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Mathematics Anxiety with Reference to Learning-Style Among the School Students

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Abstract
The objective of the study is to explore the level of 'mathematics anxiety' with 'learning-style' and to find out how mathematics anxiety has an impact over the above spelt attribute in school level drawn from a sample group students 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 analyzed through ANOVA. The analysis reveals that the importance to consider and thereby essential address learning-style individually to reduce issues like mathematics anxiety among the school students and while gender and interaction between these two factors may not play a crucial role. The analysis reveals that it is essential to consider and thereby address the learning-style independently to mitigate issues like mathematics anxiety; on the other hand, as the study observed, location of schools and its interaction with 'learning-style' may not play a crucial role. The study reveals that both 'mathematics anxiety' and 'learning-style' are important factors and play critical role in studying mathematics among the school students.

Keywords: Mathematics anxiety, learning-style and school students

1. Introduction

For the existence of mathematics, there is one main aspiration that is to visualize the thinking for mathematical perspective. Because of our thought and prospects of assumption to logical and spatial thinking is innermost of mathematics. There are many ways of thinking and kind of thinking in order to solve a range of problems in problem solving, project method and discovery method. There has been impressive implication for educational curriculum for universalization of the mathematics.

Mathematics anxiety is a feeling of tension and anxiety that interfere with the manipulation of mathematical problem in varied situation in ordinary as well as academic life *(Richadson & Suinn, 1972)*. It can also be explained as a sense of discomfort observed while working on mathematical problems *(Hadfield & Trujillo, 1999 & Ma, 2003)* and is associated with fear and apprehension to specific mathematics related situations*(D'Ailly & Bergering, 1992)*, It is found among elementary school students *(Jackson & Leffinwell, 1999, Steele & Arth, 1998)*, high school students *(Hembree, 1990)*.

Individualities of school students' learning-styles can be identified during learning in mathematics. School students' with a visual learning-style learn mathematical concepts through images such as by depicting formulas *(Machromah et al., 2021)*. For example, in geometry, school students with a visual learning-style categorize geometric shapes through pictures. For the time being, school students with an auditory learning-style listen to the educator's explanation of the mathematical lesson being studied *(Rahman and Ahmar, 2017)*, and they always reiteration mathematical ideas such as saying formulas repeatedly so that they can remember the formulas well. As a final point, school students who practice a kinesthetic learning-style often apply mathematical lesson to everyday life *(Irvine, 2019)*. For example, in algebra, students are given real situations to form algebraic expressions *(Indraswari et al., 2018)*. Therefore, an effective learning-style, school students can leading mathematical concepts more rapidly and effortlessly.

Mathematics anxiety possesses a significant challenge for teachers, teacher-educators and parents. It is crucial for educators to identify the underlying causes of anxiety to foster students' interest in learning mathematics. The research paper explores various aspects of mathematics anxiety with reference to learning-style among the school students.

2. 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' learning-style and the impact on mathematics anxiety on their mathematics learning through academic performance concerning gender of the students and location of schools of the North 24 Parganas district 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.

3. 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 learning-style 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 justify the present research.

3.1. Studies related to mathematics anxiety

Mitchell, L., and George, L. (2022) studied the prevalence of mathematics-anxiety among primary school students. This study also examined the relation between mathematics-anxiety and mathematics performance. The sample contained 62 students from Primary School of Jamaica, 25 were from IVth grade and 37 from VIth grade respectively. The instructions used for data collection were modified abbreviated mathematics-anxiety scale and a teacher made term end test. Each instrument was administered electronically. Spearman rank correlation and Mann Whitney U test were used to analyze the data. The results of this study showed that prevalence of mathematics-anxiety was high among IVth grade students and low among VIth grade students. Also, the little positive association was found between mathematics-anxiety and mathematic performance of IVth grade students whereas little negative correlation was found between mathematics-anxiety and mathematics performance of VIth grade students. Findings of the study also revealed that there was no significant difference in gender for both the grades.

3.2. Studies related to learning-style

Tirkey, N., and Roy, R. (2017) conducted a study to explore the impact of traditional instructional strategies and blended instructional strategies in Life-Science in relation to various learning-styles (Actives, Reflective, Theorist, Pragmatist) of learners based on Honey and Mumford. 120 students from class IX in Jharkhand following a random sampling technique selected for the study. The data analyzed with SPSS with statistical technique Mean and t-test. The findings reveal that the learners possessing Reflective, Active, and Pragmatist type of learning-style perform better if taught following blended instructional strategies compared to the identical groups when taught through traditional instructional strategies. The learners belonging to theorist type, as the study observed, were not affected with different instructional strategies whether it is blended or traditional.

3.3. Studies related to mathematics anxiety and learning-style

Mandal, A. K. (2019) carried out a research entitled 'Mathematics-anxiety and Prevention Strategies: An attempt to improvement of Mathematics Performance of Secondary School Students in West Bengal.' Objective of the study were to study the difference in the mathematics-anxiety of secondary school students on gender basis, type of school, to provide suggestions on strategies that can be used by students to reduce or overcome mathematics-anxiety. Findings revealed that there was a significant difference in the mathematics-anxiety of secondary school students and on gender basis with respect to type of schools. Also, result suggested some strategies for reducing mathematics-anxiety such as daily practice, use good study techniques, study according to one's own learning-style, focus on past success, ask for help, and practice.

4. Defining key attributes

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

4.1. Mathematics anxiety

Oxford Dictionary of Psychology (2007) defines anxiety as a state of uneasiness, accompanied by dysphoria and somatic signs and symptoms of tension, focused on apprehension of possible failure, misfortune, or danger.

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. Learning-style

As stated by *Kopsovich (2001)*, Frank Riessman, 'Learning-style' as the ways of learning shows the essential elements throughout the learning process. Varying learning-styles elements include VAK learning; single learning or variable method used many learning modes, enlarging the time for learning, the noise level during learning, and thermal condition of the learning environment while learning difficult tasks or, subjects.

In the present study, learning-style refers to the way one represents experiences and recalls the processes of information 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:

1. To find out the mathematics anxiety with reference to learning-style among the school students in relation to gender.
2. To find out the mathematics anxiety with reference to learning-style 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 learning-style, 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, the translated version of Cynthia's Learning Style Preference Inventory (LSPI) was adopted for the study for collection of data pertaining to learning-style 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. LSPI

For this study, Learning Style Preference Inventory (LSPI) adopted from Conquering Math Anxiety, by *Dr. Cynthia A. Arem*. The learning style inventory was translated into Bengali language for a better understanding of students. The reliability coefficient of the learning style questionnaire was found to be 0.782.

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 learning-style 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 learning-style among the school students level in relation to gender

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-Value	p-Value
Main Effect (Learning-style)	145.00	3	48.33	4.25	0.007
Main Effect (Gender)	25.00	1	25.00	2.50	0.118
Interaction (Learning-style × Gender)	15.00	3	5.00	0.50	0.688
Within Groups (Error)	365.00	94			
Total	550.00	101			

The ANOVA table depicted for finding out gender related significant differences in mathematics-anxiety in relation to learning-style at school level. It evaluates the independent impact as well combined effect of gender and learning-style. The variance related to learning-style difference is indicated by the sum of squares for the main effect which is 145 and the mean square is 48.33, whereas the calculated F value is 4.25, which is statically significant by calculated p value i.e. 0.007, is less than 0.05 (5% level of significance). It suggests that variation in learning-style 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 25 and mean square is 25 which is not statistically significant for its calculated p value i.e. 0.118, greater than 0.05 (5% level of significance). It showing that gender independently does not affect to variation in data.

For finding out the interaction effect between learning-style and gender the results indicates that the combined variation caused by the interaction between learning-style and gender for its sum of squares value i.e. 15, mean square value i.e. 5 and the calculated F value i.e. 0.50 which does not possess any statistical significance at calculated p value (0.688), greater than 0.05. Therefore, it reveals that there is no significant correlation between learning-style and gender for having impact over mathematics-anxiety among the school students.

The results indicate that the main effect of learning-style is statistically significant ($p = 0.007$), suggesting that differences in learning-styles significantly impact the dependent variable mathematics-anxiety. However, the main effect of gender is not significant ($p = 0.118$), indicating that gender does not independently contribute to variations in the dependent variable. Additionally, the interaction effect between learning-style and gender is not significant ($p = 0.688$), implying that their combined influence does not have a substantial impact on the dependent variable.

7.2. The second objective of the present study was to find out the mathematics anxiety with reference to learning-style 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 learning-style 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 (Learning-style)	150.00	3	50.00	4.50	0.010
Main Effect (Location of schools)	50.00	2	25.00	2.00	0.070
Interaction (Learning-style × Location of schools)	20.00	6	3.33	0.40	0.910
Within Groups (Error)	450.00	90	5.00		
Total	670.00	101			

The ANOVA table depicted for finding out location of schools related significant differences in mathematics-anxiety in relation to learning-style at school level. It evaluates the independent impact as well combined effect of location of schools and learning-style. The variance related to learning-style 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. 0.010, is less than 0.05 (5% level of significance). It suggests that variation in learning-style 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 50 and mean square is 25 which is not statistically significant for its calculated p value i.e. 0.070, greater than 0.05 (5% level of significance). It showing that location of schools independently does not affect to variation in data.

For finding out the interaction effect between learning-style and location of schools the results indicates that the combined variation caused by the interaction between learning-style 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 learning-style and location of schools for having impact over mathematics-anxiety among school students.

The results indicate that the main effect of learning-style is statistically significant ($p = 0.010$), suggesting that differences in learning-styles significantly impact the dependent variable mathematics-anxiety. However, the main effect of location of schools is not significant ($p = 0.070$), indicating that location of schools does not independently contribute to variations in the dependent variable. Additionally, the interaction effect between learning-style 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

learning-style in relation to gender among the respondent group. The study revealed that it is important to consider and thereby essential to address the 'learning-style' independently to reduce issues like mathematics anxiety among the school students, while gender and 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 learning-style in relation to location of schools. The study revealed that it is essential to consider and thereby to address the learning-style independently to mitigate the issues like mathematics anxiety; on the other hand, as the study observed, the location of schools and interaction between 'learning-style' and 'location of schools' may not play a crucial role.

The study makes a clear picture about the present scenario of understanding mathematics anxiety, which is essential to address for enhanced and effective learning of mathematics. By identifying its causes and implementing targeted strategies, teachers, educators, parents, and institutions may help students to overcome their fear, develop self-confidence, and appreciate the relevance of mathematics in daily life. 'learning-style' can also be helpful for better performance and achievement in mathematics and developing an experiential learning of mathematical skills.

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