



## A study on mathematics anxiety among the 9<sup>th</sup> and 10<sup>th</sup> grade secondary school students of Tinsukia district in Assam, India.

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### Abstract

Math anxiety indicates psychologically negative mind-set towards solving mathematical problems which impacts on students' learning practices and out comes. It can be inferred that maths anxiety greatly impacts maths education and students careers choice. The professional and economic gains that will result from changing maths anxiety into maths confidence can not be overstated. Using a sample of 9<sup>th</sup> and 10<sup>th</sup> graders, this study investigated whether students' mathematics anxiety differed significantly according to a group of variables. A total of 300 students participated in the study."Mathematics Anxiety Scale for Secondary School Students" and "The Personal Information Form" was used for data collection. Independent samples t-tests, Coefficient of correlation were used to analyze the data. Results showed that students' mathematics anxiety differ significantly according to gender, environment of the school and the performance in mathematics. Female students reported significantly higher mathematics anxiety than males. Students with higher achievements in mathematics reported lower degrees of mathematics anxiety. However, results did not show any significant difference in students' mathematics anxiety with respect to their grade level and school environment.

**Keywords:** Mathematics anxiety, achievement, secondary school.

### 1. Introduction

Despite its importance and applications in everyday life, Mathematics is often considered as a difficult subject. Research has demonstrated that many students have learning difficulties and show poor performance in mathematics. One of the attributed reasons is the anxiety that an individual may have towards mathematics. Mathematics anxiety is a multi-sided structure and is intertwined with the term of fear, worry and tension. Mathematics anxiety often leads to avoidance of math by those who experience it. Often students who are anxious, bored, and fearful towards mathematics or who do not comprehend the importance of mathematics in professionals and personal life are those who most likely to avoid the study of mathematics. It can not be stressed more forcefully, the fact that maths is truly the gateway of engineering, scientific, and technological fields. A remarkable number of researches have been

accumulated on mathematics anxiety since the 1960s. There have been a variety of definitions of what constitutes mathematics anxiety. Richardson and Suinn (1972) have defined mathematics anxiety, "is a feeling of tension and anxiety that interfere with the manipulation of mathematical problem in varied situations in ordinary as well as academic life". 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 maths related situations (D' Ailly & Begering,1992).Tobias and Weissbrod (1980) defined math anxiety as panic, helplessness, paralysis and mental disorganization that arises at the time of solving mathematical problems (Fiore,1999,p-403).Tobias(1993) described math anxiety as a feeling of sudden death. Smith (1997) characterized maths anxiety in number of ways, including: (a) uneasiness when asked to perform

mathematically (b) avoidance of maths classes (c) feelings of physical illness, faintness, dread or panic (d) inability to perform on a test and (e) utilization of tutorial sessions that provide very little success. Miller (1981) concluded that maths anxiety is directly related to perceptions of one's own mathematical skill in relation to skills in other subject areas. Studies point out a host of factors associated with mathematics anxiety. These variables range from environmental factors such as family pressure for higher achievement, to intellectual factors as learning styles or to personality factors such as low-self esteem (Uusimaki & Nason, 2004; Woodard, 2004). In other words, mathematics anxiety is a multifaceted construct with affective and cognitive dimensions. Personality, self-concept, self-esteem, learning style, parental attitudes, high expectation of parents, negative attitudes toward mathematics, avoidance of math, teachers attitudes ineffective teaching styles, negative school experiences and low degree of achievement in mathematics are among the concepts and constructs related to mathematics anxiety (Bursal & Paznoka, 2006; Cook, 1998; Hadfield & McNeil, 1994; Hopko et al., 2003; Ma & Xu, 2004; Norwood, 1994; Reynolds, 2001; Thomas & Furner, 1997; Williams, 1994; Woodard, 2004).

There are some symptomatic characteristics of math anxiety helping in identifying children suffering from math anxiety, which are in the form of physical, psychological and behavioral (Plaisance, 2009; Jackson, 2008; Woodard, 2004) :

**Physical symptom** : It includes increased heart rate, clammy hands, upset stomach, light headedness.

**Psychological symptom** : It includes inability to concentrate, feeling of helplessness, worry and disgrace.

**Behavioral symptoms** : It includes avoidance of mathematics classes, putting off the mathematics homework until the last minute and irregular study.

## 2. Needs of the study

“Mathematics is the gate way and key of all the sciences” Hence in the age of science and information technology the knowledge of mathematics is very much essential and useful. If mathematics is not given an important place in the curriculum then students would not get any opportunity for mental training and in the absence of which their intellectual development might be affected. Mathematics anxiety in students has become a concern for our Indian society. The standard of Mathematics of class XII in India is same

as that of class X in America or England. Evidence of students' poor attitude and high levels of anxiety toward mathematics are abundant. In the midst of a technological era findings related to declining mathematics scores in 'Scholastics Aptitude Test' as well as poor maths scores had been already published in the 'International Mathematics and science study. The other notable consequences of maths anxiousness are the inability to do maths, the decline in mathematics achievement, the avoidance of mathematics courses, the limitation in selecting college majors and future careers and the negative feelings of guilt and shame (Betz, 1979; Burten, 1979; Donady & Tobias, 1977; Hendel, 1980; Recharadson & Suinn, 1972). Furthermore, individuals with maths anxiety have shown to avoid environments and careers that require the utilization of maths skills (Ashcraft, 2002).

While going through the literature it is found that in India and abroad numbers of studies have been undertaken on 'Mathematics anxiety' but in the North east number of such studies are very few. No work has yet been undertaken on the 'Mathematics anxiety of secondary school students of Tinsukia District in Assam. Moreover research carried out by the present investigator earlier on 'Attitude of the secondary school students towards Mathematics' found that the students of this district have average level of favorable attitude towards mathematics. Therefore, this is an attempt to study student's anxiety towards mathematics which may be one of the important reasons of average level of favorable attitude of the students towards mathematics. The investigator anticipates that the results of this study would have its far reaching implications for both teachers and students at secondary level.

## 3. Objectives of the study

- To find out the extent to which the students have their anxiety towards Mathematics.
- To investigate if students' mathematics anxiety differs significantly according to a group of variables such as Gender, grade level, school environment and medium of instruction.
- To find out the relationship between student anxiety in mathematics & mathematics achievements.

## 4. Hypotheses

- Secondary school students do not differ

significantly in their anxiety towards mathematics with respect to their gender

- Secondary school students do not differ significantly in their anxiety towards mathematics with respect to their grade level.
- Secondary school students do not differ significantly in their anxiety towards mathematics with respect to the varying environment..
- Secondary school students do not differ significantly in their anxiety towards mathematics due to the difference of the medium of instruction.

## 5. Methodology

Simple survey method was used in this study. In

order to achieve the above-cited objective, the various aspects of the methodology followed were: Sample, tools, procedure of data collection and statistical techniques, scoring procedure.

### a) Population and sample

All the students of IX and X standards studying in different secondary schools of Tinsukia District of Assam constitute the population of the study.

A sample consisting of 300 students belonging to different communities which includes males, females; rural-urban; studying in English medium and vernacular medium schools were selected on stratified random sampling basis from 20 schools i.e. 10 government and 10 private schools spreaded in and around the Tinsukia district of Assam. Distribution of sample is furnished in the following Table No. 1.

**Table 1 : Distribution of the sample**

Distribution of schools				Distribution of respondents (students)							
Govt.-10		Private-10		Gender		Class		School environment		Medium of instruction	
Urban	Rural	Urban	Rural	Male	Female	9	10	Urban	Rural	English	Vernacular
6	4	5	5	150	150	150	150	155	145	170	130

### b) Tools used

(i) **Mathematics anxiety scale (MAS -MKST)** developed by Dr (Mrs.) Sadia Mahmood ( Aligarh) and Dr Tahira Katoon ( Aligarh) published by the National Psychological Corporation was adopted by the Investigator for collecting data required for the present study. The scale consists of 14 items designed to measure the anxiety of students towards Mathematics. The scale contains 7 positive items and 7 negative items.

(ii) **Mathematics achievement:** Marks are obtained from the students in the last class examination in the school in mathematics

### c) Procedure of data collection

After selecting 300 students of the selected schools, the investigator approached them individually and requested them to fill up the Mathematics Anxiety Scale (MAS). Though the tool was self administering,

the investigator explained the students how to fill up the tool. After the collecting the filled in tool, it was scored and tabulated systematically for statistical calculation.

### d) Statistical techniques used

The investigator used the statistical techniques like Mean, Z-score, standard deviation, t-test, etc for analyzing and interpretation of the data collected for the study.

## 6. Analysis and interpretation

To find out the extent to which the students have their anxiety towards Mathematics, the investigator converted the raw scores into corresponding Z- scores from the table which was provided in the MAS for the interpretation of data. There after the number of students falling in each grade and their grade-wise percentages were calculated and the calculated values are represented in the following.

**Table 2 :** Level of anxiety of the male and female students towards mathematics:

Variable	Extremely High Anxiety		High Anxiety		Above Average		Average/moderate		Low Anxiety		Very low Anxietyable		Extremely low Anxiety	
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Male student	30	20	50	33.33	20	13.33	25	16.66	20	13.33	5	3.33	-	-
Female student	45	30	60	40	24	16	12	8	9	6	-	-	-	-
Total	75	30	110	44	44	17.6	37	24.66	29	11.6	5	2		

It is evident from the above table that 20 Percent of male students have extremely High anxiety, 33.33 Percent of them have high anxiety, 13.33 percent of them have above average, 16.66 percent have average, 13.33 Percent have low anxiety and 3.33 percent very

low anxiety mathematics. Among the female students 30 Percent have extremely high, 44 percent have high anxiety, 17.6 Percent have above anxiety, 24.66 average anxiety, 11.6 percent have low anxiety and 2 percent have very low anxiety in mathematics.

**Table 3 :** Comparison of mean score of different sub-groups of students – standard IX and X of Tinsukia district with regard to their anxiety towards mathematics

Variable	Sub group	Mean	S.D	C.R	Level of significance
Gender	Male	38.93	2841.72	8.88	.01
	Female	47.1	997.47		
Grade Level	IX	42.96	2694.31	0.09	NS
	X	43.06	2429.71		
School Environment	Rural	42.23	1980.66	1.31	NS
	Urban	43.62	3127.22		
Medium of Instruction	English	44.41	3154.41	2.81	.01
	Vernacular	41.51	3727.37		

**Table 4 :** Correlation of anxieties in mathematics and performance of students

Variable	N	Mean	R	T-value	Level of significance
Anxiety in mathematics	300	43	0.32	5.81	.01
Achievement in mathematics	300	38			

## Testing of hypothesis

**Hypothesis 1 :** Secondary school students do not differ significantly in their anxiety towards mathematics with respect to their gender

From the table 3, it is clear that the obtained t-values with respect gender of secondary school students differ significantly. Hence the formulated null hypothesis is rejected. It means there is significant difference in secondary school students' anxiety in mathematics with respect to the gender.

**Hypothesis 2:** Secondary school students do not differ significantly in their anxiety towards mathematics with respect to their grade level.

It is inferred from the table no 3 that students of secondary schools do not differ significantly with respect to their grade levels. Hence the formulated null hypothesis is accepted. It means there is no significant difference in secondary school students' anxiety in mathematics with respect to the grade level.

**Hypothesis 3:** Secondary school students do not differ significantly in their anxiety towards mathematics due to the variation of school environment.

It is inferred from the table no 3 that students of secondary schools do not differ significantly with respect to their grade levels. Hence the formulated null hypothesis is accepted. It means there is no significant difference in secondary school students' anxiety in mathematics due to the variation of school environment.

**Hypothesis 4:** Secondary school students do not differ significantly in their anxiety towards mathematics due to the difference of the medium of instruction.

Table 3 showed that students of secondary schools differ significantly due to the difference of the medium of instruction. Hence the formulated null hypothesis is rejected. It means there is significant difference in secondary school students' anxiety in mathematics due to the difference of the medium of instruction.

### **Relationship between students' anxiety and achievement in mathematics at secondary Level**

In order to determine the significance of relationship between anxieties and achievement in mathematics, the hypothesis formulated was: There is no significant relationship between student's anxiety and achievement in mathematics at secondary schools of Tinsukia district.

It can be observed from the table that the value is significant at 0.01 levels. Therefore, the null hypothesis is rejected. In the light of this result it could be interpreted that there is significant positive relationship between the Mean of scores of students' anxieties and mathematics achievement. This indicates that as math anxiety scores increase, achievement scores decrease.. The findings confirm the previous findings, which report significant relationships between mathematics anxiety and mathematics achievement (Clute 1984;Hembree 1990;Lee 1996,Ashcraft 2001).The finding is also consistent with the studies of Betz (1978), Ma (1999) and Woodard (2004) which revealed a negative relationship between the two variables.

## 7. Discussion

In the present study the investigator sought to find out the extent to which the students have their anxiety towards Mathematics and to investigate whether 9<sup>th</sup> and 10<sup>th</sup> grader students' mathematics anxiety differed significantly to a group of variables. It is observed from the result of the study that majority of the students have higher anxiety in mathematics. The causes behind of such findings may be truancy, poor self image, poor coping skill, teacher's attitude and emphasis on learning maths through drill without understanding which is supported by the findings of Newstead (1995 ).In his studies the possible causes include teacher anxiety, societal, educational or environmental factors, innate characteristics of mathematics, failure and the influence of pre-school experiences of mathematics.

Results also showed that 9<sup>th</sup> and 10<sup>th</sup> grade secondary school students' mathematics anxiety differed significantly with respect to gender. Female students reported higher levels of mathematics anxiety than their male peers. Students more successful in mathematics had lower degree of mathematics anxiety. Results regarding mathematics anxiety with respect to gender are parallel to those of Lafferty (1996) who found higher self-reported anxiety by females. However, they differ from findings of Rexes (1995) who did not detect any significant gender differences in mathematics anxiety among elementary school

students. It is noteworthy that female participants in Rexes' sample had higher means however not to a statistically significant degree. Likewise, working with a sample of elementary school students, Girel and Bisanz (1995) also did not find any differences between male and female students with regard to their mathematical anxiety.

Results of this study did not find any significant difference in mathematics anxiety according to grade level. In other words, no significant difference was found between scores of 9<sup>th</sup> and 10<sup>th</sup> graders. This could be partly due to the fact that these two grade levels are consecutive. One could expect that unless intervened, students' mathematics would worsen with time/grade. Part of the rationale for this expectation is that factors contributing to mathematics anxiety (i.e., low self-confidence, low self-efficacy performance in math, low grades in math, negative attitudes toward math, negative attitudes of parents and teachers, learning styles and effective teaching strategies) might perpetuate one another and therefore cause higher mathematics anxiety as students go further in grade levels (Bursal & Paznokas, 2006; Cook, 1998; Hadfield & McNeil, 1994; Hopko et al., 2003; Ma & Xu, 2004; Norwood, 1994; Reynolds, 2001; Thomas & Furner, 1997; Williams, 1994; Woodard, 2004). Another reason for this expectation could be the fact that subjects in mathematics get harder with each grade and thus the increased difficulty in the topics could lead to mathematics anxiety or exasperate existing levels of apprehension toward math.

The data in the aforesaid table further indicates that there is no significant difference between urban and rural students in terms of their anxiety in mathematics. Comparing the Mean scores, it was found that anxiety in mathematics of urban students is more than their counterpart. The reason behind such finding may be high expectations of parents and teachers from their children for mathematics achievement which may not be at par with their capability. Further, it may be attributed to the pressure exerted by the parents and teachers on the children due to own tensions. But this may not be exactly the situation which arises in the rural areas.

So far as the medium of instruction is concerned the present study reported that there is a significant difference between students studying in English medium and vernacular medium schools. The reason behind such findings may be that the parents and teachers of students studying in English medium are less supportive of their children in order to foster

competence in mathematics and also may be overly sensitive attitudes of children toward mathematics. Children with such feelings and sensitivities commit more mistakes and develop negative attitude towards mathematics as a subject.

## 8. Implication

Research confirms that pressure of timed tests and risks of public embarrassment have long been recognized as sources of unproductive tension among many students. Three particles that are a regular part of the traditional mathematics classroom and cause great anxiety in many students are imposed authority, public expose and time deadlines. Although these are a regular part of the traditional mathematics classroom which cause great deal of anxiety. Therefore, teaching methods must be re-examined. Consequently, there should be more emphasis on practical based teaching methodology involving more and more students in the teaching learning process enabling them to develop positive attitude towards maths.

Studies have shown students learn best when they are active rather than passive learner (Spikell, 1993). The theory of multiple intelligences addresses the different learning styles. Everyone is capable of learning, but may learn in different ways. Therefore, lessons must be presented in a variety of ways. For example, different ways to teach a new concept can be adopted through play acting, cooperative groups, learning using visual aids etc. which in turn may cater to the needs and requirements of each individual student.

Students today have a need for practical math. Therefore, math needs to be relevant to their everyday lives. Students enjoy experimenting. To learn mathematics, students must be engaged in exploring, conjecturing and thinking rather than, engaged only in rote learning of rules and procedures. The educators must re-define traditional teaching methodologies which often do not match students' learning styles and skill needed in society. Teachers should be instrumental towards creating such environment which would be conducive to draw and sustain students' attention and develop keen interest among students learning maths totally free from any anxiety.

Teachers need to be aware of the effects of anxiety on students' achievements. They should make an effort to lessen anxiety on these students. Teachers should develop teaching strategies that help highly anxious students. Woodard (2004) suggested the following techniques: (a) create an environment in

which students do not feel threatened and allow them to relax (b) Use cooperative grouping. It helps students to understand that others have the same problems as they do (c) Teach at a slow pace. It can help students better comprehend the material being taught (d) Provide extra tuition sessions so that they are not left behind academically. With all these efforts it can be a positive force in reducing mathematics anxiety. Mathematics teacher should show their students a sincere, caring attitude to help them overcome mathematics anxiety. In this context some important and effective suggestions provided in National council of teachers of Mathematics (NCTM, 1989, 1995b) for teachers seeking to prevent math anxiety may be worth mentioning for the teachers to be followed invariably:

- Accommodating for different learning style
- Creating a variety of testing environments
- Designing positive experiences in math classes
- Refraining from tying self-esteem to success with math
- Emphasizing that everyone makes mistakes in mathematics
- Making math relevant
- Letting students have some input into their own evaluations
- Allowing for different social approaches to learning mathematics

- Emphasizing the importance of original, quality thinking rather than rote manipulation of formulas.

## 9. Conclusion

In conclusion, it may be noted down that math anxiety is very real and occurs among thousands of people. Much of this anxiety happens in the classroom due to the lack of consideration of different learning styles of students. Today, the needs of society require a greater need for mathematics. Math must be looked upon in a positive light to reduce math anxiety. If once children see mathematics as fun, then it will be anxiety free for them, and, the enjoyment with mathematics could remain within them throughout the rest of their lives.

If this issue is not dealt with sincerely, it could have a terrible effect in many areas of our education system. There are some major consequences for math anxiety to be alert as mentioned earlier, mathematics avoidance, distress and interference with conceptual thinking and memory processes which may create deficiency of workers in the field of today's high-tech world. Math educators dream for the day when students can confidently say, "I enjoy math!" This dream will be realized only when the entire educational community strives to prevent, recognize, and treat math anxiety with all sincerity and dedication.

## References

- Bhandarkar, K.M., 2009 : Statistics in Education', 3<sup>rd</sup> Edition, Neelkamal Publications Pvt. Ltd., New Delhi. PP-247- 251
- Brusal, M. & Paznokas, L., 2006 : Mathematics anxiety and preservice elementary teachers' confidence to teach mathematics and science. *School science and Mathematics*, 106 (4), 173-180. Retrieved June 22, 2006, from EBSCO database.
- Cook, R.P., 1998 : An exploration of relationship between mathematics anxiety level and perceptual learning style of adult learners in community college setting. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 58(10-A), 3801. Abstract retrieved April 10, 2002, from PsycINFO database.
- D'Ailly, H and Bergerning, A.J., 1992 : Mathematics anxiety and mathematics avoidance behavior : a validation study of two factor. *Educational and Psychological Measurement*, 52(2), 369-378 Retrieved April 10, 1999 from EBSCO database.
- Garrett H.E and Woodsworths, R.S. and : Statistics in Psychology, 10th Edition, Vakil Feffar & Simsons Ltd, Bombay.

- Hadfield, O.D and Trujillo,K.M., 1999 : Tracing the roots of mathematics anxiety through in depth interviews with preservice elementary teachers. *College students Journal*, 333(2)
- Hopko, 2003 : The effects of anxious responding arithmetic and lexical decision task performance. *Journal of Anxiety Disorders*,17(6),647-665 Retrieved April 20,2004, from Science Direct database.
- Karimi Ayatollah and Venkatesan 2009 : Mathematics Anxiety, Mathematics Performance and Academic Hardiness in High School students.*Int J Edu Sci*, 1(1) : 33-37 (2009)
- Kulshrestha A.K., 2011 : Teaching of Mathematics.2011 Edition. R .Lall Book Depot.Meerut-250001.
- Lafferty J. F., 1996 : The links mathematics text, students' achievement, and students' mathematics anxiety : A comparison of the incremental development and traditional text .56(08) DAI-A.(publication No.AAT9537085).
- Mahmood Sadia,Khatoon Tahira, 2012 : Mathematics Anxiety scale, H. P Bhargava House, Agra-282004
- Ma, X & Xu, j., 2004 : The casual ordering of mathematics anxiety and mathematics achievement : a longitudinal panel analysis. *Journal of adolescence*, 27(2), 165-179. Retrieved April 10,2004,from Science Direct database.
- National Council of Teachers of Mathematics (NTCM), 1989 : Curriculum And evaluation standards for School mathematics. Reston, VA: Author.
- Newstead Karen : Aspects of Children's Mathematics Anxiety. [Academic.sun.ac.za](http://Academic.sun.ac.za)
- Phillips Marilyn Curtain : The Causes and Prevention of Math Anxiety from [www.mathgoodies.com /article/math](http://www.mathgoodies.com /article/math)
- Richardson F. C, & Suinn R.M., 1972 : The Mathematics Anxiety Rating Scale: Psychometric data.*Journal of Counseling Psychology*,79,551-554
- Sahin Fulya Yuksel, 2008 : Mathematics anxiety among 4<sup>th</sup> and 5<sup>th</sup> grade Turkish elementary school students, *International Electronic Journal Of Mathematics Education*.Vol 3.Number 3.October 2008.
- Thomas, H. & Fumer, J.M 9, 1997 : Helping high ability students overcome mathematics anxiety though bibliotherapy, *Journal Of Secondary Gifted Education*,8(4), 164-179.
- Williams, J., 1994 : Anxiety measurement construct validity and test performance. *Measurement And Evaluation in Counseling and development*, 27(1), 302-308. Retrieved April 25, 1999, from, from EBSCO database.
- Woodard, T., 2004 : The effect of mathematics anxiety on post-secondary developmental students as related to achievement, gender and age. *Inquiry*, 9(1). Retrived, June 29, 2006, from <http://www.vccaedu.org inquiry/inquiry-spring 2004/i-91-woodard.html>

