

Mathematics anxiety and its relationship with the achievement of Secondary school students

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ABSTRACT

Mathematics knowledge is necessary for secondary school students. Mathematics anxiety is a feeling of tension or fear that impairs the performance of students in mathematics. The present investigation has been conducted to study the Mathematics anxiety and its relationship with the achievement of secondary school students. The study employed descriptive survey method. The Sample of the study were 310 students of the 10 the grade selected from Purulia district in West Bengal. The data was analyzed by using 't' test and Pearson correlation. Analysis of the 't' test results for gender show that there is no significant differences of anxiety towards mathematics between boys and girls students and rural students are significantly more math anxious than urban students. The correlation test showed a significant and negative relationship between student's mathematics achievement and their mathematics anxiety with correlation value $r = -0.667$.

Keywords: Math anxiety, secondary student, gender, Math achievement, Pearson correlation

1. Introduction:-

Mathematics knowledge is necessary for secondary school students; it is very useful for higher education. Mathematics anxiety is one of the psychological barriers that students encounter when they are performing a mathematics task. Mathematics anxiety is a psychological dimension of learning that is important for educators to identify. Mathematics anxiety can negatively impact an individual's initial learning of mathematics. Math anxiety is described as "feelings of tension and anxiety that interfere the manipulation of mathematical problems in a wide variety of ordinary life and academic situations" (Richardson and Suinn, 1972). It was also described as a "sudden death". Students with mathematics anxiety may also feel embarrassed, irritated, frustrated and fearful (Buxton, 1981). Mathematics anxiety blocks mathematics learning (Martinez, 1987). Mathematics anxiety may lead to mathematics avoidance (Tobias, 1993). Mathematics anxiety can be defined as mental defect, fear of mathematics, a feeling of intense frustration or helplessness when one is required to solve mathematical operations and manipulate numbers or figures (Ashcraft & Faust, 1994). Mathematics anxiety as a combination of negative attitude towards mathematics learning, fear of success, lack of self confidence and exam pressure (Bessant, 1995) Math anxiety severely hinders students' working memory (Perina, 2002). According to Sherman and Wither (2003), a five year study conducted on students from the age of 6 to the age of 10 revealed that the level of mathematics anxiety in students is strongly related to student achievement. Mathematics anxiety makes person to negatively react to circumstances that involve abstract concept of mathematics like numbers, and calculations (Ashcraft & Moore, 2009). According to Arem (2009) mathematics anxiety is an emotional, mental and physical act related to the mathematical thinking and problem solving processes and resulting from uncomfortable past experiences related to mathematics. Freedman (2013) defined mathematics anxiety as " an emotional reaction to mathematics based on a past unpleasant experience which harms future learning" .Mathematics anxiety can cause physical symptoms such as rapid heartbeat, feeling faint and trembling while dealing with manipulation of numbers and solving problem (Kumari, 2015). Based on several studies, some researchers have argued that there is no significant difference in mathematics anxiety between males and females (Marsh & Tapia, 2002; Elenchothy, 2007) .some researcher have shown that females have higher mathematics anxiety than males (Salwani & Salleh, 2001; Woodard, 2004; Khatoon & Mahmood, 2010). Good (1959) defined achievement in mathematics as "knowledge attained or skills developed in the school subjects usually test scores or by marks assigned by teachers". According to Kulkarni (1970), "Mathematical achievement refers to understanding of mathematical concepts ,application of knowledge to new situations and logical reasoning as involved in interpretation of data, interpretation of missing link, etc". Mathematics achievement refers to not only to obtaining excellent marks in the greater level final examination but it also refers to the attainment of the mathematical ability and skills. Mathematics achievement is an essential part of the academic achievement in the modern era.

2. Literature Review:-

Tuan Salwani(2001), have found that high level of mathematics anxiety led to decline of student's achievement with the correlation $r=-0.254$ and $P< 0.05$. According **Marzita (2002)**, Mathematics anxiety exists due to various factors such as classroom climate, mathematical abstraction, past experience, the pressure from the family, the experience of being humiliated in front of the class, teaching techniques and so on. Based on several studies, some researchers have argued that there is no significant difference in mathematics anxiety between males and females (**Marsh & Tapia, 2002; Elenchothy, 2007** .some researchers have shown that females have higher mathematics anxiety than males (**Salwani & Salleh, 2001; Woodard, 2004; Khatoon & Mahmood, 2010**). **Effandi Zakaria and Norazah Mohd Nordin(2007)** conducted a study on The effects of Mathematics anxiety on Matriculation students as related to motivation and achievement. The results revealed a low ($r = -0.32$) but significant ($p<0.05$) negative correlation between mathematics anxiety and achievement. **Venkatesh kumar, G. & Ayatollah Karimi (2010)** conducted a study on Mathematics anxiety, mathematics performance and overall academic performance in High School students. Here it is shown that there is significant gender difference in mathematics anxiety, whereas there is no significant gender difference between boys and girls in mathematics performances and academic performance. **Monoranjan Bhowmik & Bharati Banerjee (2015)** conducted a study on co relational study on anxiety and achievement in mathematics of secondary school students in Jangal-Mahal of West Bengal, India. The result reveals that in gender difference there is no significant difference on the student's anxiety towards mathematics, though there is not so significant difference in achievement in mathematics. Also there is a significant negative correlation between anxiety towards mathematics and achievement in mathematics. **Marzita Puteh & Siti Zaleha Binti Khalin(2016)** conducted a study on Mathematics Anxiety and its relationship with the achievement of secondary students in Malaysia .Here it is shown that there is no significant difference between the level of mathematics anxiety of female students compared to the male students. **Muhammad (2017)** conducted a study on gender difference in math anxiety and mathematics performance of secondary schools students in Bauchi state Nigeria. Here it is revealed that there was significant difference between math anxiety and math performance and there was no significant gender difference in student's performance in mathematics. **Priti Kalsia (2017)** conducted a study on mathematical achievement of senior secondary school students in relation to academic anxiety. Here it is shown that an inverse relationship was found between the mathematical achievement and academic anxiety of senior secondary school students.

2.1. Objectives of the study:-

The researcher considered the followings as the objectives of the study:

- i. To study the mathematics anxiety of secondary school students with regard to gender.
- ii. To study the mathematics anxiety of secondary school students with regard to residence.
- iii. To find out the relationship between Mathematics anxiety and Mathematics achievement of secondary school students.

2.2. Hypotheses of the study:-

The following hypothesis has been made by the researcher for the study:

H_{01} : There exist no significant differences between boys and girls students of secondary school on their mathematics anxiety.

H_{02} : There exist no significant differences between urban and rural students of secondary school on their mathematics anxiety.

H_{03} : There exist no significant relationship between Mathematics anxiety and Mathematics achievement.

2.3. Variables of the study:-

Dependent variable: - mathematics anxiety, mathematics achievement

Independent variable: - Gender, residential background

3. Methodology:

Descriptive survey type method and stratified random sampling technique has been used in this study.

3.1. Population of the Study:-

All the secondary students in Purulia district of West Bengal comprised the population of this study.

3.2. Sample:-

310 secondary level students from Bengali medium school in the district of Purulia in W.B was considered and stratified random sampling was used for sample selection .The distribution of the samples has been presented table 1.

Table 1: showing the distribution of sample

Localities	Boys	Girls	Total
Rural	70	72	142
Urban	80	88	168
Total	150	160	310

3.3. Sample tools:-

Researcher developed a tool to study the mathematics anxiety of secondary school students. After item analysis 40 items was selected. The validity and reliability was estimated by applying Test -Retest method and they was found sufficient for the study. A self made achievement tool prepared by researchers consisted with 20 MCQ items, covering the text book (Mathematics) of class x.

- **Scoring**

The scale was constructed by making use of Likert's methods of summation to get a five point judgment on each item. Against each statement, five alternative responses, namely, "Strongly Agree" (SA), "Agree" (A), "Undecided" (U), "Disagree" (D) and "Strongly Disagree" (SD) were given. Weights of 5,4,3,2 and 1 were given for favorable statements and the scoring system is reversed for unfavorable statements. A schedule was added in the beginning of the questionnaire in order to get information about sex and residential background.

3.4. Data analysis:-

The mean, standard deviation and 't' test, correlation were used for analyzing the data.

4. Results & Discussions:-

The data has been subjected to statistical analysis and discussed over subheads under different objectives of the study. The statistical analysis gives a comprehensive idea about the mathematics.

4.1. To study the mathematics anxiety of secondary school students with regard to gender.

To compare the mathematics anxiety between boys and girls students of secondary school. The data have been subjected to mean, standard Deviation (SD) and t test as shown in following table 2.

Table 2: Determination of t -value

Group	No. of participants	Mean	SD	df	't' values
Boys	150	81.50	4.959	308	2.066*
Girls	160	80.237	5.788		

*not significant

Here the score of 't' is greater than the calculated value, so the result is not significant. Therefore the above said null hypothesis is accepted, so it can be said that there exists no significant differences of anxiety towards mathematics between boys and girls students.

This study found that there was no significant difference in mathematics anxiety levels of students according to gender. This finding is consistent with the studies by Bhowmik & Banerjee (2015) [20], Puteh & Khalin (2016) [21] which determined that there is no relationship between mathematics anxiety and gender. However this findings contradicts with the findings of Lee (1996) [3], Orenstein (1994) [2], Woodard (2004) [10], Baloglu & Kocak(2006)[11], Karimi and Venkatesan(2010) [15] all of which noted significant differences in mathematics anxiety according to gender, with female students exhibiting higher math anxiety than their male counterparts.

4.2. To study the mathematics anxiety of secondary school students with regard to residence.

To compare the mathematics anxiety between urban and rural students of secondary school. The data have been subjected to mean, Standard Deviation (SD) and t test as shown in following table 3.

Table 3: Determination of t -value

Group	No. of participants	Mean	SD	df	't' values
Urban	168	79.714	4.621	308	4.013*
Rural	142	82.190	6.001		

*significant at 0.05 level

Here the score of 't' is less than the calculated value, so the result is significant. Therefore the above said null hypothesis is rejected, so it can be said that there exists significant differences of anxiety towards mathematics between urban and rural students.

4.3. To find out the relation between mathematics anxiety and mathematics achievement

Here find out the relation between mathematics anxiety and mathematics achievement of secondary school students. The data have been subjected to Pearson correlation method shown in following table 4.

Table 4. Correlation level between math anxiety and math achievement

		Student Math Anxiety	Student Math Achievement
Student Math Anxiety	Pearson correlation	1	-0.667**
	Sig.(2 tailed)		0.000
	N	310	310
Student Math Achievement	Pearson correlation	-0.667**	1
	Sig.(2 tailed)	0.000	
	N	310	310

** Co-relation is significant at the 0.01 level (2 tailed)

Here shows that there is a significant inverse relationship between mathematics anxiety and mathematics achievement of students with $r = -0.667$. Therefore H_{03} is rejected. This indicates that students who have high anxiety exhibit low achievement in mathematics and vice versa. The finding is consistent with the findings of Ashcraft & Kirk (2001) [7], Bower (2001) [6], Tapia and Marsh (2004) [8], Ashcraft & Krause (2007) [12], Ashcraft & Moore (2009) [13], Wang et al. (2015) [19], Bhowmik and Banerjee (2015) [20].

5. Conclusion and recommendations:-

Mathematics achievement in students is influenced by psychological factors such as mathematics anxiety. Math anxiety is a problem that can negatively affect children's academic achievement and future employment prospects. This research is accomplished on the students of secondary level to study the Mathematics anxiety and its relationship with the Mathematics achievement. From the finding of this study, it was concluded that boys and girls students have same math anxious. The research idea is to find rural students are more math anxious than urban students. Students who have high anxiety exhibit low achievement in mathematics and vice versa. The schools and educational institutions should take measure to reduce the math anxiety. Math teachers should try to make student active and motivated during mathematics classes. As math are not only a subject of study in schools but also the essential part and way of our daily life. Studies of socio-economic and other important parameters of secondary schools students in the district of purulia in West Bengal may accomplish further these findings from this particular study.

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