MATHEMATICS ANXIETY AMONG SECONDARY SCHOOL STUDENTS IN AIZAWL AND SHILLONG: A COMPARATIVE STUDY

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The present study was conducted to compare the mathematics anxiety of secondary school students in Aizawl and Shillong. Descriptive survey method was employed in which Stratified Random Sampling has been adopted to collect a sample of 364 secondary school students. The tool used for collecting data was Mathematics Anxiety Scale developed by the investigator. It was found that there was no significant difference in the mathematics anxiety of secondary school students in Aizawl and Shillong. Furthermore, it was also found that there was no significant difference in the mathematics anxiety between male secondary school students of Aizawl and Shillong, as well as female students of the two cities.

Keywords: Mathematics anxiety, Survey, Compare, School students

Introduction

Mathematics is a fundamental discipline that deals with numbers, quantities, shapes and patterns. It is both an abstract science as well as a practical tool which is used in various fields, including engineering, economics, physics, computer science, etc. In India, mathematics is a compulsory subject at the secondary school level and is inherently one of the most intimidating subjects (Kunwar et al., 2022). Pressure is given on students as they are under compulsion to give examination on mathematics where their preference of choosing subjects is irrelevant at the secondary level of schooling. This may create a feeling of anxiety when faced with or even just thinking about mathematical tasks.

Mathematics anxiety (MA) is characterised by feelings of stress, fear and unease when individuals are required to encounter any kind of mathematical activity (Zhang, Zhao and Kong, 2019). It refers to the feeling of tension or apprehension that individuals experience when confronted with mathematical tasks. According to Nandhini and Subramanian (2021), Mathematics Anxiety is defined as a feeling of tension and anxiety that interferes with the manipulation of numbers and solving of mathematical problems in ordinary life and as well as in academic situations.

Numerous studies, conducted in the past, have shown that various factors such as gender, age, parental occupations, school management styles, attitudes, etc., significantly affect the mathematics anxiety of a person. These factors may also influence whether or not an individual develops an interest in the subject. Moreover, social psychologists asserts that an individual's thoughts, feelings and behaviours are greatly influenced by social situations (Lumen Learning, n.d.). If this is the case, it can also be assumed that social structures such as patriarchal, matriarchal or other societies, may influence mathematics anxiety alongside the other factors mentioned.

Comparing the two state's capitals, Aizawl and Shillong, promises to be both interesting and educational. Shillong is fast emerging as an educational hub for the entire North Eastern region (Ministry of Education, n.d.). Nonetheless, Aizawl, the capital city of Mizoram has also earned a strong reputation in education such as having a high literacy rate of 98.36 per cent (Census 2011, para. 2). Secondary schools in Aizawl and Shillong adopt a similar approach to design curriculum, which is a crucial factor in addressing mathematics anxiety. The mathematics curriculum in both, adheres to the NCERT curriculum, covering core topics of mathematics such as, geometry, algebra, mensuration and data handling. The curriculum prepares students for higher education and competitive examinations. A major difference is seen in the evaluative schedule where examinations are conducted twice a year in Shillong, while they are conducted thrice in Aizawl.

Teachers play a crucial role in mathematics classroom. Although various factors may significantly impact students' anxiety on mathematics, a teacher's influence may greatly enhance the learning environment, ultimately leading to an improved outcome for students. Teachers can help to reduce the level of mathematics anxiety among students. In fact, parents and educators alike may be the source for learned response of children with mathematics anxiety. Lending support and providing positive mathematics learning environment may alleviate mathematical anxiety among learners (Shields, 2006).

Mathematics is considered a crucial subject in secondary education. Many students, even before they begin studying it, approach it with the assumption that it is naturally difficult. Therefore, a study on mathematics anxiety is essential, as it impacts academic performance, mental health and most importantly, future opportunities for students.

Comparative education deepens and broadens understanding for betterment as it assists in developing educational system of different regions. Comparison of education system across different regions can rather be an intriguing endeavour, particularly when it appears to be beneficial. Furthermore, analysing two regions that appear to have a significant impact can be seen to help capture people's attention and perhaps could ultimately create a meaningful influence.

The researcher found that Shillong, with its history as a leading educational hub in North East India, has never been subjected to comparison with other states in India on account of mathematics anxiety among secondary school students.

Therefore, with consideration of the relevancy mentioned, Aizawl as a city of a neighbouring state which has one of the highest literacy rates, is one of the most suitable and intriguing cities to compare with Shillong. The investigator feels a study such as mathematics anxiety among secondary school students is necessary between these two cities that is Aizawl and Shillong, in hope that it will open the minds for positive furtherance in plentiful ways.

Furthermore, this research is expected to promote equity in education by addressing the disparities between students in Aizawl and Shillong, considering the differences in social structures which may impact anxiety in mathematics—Mizoram follows a patriarchal

society while Meghalaya follows a matriarchal society.

The researcher dug deep and found that such a comparative study on mathematics anxiety of secondary students of different regions with different society structure is believed to have never been conducted over the past. So, the researcher felt the need to conduct the study to see if different societal structure influences gender on their mathematics anxiety.

Review of Related Literature

Mohamed and Tarmizi (2010) conducted a study, 'Anxiety in mathematics learning among secondary school learners: A comparative study between Tanzania and Malaysia'. This study assessed mathematical anxiety across four sub-categories: teaching anxiety, general anxiety, test anxiety and overall anxiety. The result showed that there were no significant differences in the mean scores for mathematics learning anxiety between students from the two countries.

Sathishkumar (2023) conducted a study on mathematics performance in relation to attitude towards mathematics, interest in mathematics and mathematics anxiety. The study revealed that from a total sample of 590 students, there was a significant difference between male and female students in their mathematics anxiety, in which female students experienced higher levels of mathematics anxiety compared to their male counterparts. The study also showed that there was no significant difference between the rural and urban higher secondary school students in respect of their mathematics anxiety.

Ganai (2024) conducted a study on attitude towards mathematics anxiety and school adjustment of secondary school students of Kashmir valley. The study was conducted at schools affiliated to JKBOSE and CBSE. The results indicated that CBSE students exhibited significantly lower levels of mathematics anxiety compared to JKBOSE students. However, no significant difference was found between JKBOSE and CBSE male students on mathematics anxiety. However, it could be seen that there was a significant difference between female students of both boards on their mathematics anxiety. JKBOSE female students suffered more mathematics anxiety than CBSE female students.

From the above studies, it may be safely concluded that, often, there were differences in the level of mathematics anxiety when comparisons were made between various variables. However, no studies have been conducted similar to the present one, which compares mathematics anxiety of students with same gender across different states. Thus, no research findings were available that could help in making generalisations regarding this phenomenon. This was considered as a high research gap. Therefore, this information further reiterated the importance of undertaking the present research so as to fill research gaps and to provide data for future researchers.

Objectives

1. To compare the mathematics anxiety between secondary school students of Aizawl and Shillong;
2. To compare the mathematics anxiety between male secondary school students of Aizawl and Shillong;

3. To compare the mathematics anxiety between female secondary school students of Aizawl and Shillong.

Research Hypotheses

1. There is a significant difference in mathematics anxiety between secondary school students of Aizawl and Shillong.
2. There is a significant difference in mathematics anxiety between male secondary school students of Aizawl and Shillong.
3. There is a significant difference in mathematics anxiety between female secondary school students of Aizawl and Shillong.

Methodology

Descriptive survey method was employed by the investigator.

Population

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

Sample

The investigator employed Stratified Random Sampling method for collecting data in which the sample constitutes of 364 secondary school students from Aizawl and Shillong. The secondary school students categorised as male and female were put together with respect to the city. The profile of the sample is given in Table 1.

Table 1 indicates that 364 secondary school students taken as sample has been categorised into male and female in which there are 219 male and 145 female students. Of the male, 73 are from Aizawl and 146 are from Shillong. Also, among the female students, 103 are from Aizawl and the rest 42 are from Shillong.

Tool

For the present study, Mathematics Anxiety Scale, following Likert's Method developed by the investigator, was used for collecting data. This is a standardised tool to measure the mathematics anxiety of secondary school students. The scale is divided into three major dimensions: Cognitive dimension, emotional dimension and behavioural dimension of

Table 1: Profile of Secondary School Students

Gender	City	No. of male and female secondary school students	Total no. of male and female secondary school students in each city	Total no. of secondary school students
Male	Aizawl	73	219	364
	Shillong	146		
Female	Aizawl	103	145	
	Shillong	42		

mathematics anxiety in which a total of 38 items are distributed. The scale is a five-point scale which includes: Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree.

Reliability and validity

The reliability of the scale was found by Test-Retest method in which a reliability coefficient of 0.84 was found. Validity of this Mathematics Anxiety Scale was also assessed by content validity which was ensured through logical analysis by experts, and concurrent validity in which a coefficient of 0.82 was found. Pearson Product Moment Correlation method was used for calculation in finding the reliability and validity of the scale.

Normality

Normality is ensured by analytical as well as graphical test. Test of skewness and kurtosis was employed for analytical test while histogram with a curve showing the data distribution was plotted for the graphical test. The data in the present study showed a skewness of –0.003 and a kurtosis of–0.24, indicating that normality assumptions were met and the data was normally distributed (Orcan, 2020). The data presented by a normal distribution curve (bell-shaped) was plotted to visually represent the data's normal distribution. Thus, with normality established, further steps were taken using parametric tests.

Figure 1 ensures the normality of the data obtained by showing a bell curve. The mean of the data obtained is 110.08 while the standard deviation is 28.91. It can be observed from the curve that the highest peak represents the mean of the data, that is the average score of students, and is heavily dense. It can also be observed from the curve that the lowest score is below 40 and the highest is just above 190.

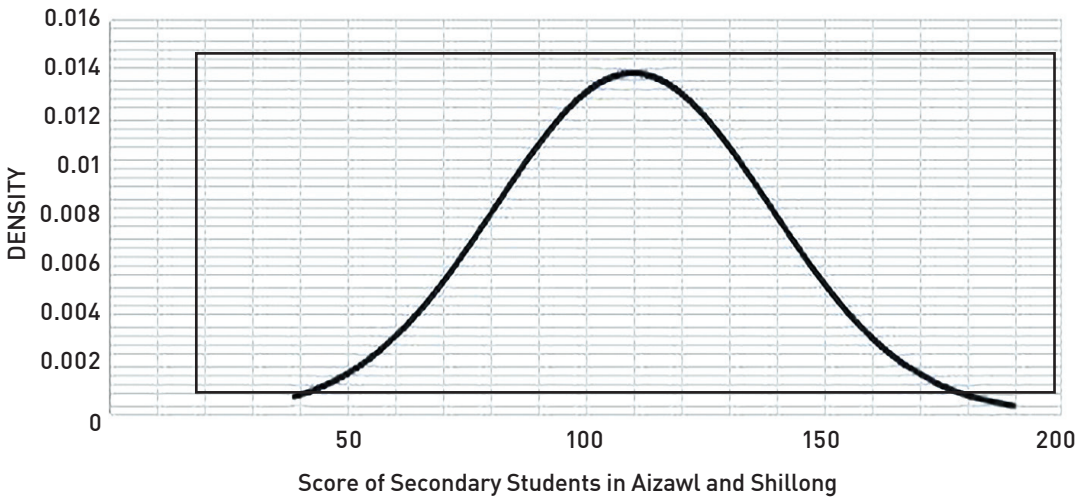

Fig. 1. Bell curve showing normal distribution of data for the present study
Mean = 110.08, Standard deviation = 28.91

Statistical techniques used

Considering the nature of the data which has established normality and in accordance with the objectives, the researcher employed descriptive statistics such as mean and standard deviation as well as t-test, which is an inferential statistical technique.

Delimitation

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

Operational definition of the key terms used

Mathematical anxiety: The feeling of tension and anxiety that interferes with the manipulation of numbers and solving of mathematical problems in all spheres of life.

Aizawl: The capital city of the state, Mizoram, India

Shillong: The capital city of the state, Meghalaya, India.

Data analysis and interpretation

The data collected were analysed and interpreted in accordance with the objectives.

Objective No. 1: To compare the mathematics anxiety between secondary school students of Aizawl and Shillong

To compare the mathematics anxiety of secondary school students of Aizawl and Shillong, the hypothesis which stated, 'There is a significant difference in mathematics anxiety between secondary school students of Aizawl and Shillong,' was converted into a null hypothesis which stated, 'There is no significant difference in mathematics anxiety between secondary school students of Aizawl and Shillong'.

To test this null hypothesis, a t-test was conducted and comparison was made between students of Aizawl and Shillong. The mean and the standard deviation were also calculated and t-test was used to test the mean difference, the detail is given in Table 2.

Table 2 reveals that the calculated t-value 1.28 is less than the critical value at the required level of significance, thus there is no significant difference in the mathematics anxiety between secondary school students of Aizawl and Shillong.

Thus, the null hypothesis, 'There is no significant difference in mathematics anxiety between secondary school students of Aizawl and Shillong', is accepted.

Objective No. 2: To compare the mathematics anxiety between male secondary school students of Aizawl and Shillong

To compare the mathematics anxiety between male secondary school students of Aizawl and Shillong, the hypothesis which stated, 'There is a significant difference in mathematics anxiety between male secondary school students of Aizawl and Shillong,

Table 2: Comparison of Mathematics Anxiety between Secondary School Students of Aizawl and Shillong

City	No. of Students	Mean	SED	t-value	df	Significance level
Aizawl	176	27.86	3.03	1.28	362	Not significant
Shillong	188	29.87				

was converted into a null hypothesis which stated, 'There is no significant difference in mathematics anxiety between male secondary school students of Aizawl and Shillong.'

To test this null hypothesis, a t-test was conducted and comparison was made between male secondary school students of Aizawl and Shillong. The mean and the standard deviation were calculated and t-test was used to test the mean difference, the detail being given in the Table 3.

Objective No. 3: To compare the mathematics anxiety between female secondary school students of Aizawl and Shillong.

To compare the mathematics anxiety between female secondary school students of Aizawl and Shillong, the hypothesis which stated, 'There is a significant difference in mathematics anxiety between female secondary school students of Aizawl and Shillong,' was converted into a null hypothesis which stated, 'There is no significant difference in mathematics anxiety between female secondary school students of Aizawl and Shillong.'

Table 3: Comparison of Mathematics Anxiety between Male Secondary School Students of Aizawl and Shillong

Male secondary school students of city	No. of Students	Mean	Standard Deviation	SED	t-value	df	Significance level
Aizawl	73	105.55	24.61	3.76	0.34	172	Not significant
Shillong	146	104.27	30.05				

Table 3 reveals the calculated t-value 0.34 is less than the critical value at the required level of significance. Thus, there is no significant difference in the mathematics anxiety between male secondary school students of Aizawl and Shillong

Thus, the null hypothesis, 'There is no significant difference in mathematics anxiety between male secondary school students of Aizawl and Shillong', is accepted.

To test the null hypothesis, a t-test was conducted and comparison was made between female secondary school students of Aizawl and Shillong. The mean and the standard deviation were calculated and t-test was used to test the mean difference, the detail of which is given in Table 4.

Table 4: Comparison of Mathematics Anxiety between Female Secondary School Students of Aizawl and Shillong

Female secondary school students of city	No. of Students	Mean	Standard Deviation	SED	t-value	df	Significance level
Aizawl	103	116.71	29.2	4.83	1.07	88	Not significant
Shillong	42	121.88	25.07				

Table 4 reveals that the calculated t-value 1.07 which is less than the critical value at the required level of significance. Therefore, there is no significant difference in the mathematics anxiety between female secondary school students of Aizawl and Shillong.

Thus, the null hypothesis, 'There is no significant difference in mathematics anxiety between female secondary school students of Aizawl and Shillong', is accepted.

Findings

1. There is no significant difference in mathematics anxiety between secondary school students of Aizawl and Shillong.
2. There is no significant difference in mathematics anxiety between male secondary school students of Aizawl and Shillong.
3. There is no significant difference in mathematics anxiety between female secondary school students of Aizawl and Shillong.

Discussion of Findings

The findings of the study conducted revealed that there was no significant difference in mathematics anxiety between secondary school students of Aizawl and Shillong city, although students of Aizawl showed higher anxiety as compared to those in Shillong. The study between male students of Aizawl and Shillong as well as the study between female students of Aizawl and Shillong, indicated that students' mathematics anxiety was not significantly affected by the distinct social structure of the two states where these cities are located, a patriarchal society and a matriarchal society, respectively.

Conclusion

The study was conducted with the expectation that there would either be a significant, high or moderately high difference in mathematics anxiety between the students of Mizoram and Meghalaya, as the two neighbouring states are of different societal and religious values. However, the findings suggested that both states, despite their differences, followed similar patterns and syllabi in learning mathematics through their respective school boards. These factors may have played a significant role in the academic growth and development of students, regardless of the mentioned societal variations. Although it could be assumed that societal structure may influence mathematics anxiety, this research, though not entirely negating to the idea, indicated that society is not the sole determinant of students' academic development; rather, the syllabus followed by schools and the teaching methods employed appeared to be more crucial. Besides these facts, the significance of this research was that it has managed to disprove the hypothesis that societal and religious beliefs have a strong bearing on the attitude of students with regards to certain subjects.

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