

---

**MATHEMATICS ANXIETY AND ITS RELATIONSHIP WITH THE ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN SIKKIM**

Rajesh Singh, Research Scholar  
OPJS University, Rajasthan

**ABSTRACT**

*This study aims to identify the Mathematics anxiety and its relationship with the achievement of Students in east district, Sikkim. The design of the study is using quantitative method and the data was collected by using a questionnaire of Student Mathematics Anxiety Scale (SKMP). A total of 190 students were selected as a research sample. The results showed that the level of mathematics anxiety of the students were at moderate level with  $M = 2.55$ ,  $SD = 0.72$ . Analysis of the  $t$  test results for gender show that there is no significant difference with  $t = -0.889$ ,  $p < 0.05$  between the level of mathematics anxiety of female students compared to the male students. The correlation test showed a significant and negative relationship between student's achievement and their mathematics anxiety with correlation value  $r = -0.237$ .*

**Key words**—*Mathematics anxiety, mathematics achievement, student math anxiety scale*

**INTRODUCTION**

We should acknowledge that the importance and fundamental role of mathematics is undeniable in the history of scientific thought, and even in the course of industrialization and technological developments. However, "mathematics anxiety" is one of the factors, which can be a hindrance on the way of studying mathematics, and positive factors associated with it. More than four decades pass since the first time the term "mathematics anxiety" has entered into the glossary of psychology terms. During this period, although a more clear perspective has been achieved, there is a long way to understand the structure and its dynamics thoroughly (McCoy 1992; quoted from Shokrani, 2002). "Mathematics Anxiety" is a psychological status, which come forth in people when dealing with mathematical content whether in teaching and learning situation or in solving mathematical problems and assessing the mathematical behavior (Alam al-Hoda, 2000). Although for many years researchers have investigated the causes of mathematics anxiety, there has not been presented any integrated approach in math anxiety development. Since the environmental factors have a high impact on human personality development "ego" or its meaning, which is one of the main dimensions of human personality is influenced by environmental factors. Therefore, the present study aims to address the relationship between the students' mathematics anxiety and their self-esteem. Sherman and Elizabeth Fenma (1998) indicated in a research that the lack of sufficient background in mathematics to do mathematical activities and low self-esteem in mathematics will reinforce math anxiety. Occasionally, we could observe that even relatively good math students, due to lack of proper mathematical sense of confidence, experience fear, and anxiety with slight variations in the conditions. Vayne and colleagues (2004) showed in a research that math anxiety is one of the most serious limitations for training, so that it could cause a fear of working with numbers, or understanding of mathematical theories aims (theoretical support) and solving practical problems in everyday life.

**OPERATIONAL DEFINITION**

Anxiety according to Freud (1936) is an unpleasant feeling and can cause emotional distress. Tang (1990) defines anxiety as an emotional state when there is fear, anxious and uneasy passions associated with a fear of something. Mathematics anxiety according to Marzita (2002), is a feeling of stressed and anxious when faced with numbers and mathematical problem solving in everyday life or when learning mathematics. Arem (2003), defines math anxiety as a feeling of worry, anxiety, denial, resistance and

rejection reactions in mathematics and problem solving. Laurie (1981), expressed as a mathematical anxiety fear, worry, anxious or maybe bored towards mathematics. According Marzita (2002), mathematics anxiety exist 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.

## REVIEW OF LITERATURE

Hyde, Janet S.; Fennema, Elizabeth; Lamon, Susan J. (1990) had investigated "The gender differences in mathematics performance", and found that there were no gender differences in problem solving in elementary or middle school; differences favoring men emerged in high school and college. Gender differences were smallest and actually favored females in samples of the general population, grew larger with increasingly selective samples, and were largest for highly selected samples and samples of highly precocious persons. The magnitude of the gender difference has declined over the years. Gender differences in mathematics performance are small. Nonetheless, the lower performance of women in problem solving that is evident in high school requires attention.

Aswal, (2001) had investigated "A study on Intelligence as a correlate of achievement in mathematics across different levels of socio economic status". The study intended to examine the relationship of intelligence with achievement in mathematics in context with different level of socio-economic status. Two hundred students of class XI selected randomly from five colleges of Tehri district served as a sample for the study and also found that there was a significant correlation between intelligence and achievement in mathematics. Relation between intelligence and achievement in mathematics may vary across different levels of socio-economic levels as three colleges reflected significant difference among different levels of SES out of live colleges in intelligence and achievement in mathematics 15 references are cites.

Manju Krishna (2004) had conducted "a study on effectiveness of strategies involving multiple intelligence theory on the achievement in mathematics at higher secondary level". The purpose of the study was to compare the effectiveness of strategies involving multiple intelligence theory on mathematics at secondary school level with reference to instructional objectives. The researcher adopted experimental method for the present study and selected the pre-test and post-test nonequivalent group design for the study. The tools used were lesson transcript multiple intelligence theory is more effective than present methods of teaching on achievement on mathematics and strategies involving multiple intelligence theory were effective than the present method under instructional objectives. Olivas,

Charles, T., Clotfelter, Helen, F., LaddJacob, L., Vigdor, (2007), had studied "the Teacher credentials and student achievement". Longitudinal analysis with student fixed effects and had concluded that a teacher's experience, test scores and regular licensure all have positive effects on student achievement, with larger effects for math than for reading. Taken together the various teacher credentials exhibit quite large effects on math achievement, whether compared to the effects of changes in class size or to the socio-economic characteristics of students.

Salleela k,(2012), had conducted "a self-regulation, self-efficacy and attitude towards mathematics of higher secondary students in relation to achievement". The purpose of the study was to compare self-regulation scale, self-efficacy scale and attitude towards mathematics scale in relation to achievement test in mathematics .investigator administered to a random sample of 1000 first year higher secondary students. the result of the study reveals that there is achievement in mathematics of boys is significantly greater than girls and there is exists positive and significant correlation between achievement and self-efficacy.

Jiangming (2003) had conducted "a study on the causal ordering of mathematics anxiety and mathematics achievement". Using data from the longitudinal study of American youth (LSAY), we aimed

to determine the causal ordering between mathematics anxiety and mathematics achievement. Results of structural equation modeling showed that, across the entire junior and senior high school, prior low mathematics achievement significantly related to later high mathematics anxiety, but prior high mathematics anxiety hardly related to later low mathematics achievement. There were statistically significant gender differences in the causal ordering between mathematics anxiety and mathematics achievement. Prior low mathematics achievement significantly related to later high mathematics anxiety for boys across the entire junior and senior high school but for girls at critical transition points only. Mathematics anxiety was more reliably stable from year to year among girls than among boys.

Shahapur Nagappa Panchalingappa (2004) had conducted "a study on self-confidence, anxiety, study habits and mathematics achievement of underachievers at secondary school level". The main objective of the study was to study self-confidence, general anxiety, test anxiety, and study habits in relation to underachievers in mathematics at secondary school level. Survey method was adopted in the study. The findings were, there is significant difference between normal achievers and underachievers in respect of their self-confidence; there is significant difference between normal achievers and underachievers in respect of their general anxiety; there is significant difference between normal achievers and underachievers in respect of their test anxiety mathematics; there is significant difference between normal achievers and underachievers in respect of their study habits; there is significant difference between normal achievers and underachievers in respect of their mathematics achievement.

Effandi Zakaria and Norazah Mohd Nordin (2007) had conducted "a study on the effects of mathematics anxiety on matriculation students as related to motivation and achievement". The study investigated the effects of mathematics anxiety on matriculation students as related to motivation and achievement. Subjects included 88 students who were at the end of their second semester of study. The ANOVA results showed that the mean achievement scores and motivation scores of low, moderate and high anxiety groups were significantly different. Findings also revealed a low ( $r = 0.32$ ) but significant ( $p < 0.05$ ) negative correlation between mathematics anxiety and achievement and also a strong ( $r = 0.72$ ) significant ( $p < 0.05$ ) negative correlation between mathematics anxiety and motivation. The study also revealed a significant low positive correlation ( $r = 0.31$ ) between motivation and achievement.

### OBJECTIVES

- To study the relationship between attitude towards mathematics of secondary school students and mathematics anxiety.
- To study the impact of anxiety on mathematics achievement of secondary school students.

### HYPOTHESES

Ho<sub>1</sub> There is no significant relationship between attitude towards mathematics and anxiety in mathematics of students.

Ho<sub>2</sub> There is no significant difference in the anxiety of the students having different levels of achievement

### STATEMENT OF THE PROBLEM

The decline of performance in mathematics has created anxiety in students and strengthens the perception that they are weak in math. This response will ultimately be a belief that hard to change. Research by Fulya (2008), Elenchoty (2007), Marzita (2002), Tn. Salwani (2001), Arem (1993) and Tobias (1980), has shown that mathematics anxiety had become one of the factors contributing to the decline of the mathematical achievements of the students.

### SIGNIFICANCE OF THE STUDY

In education, there are endless conversations about rigorous curriculum, instruction, and assessments, yet it is not common practice for the school system to have conversations about the emotional state students are in when trying to learn a specific subject. Researchers point out the importance of continuing the research in math anxiety. “Math anxiety is a real issue that can impact a young person’s goals, many career-related decisions they may make in life and their overall future” (Furner & Gonzales-DeHass, 2011). This study will add to the ongoing research around math anxiety and the effect it has on student achievement. The instrument used in this study may help educators prescribe an early intervention for those math-anxious students.

**LIMITATIONS**

The sample used was from one secondary school in the east district of Sikkim, thus limiting generalize ability of the study. There was no control over the schools demographics and each student participating in the study was categorized by current grade level and not by age. Students absent on the day the questionnaire was administered completed the questionnaire on the next day they were present at school.

**METHODOLOGY**

The study used a combination of methods to collect data that is quantitative and qualitative methods. Number of samples used for quantitative studies are 190 respondents, with 86 male students and 104 female students. The instrument uses a questionnaire SKMP (Student Math Anxiety Scale) which was adopted by the Elenchothy (2007) and SKMP containing 48 items. SKMP is formed based on MAS (Mathematics Anxiety Scale, Fennema & Sherman, 1976), MARS (Richardson & Suinn, 1972) and MAQ (Mathematics Anxiety questionnaires, Meece 1981). The instrument uses a 5-point Likert scale with a range very often (score 5) to never (score 1) in part I and Scale strongly agree (score 5) to strongly disagree (score 1) in part II. Math anxiety levels were divided into three levels, namely low, medium and high.

**DATA ANALYSIS**

This study aims to answer four research questions which are

- (i) What is the level of math anxiety of Form Four students in east district of Siikkim?
- (ii) Are there different levels of math anxiety of students from the gender aspect in east district of Siikkim?
- (iii) Is there a relationship between mathematics anxiety and mathematics achievement of students? and
- (iv) What are the types of questions that contribute to students’ anxiety when doing mathematics?
  - What is the level of math anxiety of students in east district of Siikkim?

The results showed that the level of mathematics anxiety of students are at a moderate level (mean = 2.55, SD = 0.72). In detail all dimensions of math anxiety construct also at a moderate level with a mean range of 2.28 to 2.83 and standard deviations range of 0.74 to 1.11.

**TABLE-I: DESCRIPTIVE ANALYSIS OF MATHEMATICS ANXIETY DIMENSION**

Dimension of mathematics anxiety	Mean	Standard Division
Climate of math class	2.58	0.86
mathematical incompetence	2.52	0.74
mathematical abstraction	2.56	0.82
Mathematics test	2.83	1.11

2) Are there different levels of math anxiety of students from the gender aspect in east district of Sikkim? The result of the t-test shown in Table II, showed no significant difference  $t = -0.889$ ;  $p > 0.05$  between the level of mathematics anxiety of boys and girls. This indicates that the level of mathematics anxiety of students in east district of Sikkim is not affected in terms of gender, male or female students have the same level of anxiety that is at a moderate level

**TABLEII:T-TEST COMPARISON OF ANXIETY LEVELS BY GENDER**

Gender	N	Mean	SD	t-test	Sig2-tailed
Boys	86	2.499	0.732	-0.889	0.375
Girl	104	2.591	0.705		

3) Is there a relationship between mathematics anxiety and mathematics achievement of students in the exam? Table III shows that there is a significant inverse relationship between mathematics anxiety and mathematics achievement of students with  $r(190) = -0.237$ ,  $p = 0.001$  ( $p < 0.01$ ). This indicates that students who have high anxiety exhibit low achievement in mathematics and vice versa.

**TABLEIII: CORRELATION LEVEL BETWEEN MATH ANXIETY AND MATH STUDENT ACHIEVEMENT**

Component	N		Student math anxiety	Student Math achievement
Student anxiety	190	Correlation of Spearman Raho Sig (2hala)	1.00	-0.237 0.001
Student achievement	190	Correlation of Spearman Raho Sig (2hala)	-0.237 0.001	1.00

Correlation is significant at 0.01 (2-way)

4) What are the types of questions that contribute to students' anxiety when doing mathematics? The results showed that the type of questions also contributed to mathematics anxiety in students in doing math. There is fear in the students for the questions in the algebra form and mathematical word compared to abstract questions and activities question activities. There are anxiety symptoms in students when answering these types of questions such as sweating, dizziness, nervousness and increased heart rate. Students feel comfortable and enjoyed when answering activities involving questions pattern because students do not bound by mathematical concepts and the direct application of these activities also provide an opportunity for students to explore and be creative in solving problems on the math. However, for students who do not like to follow directions, they will be a little bit difficult to read and understand and follow the instructions provided

**DISCUSSION**

The results showed that the level of mathematics anxiety of students in east district of Sikkim is at moderate level. The finding is consistent with the findings of Tn. Salwani (2001), Elenchonthy (2007) and Fulya (2008). The study of different levels of math anxiety in terms of gender finds that there is no difference between the anxiety level of male students and female students. The finding is consistent with the findings of Miller (2001) and Tapia and Marsh (2004) where they found that math anxiety has nothing to do with gender. There is a negative relationship between mathematics anxiety and mathematics achievement in which students with high math anxiety would show poor mathematics performance and vice versa. Although the correlation is low but significantly correlated. Therefore, the parties concerned with education directly or indirectly should take early steps in dealing with these issues so that math anxiety can be controlled. The finding is consistent with the findings of Hadfield &

Mc Neil (1993), Ashcraft & Kirk (2001), Bower (2001), Tapia and Marsh (2004) and Elenchothy (2007). The study has found that the types of questions also influence the level of anxiety of students in doing math. The type of question in the form of games or activities which are free-form can generate students' creativity and also helps to reduce students' anxiety when doing mathematics. According to Marzita (2002), questions in the form of games can contribute a sense of excitement, tranquility and comfort to the students to complete the activity as they are free to speak, to talk with each other, joking and produce their own ideas with their peers while solving math problems given

#### RESEARCH IMPLICATION

Teachers need to be concerned about the effects of math anxiety on math achievement of students. They have applied the knowledge and skills to reduce and control the level of their students' concerns by establishing teaching and learning environment that is able to invite a sense of excitement and fun for the students to learn and interactive teaching and learning environment that is conducive. Woodard (2004), propose a number of techniques that can reduce the students' anxiety levels such as

- Create an excellent learning environment and create excitement in students and avoid a stressful environment in the students.
- Using techniques in cooperative groups. This can help students reduce their anxiety because they are working in a group who shared the same problem.
- Teach students according to their ability and using effective teaching tools. Tang (1990), also suggested a number of ways that can be practiced by the teacher to help reduce anxiety in students which is
  - (i) Give encouragement and praise to the students so that they can build their confidence and encourage them in a positive way.
  - (ii) Reduce the threat. Avoid using threatening words and intimidate the students.
  - (iii) Showing love, warmth, trust, empathy and acceptance for students and
  - (iv) Provide rehabilitation to the less advanced students.

#### REFERENCES

1. Ashcraft, M. H. & Moore, A. M. (2009). Mathematics anxiety and the affective drop in performance. *Journal of Psycho educational Assessment*, 27(3), 197-205.
2. Charles T. Clotfelter, Helen F. Ladd, Jacob L. Vigdor (2007) "Teacher credentials and student achievement: Longitudinal analysis with student fixed effects", *Economics of Education Review*, Volume 26# 6: 673-682
3. Effandi Zakaria and Norazah MohdNordin (2007) conducted "a study on the effects of mathematics anxiety on matriculation students as related to motivation and achievement" *Dissertation Abstracts international*, vol.68, No.4.
4. Davis, S. (2012). Math Anxiety Bill of Rights. Retrieved from <http://faculty.mc3.edu/cvaughen/mathconfidence/rights.htm> (Access on 28/2/2017)
5. Engelhard Jr., G. (1990). Math anxiety, mother's education, and the mathematics performance of adolescent boys and girls: Evidence from the United States and Thailand. *Journal of Psychology*, 124(3), 289.
6. Hyde, Janet S.; Fennema, Elizabeth; Lamon, Susan J.(1990). "Gender differences in mathematics performance: A meta-analysis". *Psychological Bulletin*, Vol 107(2), Mar 1990, 139-155. <http://dx.doi.org/10.1037/0033-2909.107.2.139> (Access on 28/2/2017)
7. Jiangming (2003) conducted "a study on the causal ordering of mathematics anxiety and mathematics achievement: a longitudinal panel analysis", *Research in mathematics education*, Vol.11, No.4.

8. Pajares, F. & Miller, D. (1995). Mathematics self-efficacy and mathematics performances: The need for specificity of assessment. *Journal of Counseling Psychology*, 42(2), 190-198.
9. Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2013). Math anxiety, working memory, and math achievement in early elementary school. *Journal of Cognition & Development*, 14(2), 187-202.
10. Shahapur Nagappa Panchalingappa (2004) conducted “a study on self-confidence, anxiety, study habits and mathematics achievement of underachievers at secondary school level”, *Research and Reflections on Education*, Vol.02, No.03.
11. Wigfield, A., & Meece, J. L. (1988). Math anxiety in elementary and secondary school students. *Journal of Educational Psychology*, 80(2), 210-16.

