

Mathematics Anxiety among Secondary School Students in Aizawl City in Relation to Their Gender and Types of Schools

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Abstract

Mathematic is a subject of vital interest for any kind of endeavour. Its understanding has been linked positively with a number of abilities in individuals. Therefore, regardless of the kind of profession a person is likely to take up, an understanding of mathematics will go a long way in smooth conduction of a number of activities. Yet, it has also been found that, may be because of its abstract nature, a number of students have often shown dismal results in mathematics (based on examination results). With these thoughts in mind, the present study was conducted to measure the mathematics anxiety among secondary school students in Aizawl City in relation to their gender and types of schools. Descriptive survey method has been employed in which stratified random sampling has been adopted to collect a sample of 176 secondary school students. Mathematics Anxiety Scale developed by the investigator was used for collecting data. The result revealed that there was a significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of both genders, i.e., between male and female and on the basis of types of schools i.e., Government, Government Aided and Private schools. Furthermore, it was found that there was a significant difference in the mathematics anxiety between Government schools and Government Aided secondary school students, as well as between secondary school students of Government and Private schools. However, there was no significant difference in the mathematics anxiety between students in Government Aided schools and Private schools.

Keywords: Mathematics Anxiety, Gender, Types of schools

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Introduction

Learning of mathematics is crucial as it has a wide range of application in our everyday lives. Mathematics aims to comprehend and explain the fundamental properties and principles that govern the world around us. It is a great concern for the government that mathematics subject is studied with clarity and measures have been taken over the history of time. In India, the new National Education Policy, NEP 2020 introduced innovative ideas in addressing issues such as rote learning, emphasizing quantitative growth rather than qualitative growth, and a lack of conceptual clarity. Students should develop strong foundational skills in language and mathematics. NEP 2020 strongly advocated the fostering of mathematical creativity in learners.

Given the nationwide emphasis on the importance of attaining excellence in mathematics and how it connects to success in various aspects of life, it is possible that students are subjected to tremendous pressure. If this pressure is not managed appropriately or productively, it may lead to anxiety among students. Such anxiety is detrimental, as it affects their academic performance and can even negatively impact the future of students and overall outlook on life.

Cambridge dictionary defined anxiety as an uncomfortable feeling of nervousness or worry about something that is happening or might happen in the future (Cambridge dictionary, n.d.). It is a psychological reaction to stress or unwanted situations that may affect the normal functioning of a person. Likewise, mathematics anxiety can simply be explained as a negative reaction towards mathematics, a feeling of tension a person has when encountered with any kind of mathematics related activity.

It describes worry or fear of performing mathematics calculations. A person with mathematics anxiety may feel panicked at the thought of working with numbers, which makes it even harder to think. Its symptoms are the same as other types of anxiety. They may include worry, panic, tense muscles, increased heart rate, sweaty palms, light-headedness, etc (West, 2022). Richardson and Suinn defined mathematics anxiety as feelings that involves tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations (Richardson & Suinn, 1972, as cited in Suinn & Winston, 2003, p.1).

Rationale

Secondary stage of education is a crucial age for students as it is a stage that greatly determines their future, both in career as well as overall perspectives in life. The level of interest or anxiety in any subject can have a lasting impact on how an individual student deals with problems in life. As mathematics was found to have the least pass percentage level at this stage, it was chosen as the main subject to study. Students must be made to understand

the level of interest they have in mathematics, and also the level of anxiety they have as it can affect their future in the long run. The new found result could enable stakeholders to take necessary measures to tackle the issue.

Furthermore, various research findings have found that gender and types of school matters when it comes to mathematics anxiety. Such research has not been conducted in Aizawl and the investigator found the need to conduct the study to find out how gender and types of schools relate to mathematics anxiety among secondary school students of Aizawl City.

Literature Review

The Reviews of the related literature are discussed in chronological order as below:

Studies conducted on mathematical anxiety, gender and types of schools

Srivastava and Imam (2016) conducted a study on mathematics anxiety among secondary school students in relation to personal and school related factors, in which 1000 secondary school students were taken as sample. Mathematics anxiety scale (MAS), An Intuitional Background Assessment Questionnaire and A Personal Background Questionnaire were used as a tool. The data was analysed using computation of means and standard deviation, computation of standard error and use of t-test and f-test for measuring the significant of the difference between the means. It was found that there exists significant difference between male and female students in their anxiety in mathematics. It was also found that there exists significant difference among the types of schools and math anxiety, the result clearly showing that students of private school have lowest mathematics anxiety scores than the other three groups (government, Semi government, Muslim minority).

Sangral and Kumar (2023) studied Mathematical anxiety among secondary school students in relation to their gender, locality and types of schools. It was found that there is a significant difference in mathematical anxiety among the secondary school students with regard to their gender, i.e., between male and female. It is found there is a significant difference in the numerical anxiety of secondary school students with regard to their locality (rural & urban). The study also found that there is no significant difference in the mathematical anxieties of secondary school students with regard to their types of schools, i.e., although the mean score is larger among private school students more than government schools, concluding that the numerical anxiety of government and private secondary school students were found to have no significant difference.

Studies conducted on Mathematical Anxiety and types of schools

Mandal and Saha (2019) conducted a study on mathematics anxiety and prevention strategies with an attempt to improve mathematics performance of secondary school students

in West Bengal. Government and private schools from Kolkata and South 24 parganas district in the West Bengal were randomly selected where mathematics anxiety was measured using a standardized instrument whereas, students' mathematics performance was collected from the progressive report of the schools. It was found that there are significant differences in mathematics anxiety and performance in mathematics on gender and types of schools but there is no significant difference between habitat in mathematics anxiety and performance in mathematics.

Manikandan, Nair and Ajith (2022) in their study 'Math Phobia among School Students: A Comparative Design' found that level of Math Phobia/Mathematical Anxiety among the Private High School students were significantly higher than the Government High school students. The study was conducted among a total sample of 60 high school students. A Descriptive Comparative design was used to conduct the study and data analysis was done using Descriptive and Inferential statistics. The comparisons of the mean Mathematical Anxiety scores among the Government and Private High School students were done using the 'Student t test'. The computed 't value' at 3.27** (df=58) was statistically significant at $p < 0.01$.

Studies conducted on Mathematical Anxiety and gender

Yadav and Singh (2018) conducted a study to find out the relationship between achievement in Mathematics and Mathematics anxiety among secondary school students. Mathematics achievement as a cause for Mathematics anxiety and vice-versa was studied to find out the reciprocal relationship between Mathematics achievement and Mathematics anxiety. 374 students (302 male and 72 female students) were taken as samples in which self-constructed tools, Mathematics anxiety scale and Mathematics Performance Test, were applied to collect data. It was found that the relationship between achievement in Mathematics and Mathematics anxiety is negative and significant at 0.05 level of significance. It was also found that there was significant difference in mathematics anxiety between high and low achievers, and between high and low anxious students. It was also noted that that was no difference in Mathematics anxiety between male and female students.

Kumar and Srivastava (2021) conducted a study on Mathematics Anxiety and its effect on a set of independent variables (gender, school board, fathers' qualification, mothers' qualification and with respect to their types of family) of secondary school students in Pune. Survey method was adapted and the tool used for the data collection was Mathematics Anxiety Scale (MAS) developed by Dr. (Mrs.) SadiaMahmood and Dr. (Mrs.) Tahira Khatoon. 195 secondary school students were drawn randomly from two schools. Mean, standard deviation and a 't' test was used for statistical analysis. It was found that there was no significant difference in Mathematics Anxiety of students with respect to their gender, school board, fathers' qualification and with respect to their types of family. It was also found that

students whose mothers' qualification is above intermediate were having high Mathematics Anxiety in comparison to those whose mothers' qualification is intermediate and below intermediate.

Objectives of the study

1. To compare the mathematics anxiety of secondary school students in Aizawl City on the basis of gender.
2. To compare the mathematics anxiety of secondary school students in Aizawl City on the basis of types of schools.

Research hypotheses

1. There is a significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of gender.
2. There is a significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of types of schools.

Methodology

In the present study, the investigator employed Descriptive Survey Method.

Population

The population of the present study comprised of all secondary school students in Aizawl City.

Sample

The sample constitutes 176 secondary school students in Aizawl City. Stratified Random Sampling was employed by the investigator where Government, Government Aided and Private secondary schools were the main strata and samples were randomly collected from there.

Table 1
Profile of secondary school students in Aizawl City

Groups		No. of secondary school students	
Gender	Male	73	176
	Female	103	
Types of schools	Government	67	176
	Government Aided	59	
	Private	50	

Table 1 shows that out of the 176 secondary school students in Aizawl City, who are taken as sample for the present study, 73 are male and the rest 103 are female. 67 students are enrolled in Government schools, 59 in Government Aided and 50 are enrolled in Private schools.

Tool

For this study, Mathematics Anxiety Scale developed by the investigator was used for collection of data, which is a standardized tool to measure the mathematics anxiety of secondary school students. This scale is divided into three major dimensions: Cognitive dimension, Emotional dimension and Behavioral dimension of Mathematics anxiety. A total of 38 items are distributed in these dimensions. The scale is a five-point scale, which includes *Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree*.

Statistical techniques used

Data was analysed with the help of descriptive statistics like mean and standard deviation along with parametric statistics like t-test and ANOVA.

Delimitation

Due to limitations in time and cost, the present study was delimited to secondary school students studying Class 10.

Data analysis and interpretation

The data collected were analysed and interpreted in accordance with the objectives as follows:

Objective No.1: To compare the mathematics anxiety of secondary school students in Aizawl City on the basis of gender.

To compare the mathematics anxiety of secondary school students with respect to their gender, students are categorized into male and female. The hypothesis which stated that ‘There is a significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of gender’ was converted into a null hypothesis which states that, ‘There is no significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of gender’.

To test this null hypothesis, a t-test was conducted and comparison was made between male and female. The Mean and the Standard Deviation were also calculated and t-test was used to test the Mean difference, the detail of which is shown in the following table.

Table 2
Comparison of mathematics anxiety between male and female secondary school students in Aizawl City.

Gender	No. of Students	Mean	Standard Deviation	SED	t-value	df	Significance level
Male	73	105.55	24.61	4.07	2.74	169	Significant at 0.05
Female	103	116.71	29.2				

Table 2 shows the comparison of mathematics anxiety between male and female secondary school students in Aizawl City.

The calculated t-value was found to be 2.74 with its degrees of freedom 169, which is larger to the critical value at 0.05 level of significance.

So, the null hypothesis, ‘There is no significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of gender’ is rejected.

Therefore, there is a significant difference between male and female secondary school students in Aizawl City. The finding is in favour of female secondary school students showing larger mean score compared to male.

Objective No.2: To compare the mathematics anxiety of secondary school students in Aizawl City on the basis of types of schools.

In order to compare the mathematics anxiety of secondary school students in Aizawl City on the basis of types of school, the hypothesis which stated that ‘There is a significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of types of schools’ was converted into a null hypothesis which states that, ‘There is no significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of types of schools’.

To test this null hypothesis, ANOVA was used and comparison was made between secondary school students who are currently attending Government, Government Aided and Private type of schools.

Table 3

Comparison of mathematics anxiety of secondary school students in Aizawl City on the basis of types of schools

Source of variance	df	Sum of Squares	Mean Square	F-ratio	Significance
Between sets	2	15773.99	7886.99	11.36	Significant at 0.01
Within sets	173	120104.9	694.25		

The above table shows that the calculated F-ratio is 11.36 which is greater than the critical value 4.71 at 0.01 level of significance. So, the null hypothesis, 'There is no significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of types of schools' is rejected.

Since the result indicated that there exists significant difference in mathematics anxiety on the basis of types of schools, t-test was further used to compare the difference between Government, Government Aided and Private schools.

Table 4

Comparison of mathematics anxiety between secondary school students in Government school and Government Aided schools.

Types of schools	No. of Students	Mean	Standard Deviation	SED	t-value	df	Significance
Government	67	100.96	24.97	4.77	2.86	124	Significant at 0.01
Government Aided	59	114.61	28.25				

From the above table, the mean score of students in Government school is 100.96 and the standard deviation is 24.97, while the mean and standard deviation of students studying in Government Aided is 114.61 and 28.25 respectively. The calculated t-value is 2.86 which is greater than the critical value at the required level of significance at 0.01 level i.e. 2.62.

Therefore, there is a significant difference in the mathematics anxiety between secondary school students of Government schools and Government Aided schools.

Table 5

Comparison of mathematics anxiety between secondary school students in Government aided school and Private type of school.

Types of schools	No. of Students	Mean	Standard Deviation	SED	t-value	df	Significance
Government Aided	59	114.61	28.25	5.19	1.81	107	Not significant
Private	50	124	25.83				

Table 5 shows the comparison of mathematics anxiety between students in Government Aided schools and Private schools in Aizawl City.

The calculated t-value was found to be 1.81 with its degrees of freedom 107, which is smaller than the critical value at the required levels of significance. Therefore, there is no significant difference in the mathematics anxiety between students in Government aided schools and Private schools in Aizawl City.

The mean score of students in Private schools is larger showing higher anxiety than of Government aided schools, however the deviation is higher in Government aided as compared to Private schools.

Table 6

Comparison of mathematics anxiety between secondary school students in Government schools and Private type of schools

TYPES OF SCHOOLS	No. of Students	Mean	Standard Deviation	SED	t-value	df	Significance
Government	67	100.96	24.97	4.84	4.76	115	Significant at 0.01
Private	50	124	25.83				

From the above table, the mean score of students in Government schools is 100.96 and standard deviation is 24.97, while the mean and standard deviation of students studying in Private schools is 124 and 25.83 respectively. The calculated t-value is 4.76 which is greater than the critical value at the required level of significance at 0.01 level i.e. 2.62.

Therefore, there is a significant difference in the mathematics anxiety between secondary school students of Government and Private schools. The finding is in favour of Government schools with larger mean scores showing higher anxiety as compared to Private schools.

Findings

1. There is a significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of gender, i.e., between male and female.
2. There is a significant difference in the mathematics anxiety of secondary school students in Aizawl City on the basis of types of schools.
 - There is a significant difference in the mathematics anxiety between secondary school students of Government schools and Government Aided type of schools.
 - There is no significant difference in the mathematics anxiety between students in Government aided schools and Private schools.
 - There is a significant difference in the mathematics anxiety between secondary school students of Government and Private schools

Conclusion

As found in the study, while no significant differences lay in mathematics anxiety between schools that rely on the government funding, regardless of the kind and amount received, there was a significant difference when government managed schools and privately managed schools were compared with the latter having a more positive result. This shows that management does play a crucial role in students' anxiety and eventually affecting their academic performance. Since mathematics anxiety significantly impacts the academic performance and confidence of students, it is imperative that this problem is taken care of. Addressing this issue may involve diagnosing anxiety of students and creating supportive learning environments, implementing anxiety-reducing techniques, and encouraging growth mindset. Educators can integrate engaging, real-world applications of mathematics so as to make the subject more relatable and less intimidating.

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