NAEM JOURNAL
ISSN 1997-4248, eISSN 2959-4561
Volume 17 Issue 02
Serial 34
https://Doi.org/10.59629/NAEM 20213202.1601

Mathematics Anxiety among Secondary School Students of Dhaka City

Dr. Md. Billal Hossain[1]
Isteaque Ahmed[2]
Tahmina Mallik[3]

Abstract

Mathematics is one of the important subjects among other compulsory subjects at secondary level. It plays an important role in developing scientific knowledge and technological advancement. The purpose of the study was to measure and analyze the status of mathematics anxiety of secondary school students of Dhaka City in Bangladesh. This study was descriptive in nature and quantitative in method. A total of 479 students (male 256 and female 223) of class 9 were included as participants from 12 different schools. Descriptive statistics, ANOVA and t-test were performed to analyze and interpret the data. It was found that 17.1% secondary school students experienced low level of mathematics anxiety, 63.3% experienced moderate level and 19% experienced high level of mathematics anxiety where the differences were statistically significant. Girls did have more anxiety levels than boys mathematically but it was not significant. There was no enough evidence in favor of difference between the school categories in math anxiety. Though student's math anxiety was slightly defended on father's education level but it was not defended on mother's education level. The study recommended that guardians should not worry about their educational level and school category for their children's math anxiety. We can encourage girls to take mathematics as subject. But we need to identify the causes and remedies of students' math anxiety as most of the students were experienced moderate and high level of math anxiety.

Keywords: Mathematics Anxiety, Secondary Level, Dhaka city

Introduction

Secondary education is the previous stage of higher education. Ali (1999) considers the level as preparatory stage of life of any student. This stage is very important in the management of education for any country and for this reason secondary education is called the backbone of educational management (Education commission of Bangladesh 1974). It is the 'gateway to life' according to the Report of International Education Commission formed for the education

[1] Senior Teacher (Mathematics), Ideal School & College, Dhaka-1000, E-mail: billalhossainisc@gmail.com.
[2] Teacher Trainer, NAEM, Dhanmondi, Dhaka-1205,E-mail: isteeahmed @yahoo.com.
[3] Head Teacher, Govt. Primary School.

of 21st century (National Curriculum 2012, NCTB). One of the purposes of secondary education is to prepare quality students for tertiary education (Education watch, 2007). Like other country Bangladesh also wants to produce more productive and loyal citizens through its secondary education system. Mathematics is one of the important subjects among other compulsory subjects at secondary level. So, students' weakness in this subject is not expected. Bangladesh has backward in respect of mathematics education and the standard of teachers than many other countries in the world (International organization report as cited in The Daily Ittefaq 27.02.15). DSHE (2014) reported that 65% students studying in class eight and 82% of class six in Bangladesh have failed to reach the standard level of mathematics. According to the report of world economic forum (2013), the standard of mathematics education of Bangladesh is 113th out of 144 countries. The committee formed to upgrade the standard of mathematics education of Bangladesh reported (2010) that the education of secondary level of Bangladesh is not up to the mark. Besides, the committee (Formed to upgrade the standard of mathematics education in the secondary level of Bangladesh) has suggested considering the present scenario of secondary mathematics education to identify the weakness and obstacles of development as well as to ensure the overall improvement. The same committee suggested that today's world is the world of science and technology and to keep pace with the present world we have to build up our expertise in mathematics. Mathematics plays an important role in developing scientific knowledge and technological advancement. Mathematics can consider as a gatekeeper for better employment (Haciomeroglu, 2014). The extent of joy of using mathematics in personal and social life largely depends on how a child learnt mathematics (NCTB, 2013). Mathematics education is needed for the safety of a nation and quality of life and even the prosperity of a nation (NMAP, 2008).

According to the Merriam Webster Learner's Dictionary the meaning of anxiety is fear or nervousness about what might happen. Anxiety is a feeling of worry, nervousness or uneasy about something with an uncertain outcome (Oxford Dictionary). Richardson and Suinn (1972), cited by McAnallen (2010) defined mathematics anxiety as — "feelings of tension and anxiety that interfere with the manipulation of mathematical problems in a wide variety of ordinary life and academic situations (p. 544)" and also they stated that mathematics anxiety may include dislike of mathematics, worry, and fear with specific behavioral manifestations that include tension, frustration, distress, helplessness, and mental disorganization. Fennema and Sherman (1976) cited by McAnallen (2010) also believe that mathematics-related distress is accompanied by symptoms, including dread, nervousness, and an increased heart rate. Mathematics anxiety has been an important and also a common problem in learning and teaching from elementary through university levels for the last three decades (Uusimaki & Nason, 2004; Vinson, 2001 cited as Haciomeroglu, 2014). Devine, Fawcett, Szűcs and Dowker (2012) found that mathematics performance of students is negatively correlated with math anxiety. Math anxiety is also found to hinder students' working memory (Perina, 2002 as cited in Smith, 2004). He noted that math anxiety is a kind of problem facing by students and teachers. So, to improve the quality learning at first we should know about the existence of math anxiety among secondary students and how it affects students and their achievement. For this reason we are interested to conduct a study on math anxiety in secondary school students.

1.3) Rationale of the Study: Bangladesh is always serious for developing its education like other country in the world. Bangladesh wants to reach the level of developed country by 2041. So it needs to meet up SDG 4 by 2030. Bangladesh already successfully achieved the goal of Jomtien declaration 1990, Dakar Framework of Action 2000, UN Millennium Developing Goals (MDG) 2000 and Education for all (EFA) 2015. If we want to achieve our target we need to develop our educational quality by improving our teaching learning activities. As an important subject we need to improve teaching learning activities in mathematics for reducing its low achievement. Math anxiety is one of the main barriers to reduce low achievement and to improve the quality of learning at secondary level especially. To improve the effective learning at mathematics we have to minimize math anxiety from the students. Sometimes poor teaching practices, examination system, school management, parental education may affect students learning and its may increase students' math anxiety. Hambree (1990) reported that as impact of math anxiety students avoid mathematics; their career options are reduced, eroding the countries resource base in science and technology. So we need to analyze the psychological effects of our teaching learning activities which are related to student's math anxiety and its dimension. Then it will be possible to find the cause of low achievement in mathematics at secondary level. So this study will be very helpful for our education sector.

1.4) General objective of the Study: The general objective of the study was to measure and analyze the status of mathematics anxiety of secondary school students of Dhaka City in Bangladesh.

1.5) Specific objectives of the study: Specific objectives of the study were as follows.

1. To measure the mathematics anxiety level of secondary school students of Dhaka city.
2. To identify the impact of gender on mathematics anxiety of secondary school students of Dhaka city.
3. To determine the impact of school category on mathematics anxiety of secondary school students of Dhaka city.
4. To examine the impact of fathers education on mathematics anxiety of secondary school students of Dhaka city.
5. To examine the impact of mothers education on mathematics anxiety of secondary school students of Dhaka city.

1.6) Scope and Limitation of the study: According to the title in this study, it was possible to measure the mathematics anxiety level of secondary school students and how much students are experienced low, moderate or high level anxiety. It covers to measure the dimensions of student's mathematics anxiety. It was justified to identify the effect of gender, school category, father's education, mother's education, achievement and medium of instruction, grade level on mathematics anxiety. But the impact of urban and rural status of students on mathematics anxiety was not covered in this study.

There are many secondary schools in Dhaka city. But due to the restriction of time only all students of class nine of twelve schools were included which were not sufficient to generalize the result. This study was limited only on quantitative data where qualitative data might be used to triangulate the data for wider understanding at the same time. Purposive method was used to select school, which was one of the limitations. Sometimes students were not wanted to disclose his/her weakness by giving their real opinion which may hamper the actual result.

1.7) Hypotheses:

1. There is no significant difference in their anxiety level (low, medium, high) of secondary school students towards mathematics.
2. There is no significant difference in the anxiety of male and female students of secondary schools towards mathematics.
3. There is no significant difference in the anxiety of the student having different category of school.
4. Secondary school students do not differ significantly in their anxiety towards mathematics due to their father's education.
5. Secondary school students do not differ significantly in their anxiety towards mathematics due to their mother's education.

1.8) Conceptual Framework

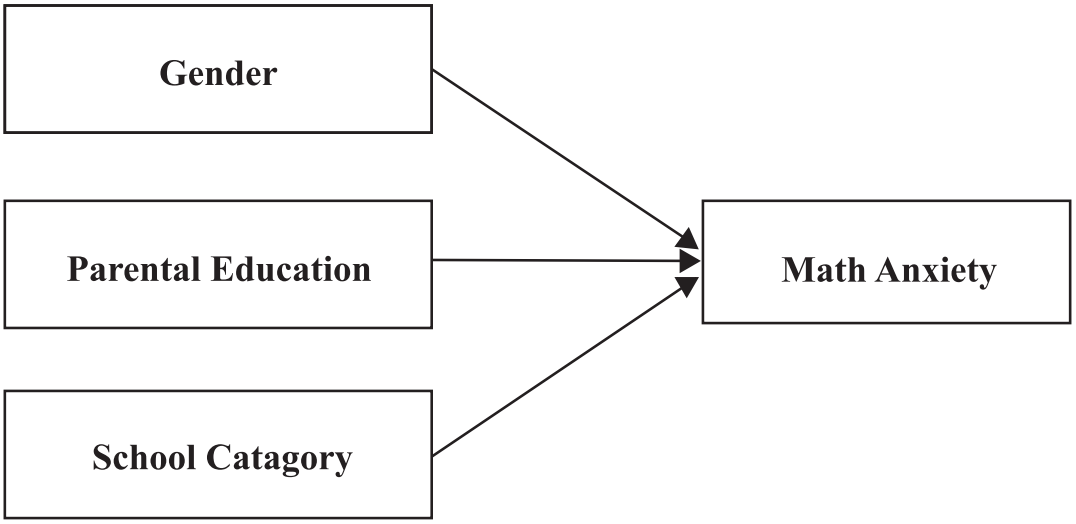


Figure 1: Conceptual framework

2.0 Methodology:

2.1) Sampling:

2.1.1) Selection of schools: There are different types of secondary schools in our country. Among them this study was focused Govt. secondary school, MPO based secondary school and private secondary school but these three types of secondary schools were not available in all thanas in Dhaka city. Therefore, two thanas were selected from each city corporation purposively. Totally four thanas were selected. Govt. girl's schools were selected from two thanas and Govt. boys schools were selected from two thanas. Then one MPO based school (Co -education) and one private school (Co - education) was selected from each thana. Thus twelve secondary schools were selected finally.

2.1.2) Selection of students: Class nine was selected as secondary level from each selected school. All available students of class nine on the selected day was considered as sample from selected twelve schools.

2.2) Source of Data and Methods of Data Collection: The opinion about mathematics as a subject of secondary school students of twelve schools of Dhaka city was data source of this study. Survey type questionnaire were used to collect data. Piloting was done to minimize any

confusion. After reaching a school, purpose of this study was described to the head teachers and the verbal consents were taken. The respondents were got the opportunity of using nick names. During data collection period, the experiences of piloting were always kept in mind.

2.3) Tools of Data Collection: To measure math anxiety in secondary school students, math anxiety scale (MAS) of Khatoon and Mahmud was used. It is a bi-dimensional and comparatively shorter instrument which was suitable for school students and where 7 items were worded positively and 7 items worded negatively. It was a 5-point Likert type instrument where the response category was 1 for strongly disagree, 2 for disagree, 3 for 'neither' agree nor disagree, 4 for agree and 5 for strongly agree for negative items and the scoring was reversed for positive items so that a high score indicated high anxiety. The positive and negative items were not arranged in the scale serially. Cronbach's alpha of math anxiety scale (MAS) was 0.87. Some demographic questions were included such as gender, parents educational qualification etc..

2.4) Methods of Data analysis and Presentation Techniques: Descriptive statistics were carried out for various categorical variables to get frequencies and percentages. Data were analyzed using computer program namely Statistical Package for Social Sciences (SPSS). Scores for each participant were computed by adding the item values. Participants' scores and the overall means and standard deviations of their scores were used to assign them into anxiety groups (i.e., low, moderate, high). Participants whose scores were at least one standard deviation below the overall mean were categorized as possessing low mathematics anxiety level, while those with scores that were at least one standard deviation above the overall mean were considered as having high mathematics anxiety level. Moderate mathematics anxiety level was assigned whose scores were not up to one standard deviation below or above the overall mean. Analysis of variance (ANOVA) and T-test were performed as significance test.

2.5 Ethical issues:

- After informing the purpose of the research, opinions were taken from the respondents.
- The respondents had the opportunity of using nick names in place of own names.
- The permission was taken from the Head Teachers at the time of data collection from the students.

- ❖ No manipulation was done in preparing results by analyzing information.
- ❖ For using all kinds of information, accurate references have been given.
- ❖ Students' opinion will not use any other purposes except research.

3.0 Results and Discussion:

3.1 Students math anxiety level:

In order to find the levels of mathematics anxiety that participants experienced, 14 items were calculated by adding their responses to each item. The negative items were reversely coded before the total scores for participants were calculated. The lowest score obtained was 15 and the highest was 66 out of the possible 70 where mean and standard deviation was 35.45 and 11.27 respectively. Then the overall means and standard deviations of their scores were used to assign them into anxiety groups as low, moderate and high. Participants whose scores were at least one standard deviation below the overall mean were categorized as possessing low mathematics anxiety level, while those with scores that were at least one standard deviation above the overall mean were considered as having high mathematics anxiety level. Moderate mathematics anxiety level was assigned to participants whose scores were not up to one standard deviation below or above the overall mean. The results indicated that 82 (17.1%) of the 479 participants experienced low level of mathematics anxiety, 306 (63.9%) experienced moderate level and 91 (19%) experienced high level of mathematics anxiety. Calculated result is shown in the figure 3.1 below.

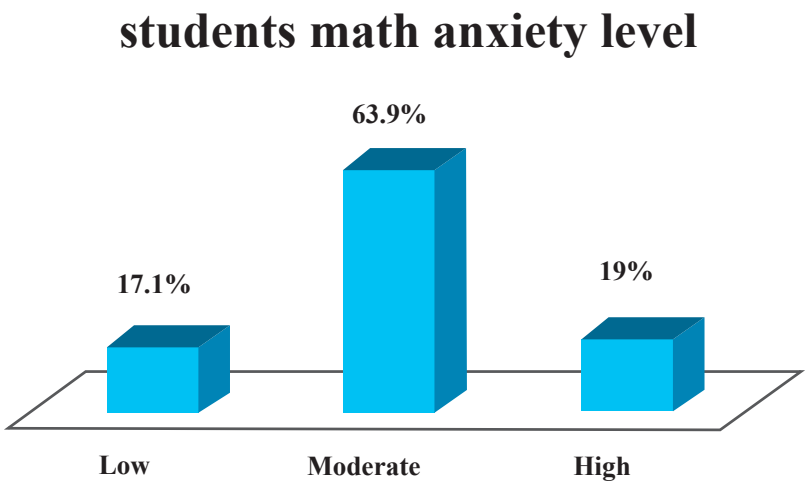


Figure 3.1: math anxiety level of the respondents

One way ANOVA was performed to compare (mean) the difference between groups of math anxiety level (Low, Moderate and High). Here $P < .01$, so, the math anxiety levels were differed and it was significant statistically at 99% confidence level. Here null hypothesis was rejected. Table 3.1(a) and 3.1(b) shows the means and ANOVA (Analysis of variance) respectively.

Table 3.1 (a): Means for math anxiety level (Low, Moderate, and High)

Math anxiety level	N	Mean (Math anxiety score)	Std. Deviation	Std. Error
Low	82	19.76	2.236	.247
Moderate	306	33.04	5.813	.332
High	61	52.46	4.947	.519
Total	479	34.45	11.274	.515

Table 3.1(b): One way ANOVA for math anxiety score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	47838.351	2	23919.176	881.619	.000
Within Groups	12914.342	476	27.131		
Total	60752.693	478			

3.2 Impact of gender on students' math anxiety:

The anxiety score of boys was 33.60 with standard deviation of 10.59 and that of girls 35.43 with SD of 11.95, where p is equal .07 with degrees of freedom 477. The results clearly indicate that girls did have more anxiety levels than males mathematically but it was not significant at 95% confidence level. So, there was no enough evidence in favor of difference between boys and girls in math anxiety. Therefore null hypothesis could not be rejected. Here levens test was not significant so variances were assumed equal.

Table 3.2: Gender and students math anxiety

	Gender	N	Mean	Std. Deviation	df	Sig.
Students math anxiety	Boys	256	33.60	10.599	477	.077
	Girls	223	35.43	11.951		

3.3 Impact of school category on students' math anxiety:

One way ANOVA was performed to compare (mean) the students' math anxiety score of difference between category of the schools. Here P > .05, so the difference was not significant statistically but it was slightly differed mathematically. So, there is no enough evidence in favor of difference between the school categories in math anxiety. Therefore null hypothesis could not be rejected. Table 3.3(a) and 3.3 (b) shows the mean and ANOVA (Analysis of variances) respectively.

Tab 3.3(a): Math anxiety score for school category

Category	N	Mean	Std. deviation
Gov. High School	149	33.40	11.308
MPO based High School	198	34.00	10.785
Private High School	132	36.32	11.802
Total	479	34.45	11.274

Tab 3.3(b): One way ANOVA for school category

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	664.218	2	332.109	2.631	.07
Within Groups	60088.475	476	126.236		
Total	60752.693	478			

3.4 Impact of fathers' education on students' math anxiety:

The difference between categories of fathers' education in students' math anxiety was significant statistically at 95% confidence level. One way ANOVA was performed and it was found that $p < .05$. Sometimes it was cleared that students' math anxiety was decreased when fathers' education level was increased. It shows the existence of the role of fathers' education level on students' math anxiety at secondary level. Here null hypothesis was rejected. Table 3.4(a) and 3.4 (b) shows the mean and ANOVA (Analysis of variances) respectively.

Tab 3.4(a): Math anxiety score and fathers' education

Category	N	Mean	Std. deviation
Upto SSC	65	35.43	11.254
HSC	106	34.54	11.469
Graduate	114	36.87	11.599
Post Graduate	194	32.66	10.744
Total	479	34.45	11.274

Tab 3.4(b): One way ANOVA for fathers' education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1351.833	3	450.611	3.603	.013
Within Groups	59400.860	475	125.054		
Total	60752.693	478			

3.5 Impact of mothers' education on students' math anxiety:

To compare (mean) the students' math anxiety score according to their mothers' education level, one way ANOVA was performed. Here $P > .05$, so the difference was not significant statistically though it was slightly differed mathematically. So, there was no enough evidence in favor of difference between the mothers education level in math anxiety. Therefore null hypothesis could not be rejected. Table 3.5(a) and 3.5 (b) shows the mean and ANOVA (Analysis of variances) respectively.

Tab 3.5(a): Math anxiety score and mothers' education

Category	N	Mean	Std. deviation
Upto SSC	142	35.55	10.968
HSC	111	33.86	12.012
Graduate	137	34.17	11.080
Post Graduate	89	33.89	11.168
Total	479	34.45	11.274

Tab 3.5(b): One way ANOVA for fathers' education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	249.829	3	83.276	.654	.581
Within Groups	60502.864	475	127.374		
Total	60752.693	478			

3.6 key findings

- The results indicated that 82 (17.1%) of the 479 participants experienced low level of mathematics anxiety, 306 (63.9%) experienced moderate level and 91 (19%) experienced high level of mathematics anxiety. Also the difference was significant statistically at 99% confidence level.The results clearly indicate that girls did have more anxiety levels than males mathematically but it was not significant at 95% confidence level.

- Math anxiety was not differed with the categories of schools at secondary level. It was found the existence of the role of fathers' education level on students' math anxiety at secondary levelThe impact of mothers' education on students' math anxiety was not significant.

4.0 Conclusion:

Based on the findings of the study it can be concluded that students of secondary school are experienced the different level of math anxiety such as low, moderate and high level where so many students were experienced in high level of math anxiety. The study also concludes that there was no effect of gender, school category and mothers education on students' math anxiety. This study has also found that students' math anxiety was slightly defended on fathers' education. Nobody should worry about gender, category of school and parental educational level as cause of students' math anxiety. Girls should be encouraged to take mathematics as a subject. At the same time it is needed to identify the real causes of students' math anxiety.

Acknowledgement

We sincerely thank the National Academy for Educational Management (NAEM) for funding this research. We also extend our gratitude to all the participants for their voluntary involvement, which was essential to the completion of this study.

5.0 References:

Alexander Alaina Hellum (2010). EFFECTIVE TEACHING STRATEGIES FOR ALLEVIATING MATH ANXIETY AND INCREASING SELF-EFFICACY IN SECONDARY STUDENTS, A Project Submitted tothe Faculty of The Evergreen State College In Partial Fulfillment of the Requirements for the degree Master in Teaching 2010, Retrieved from: http://archives.evergreen.edu/masterstheses/Accession89-0MIT/Hellum-Alexander_AMIT2010.pdf

Ali, M. E.(1999, P – 257). JUGE JUGE SHIlKSHA COMMISSION O SHIKSHAR UTTARON, JAGORONI PROKASHONI, DHAKA.

Ashcraft, M. H., & Faust, M. W. (1994). Mathematics anxiety and mental arithmetic performance: An exploratory investigation. *Cognition and Emotion,* 8(2) , 97-125. Retrieved from: http://www.tandfonline.com/doi/abs/10.1080/02699939408408931

Altermatt, E. R., & Kim, M. E. (2004). Can anxiety explain sex differences in college entrance exam scores? *Journal of College Admission*, 183, 6-11. Retrieved from: https://eric.ed.gov/?id=EJ682482

Betz, N.E. (1978). Prevalence, distribution, and correlates of math anxiety in college students. *Journal of Counseling Psychology,* 25(5), 441-448. Retrieved from: http://psycnet.apa.org/record/1979-24735-001

Devine et al.(2012). Gender differences in mathematics anxiety and the relation to mathematics performance while controlling for test anxiety. *Behavioral and Brain Functions* 2012 8:33. Retrieved from: http://www.behavioralandbrainfunctions.com/content/8/1/33

Dreger, R. M., & Aiken, L. R. (1957). The identification of number anxiety in a college population. *Journal of Educational Psychology,* 48(6), 344-351. Retrieved from: https://www.upress.umn.edu/test-division/bibliography/1950 1959/1957/ dreger_identification_1957

DSHE (2014): Directorate of Secondary and Higher Education (DSHE) evaluation report, 2014; Daily Prothom –alo (07.11.14). Education commission of Bangladesh (1974). Bangladesh Education (Qudrat-E-Khuda) Commission Report, 1974. Education watch report, (2007,p - 1), CAMPE, Dhaka. Retrieved from: https://www.campebd.org/Files/10042014051813pmEducation_Watch_Report_2008_Full_English.pdf

Fennema E., Sherman, J. (1976). Fennema-Sherman Mathematics Attitude Scales. *JSAS Catalog of Selected Documents in Psychology, 6*, 31 (MS. No. 1225). Retrieved from: *http://www.pearweb.org/atis/tools/55*

Furner, J. M. & Duffy, M. L. (2002). Equity for all students in the new millennium: Disabling math anxiety. *Intervention in School & Clinic,* 38(2): 67. Retrieved from: http://ourmathresource.weebly.com/uploads/5/3/4/8/53486121/disabling_math_anxiety.pdf

Ganley CM & McGraw AL (2016). The Development and Validation of a Revised Version of the Math Anxiety Scale for Young Children. Front. Psychol. 7:1181. doi: 10.3389/fpsyg.2016.01181, Retrieved from: http://journal.frontiersin.org/article/10.3389/fpsyg.2016.01181/full

Haciomeroglu, G. (2014). Elementary Pre-Service Teachers' Mathematics Anxiety and Mathematics Teaching Anxiety**,** International Journal for Mathematics Teaching & Learning; 2014, p1: Retrieved from: http://www.cimt.org.uk/journal/haciomeroglu.pdf

Halat, E. (2006). Sex-related differences in the acquisition of the van Hiele levels and motivation in learning geometry. *Asia Pacific Education Review,* Vol. 7(2), 173-183. Retrieved from: http://files.eric.ed.gov/fulltext/EJ752338.pdf,

Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education.* 21(1)*,* 33-46. Retrieved from: http://www.jstor.org/stable/749455?seq1#pagescan_tab_contents

Jackson, C.D. & Leffingwell, R.J. (1999). The role of instructors in creating math anxiety in students from kindergarten through college. *Mathematics Teacher,* 92 (7), 583-586. Retrieved from: https://themathwiki.wikispaces.com/file/view .

Karp, K. (1991). Elementary school teachers' attitudes towards mathematics: The impact on students' autonomous learning skills. *School Science and Mathematics*, 91(6), 265-270. Retrieved from: http://onlinelibrary.wiley.com/doi/10.1111/j.1949-8594.1991.tb12095.x/full

Khatoon, T., & Mahmood, S. (2010). Mathematics anxiety among secondary school students in India and its relationship to achievement in mathematics. *European Journal of Social Sciences*, 16(1), 75-83. Retrieved from: www.ibrarian.net/.../Mathematics_Anxiety_Among_Secondary_School_Studen.pdf

Lee, J. (2009). Universals and specifics of math self-concept, math self-efficacy, and math anxiety across 41 PISA 2003 participating countries. Learning and Individual Differences, 19, 355–365. Retrieved from: http://www.sciencedirect.com/science/article/pii/S104160800800112,

Liu, F. (2008). Impact of online discussion on elementary teacher candidates' anxiety toward teaching mathematics. Education, 128(4), 614-629. Retrieved from: https://www.learntechlib.org/p/102050/

McAnallen,R. (2010). Examining Mathematics Anxiety in Elementary Classroom Teachers : PhD thesis, university of Connecticut, Retrieved from: http://opencommons.uconn.edu/dissertations/AAI3464333,

Mathison, M. A. (1977). Curricular interventions and programming innovations for the reduction of mathematics anxiety. Paper presented at the *Annual Convention of American Psychological Association*, San Francisco, CA, 26-30 August. Retrieved from: https://eric.ed.gov/?id=ED154330

Ma, X., & Cartwright, F. (2003). A longitudinal analysis of gender differences in affective outcomes in mathematics during middle and high school. *School Effectiveness and School Improvement*, 14(4), 413-439. Retrieved from: http://www.tandfonline.com/doi/abs/10.1076/sesi.14.4.413.17155

National Curriculum (2012).National Curriculum and Textbook Board, Bangladesh(NCTB). NCTB (2013):

NCTB (Preface, mathematics Text book 2013, Class IX), Bangladesh, Dhaka.

NMAP, (2008) . The Final Report of the National Mathematics Advisory Panel National Mathematics Advisory Pane ,U.S. Department of Education: Washington, DC, 2008, Retrieved from: https://www2.ed.gov/about/bdscomm/list/mathpanel/report/final-report

Richardson, F., & Suinn, R. (1972). The mathematics anxiety rating scale: Psychometric data. *Journal of Counseling Psychology,* 19(6), 551-554. Retrieved from: http://psycnet.apa.org/record/1973-05788-001

Reed, Kara L. (2014). DO K, 1, 2 TEACHERS WHO PARTICIPATED IN A YEAR LONG MATH COURSE HAVE LESS TEACHER MATH ANXIETY THAN THOSE WHO DID NOT PARTICIPATE?, Dissertation submitted to the Faculty of the Graduate School of the University of Maryland, College Park in partial fulfillment of the requirements for the degree of Doctor of Education, Retrieved from: http://drum.lib.umd.edu/bitstream/handle/1903/15314/Reed_umd_0117E_15124.pdf;jsessionid=A7F7E7C8AABD1B0C8A935DC03831D825?sequence,

Sloan, T., Daane, C.J., & Giesen, J. (2002). Mathematics anxiety and learning styles: What is the relationship in elementary preservice teachers? *School Science and Mathematics*, 102(2), 84-87. Retrieved from: http://onlinelibrary.wiley.com/doi/10.1111/j.1949-8594.2002.tb17897.x/abstract,

Stuart. (2000). Math curse or math anxiety? *Teaching children mathematics, 6(5*).Retrieved from: https://www.researchgate.net/publication/234647654_Math_Curse_or_Math_Anxiety

Smith. Megan R. (2004). Math Anxiety: Causes, Effects, and Preventative Measures, A Senior Thesis submitted in partial fulfillment of the requirements for graduation in the Honors Program, Liberty University, Fall Semester 2004, Retrieved from: http://digitalcommons.liberty.edu/cgi/viewcontent.cgi?article=1263& context=honors,

Sloan, T. R. (2010). A quantitative and qualitative study of math anxiety among pre-service teachers. *The Educational Forum*, *74*(3), 242-256. Retrieved from: http://www.tandfonline.com/doi/abs/10.1080/00131725.2010.483909,

Tobias, S., & Weisbrod, C. (1980). Anxiety and mathematics: An update. *Harvard Educational Review,* 50(1), 63-70. Retrieved from: https://eric.ed.gov/?id=EJ224889

Trujillo K.M, & Hadfield, O.D. (1999). Tracing the roots of mathematics anxiety through in-depth interviews with preservice elementary teachings. *College Student Journal*, 33(2), 219-232. Retrieved from: http://www.freepatentsonline.com/article/College-Student-Journal/62839422.html

Uusimaki, L. & Nason, R. (2004). CAUSES UNDERLYING PRE-SERVICETEACHERS' NEGATIVE BELIEFS AND ANXIETIES ABOUTMATHEMATICS Queensland University of Technology Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, 4, 369–376 : Retrieved from: https://files.eric.ed.gov/fulltext/ED489664.pdf

Vinson, B. M. (2001). A comparison of pre-service teachers' mathematics anxiety before and after a methods class emphasizing manipulatives. *Early Childhood Education Journal*, *29*(2), 89-94. Retrieved from: https://link.springer.com/article/10.1023/A:1012568711257,

Wigfield, A., & Meece, J. (1988). Math anxiety in elementary and secondary school students. *Journal of Educational Psychology*, 80(2), 210-216. Retrieved from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.336.8626

World Economic Forum (2013): The Global Information Technology Report 2013, World Economic Forum, Geneva. Retrieved from: www.weforum.org/gitr.

Zettle, R., & Raines, S. (2002). The relationship of trait and test anxiety with mathematics anxiety. *College Student Journal*, 34, 246-258. Retrieved from: http://www.freepatentsonline.com/article/College- Student- Journal/131318271.html