-phobia. For attitude towards mathematics, the sum of squares for the main effect of attitude towards mathematics is 180, indicating the variance attributable to differences in attitude towards mathematics at df 3, the mean square is calculated as 60. The F-value is 4.50, which is statistically significant at p=0.005, indicating that differences in attitude towards

mathematics significantly impact over mathematics phobia. For effect of mathematics phobia, the sum of squaresfor mathematics-phobia is 130, representing the variance due to phobia levels at df 2, the mean square is 65. The F-value is 5, with a level of significance of p=0.010, showing that mathematics-phobia independently contributes to variations in the data. For the interaction between attitude towards mathematics and mathematics phobia, the interaction effect has a sum of squares of 40, reflecting the combined variance due to the interaction between attitude towards mathematics and mathematics phobia, at df 6, the mean square is 6.67, and the F-value is 0.50. The p-value is 0.810, which is not statistically significant, indicating no meaningful interaction between these two variables in this dataset.The results indicate that the main effect of attitude towardsmathematicsis statistically significant (p=0.005), suggesting that differences in attitudes towards mathematics possess a significant impact over the variable. Themain effect of mathematics-phobia is also significant (p=0.010), indicating that mathematics-phobia independently contributes to variations in the variable. However, the interaction effect betweenattitude towards mathematics and mathematics-phobia is not significant (p=0.810), implying that their combined influence does not have a substantial impact on the variable.

DISCUSSION AND CONCLUSION

Thefirst objective of the study aimed to explore the level of mathematics-phobia 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 differences independently to reduce mathematics-phobia among the school students, while interaction between the two factors may not play a crucial role. The second objective of the study aimed to explore the level of mathematics-phobia 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 mathematics-phobia; on the other hand, as the study observed, the location of schools and its interaction with attitude towards mathematics may not play a crucial role.The third objective of the study aimed to explore the relationship between mathematics-phobia and attitude towards mathematics among the school students. The study revealed that the attitude towards mathematics do not possess any significant relationship with mathematics-phobia.From the study it is cristal-clear that for better and effective learning of mathematics the system needs to address the issue of mathematics-phobia for better achievement of the students. By identifying its causes and implementing targeted strategies, educators, parents, and institutions can help students overcome their fear, develop self-confidence, and appreciate the relevance of mathematics and enjoy mathematics in daily life.

Attitude towards mathematics can also be of immense help for better performance and achievement in mathematics and developing various mathematical skills.

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