The Level of Math Anxiety among the Students Who Consistently Perform Poorly in Mathematics at Secondary Level Education in Bangladesh

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Abstract

This paper reports on a research that investigated Math Anxiety among students who are getting poor marks consistently in last three exams. A school from Dhaka, National Bangla High School, was selected purposively for this research. The participants were 122 students, both girls (n=75) and boys (n=47), from grade IX and X with poor results in Mathematics. The research applied two data collection tools including Math Anxiety Questionnaire (MAQ) and Self Rating Scale. The research revealed that students participated in this study has different level of Math Anxiety. A good number of students are suffering from high Math Anxiety. There is no significant difference between the level of Math Anxiety among boys and girls. This research also identifies several reasons behind the Math Anxiety among the participants of this study which includes: students do not understand Mathematical problems in the school, they do not understand what their teachers do in Math class, they feel bored in Math classes, they have low self-confidence in solving Math problems and they do not get adequate supports from their family. The findings of this study can be a lead of a large scale study on impact of Math anxiety in Math achievement and career progressions.

Keywords: Math Anxiety, Level of Math Anxiety, Cause of Math Anxiety, Secondary Education, Bangladesh.

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Introduction

Math Anxiety becomes one of the significant concerns for educators around the world. For example, only seven percent American people have positive experiences about Mathematics and it indicates that majority of Americans have negative experiences with Mathematics (Furner & Duffy, 2002). Defining Math Anxiety as an emotional state that makes people panic towards Mathematics, Maloney & Beilock explain few characteristics of Math Anxiety which included:

- Math Anxiety can happen in the time of solving Mathematical problems or even reading a cash register receipt;
- People with Math Anxiety do poor performance when numerical information is related with the work;
- Math anxious people try to avoid Mathematical task as they have less confidence about Mathematics; and
- Less practice makes Math anxious individuals weak and later Mathematics becomes a great burden to them.

Math Anxiety and Causes

Studies indicated that the cause behind Math Anxiety is multi-faceted and causes of Math Anxiety in female students can be divided into four categories including parental influences, school influences, internal influences and societal influences (Clark, 2012). Behavior of an instructor can be the cause of Math Anxiety like being hostile, gender-bias attitude, uncaring attitude, anger, unrealistic expectation and embarrassing students in front of peer. There might be some other reasons like communication problem, instructional problem, improper evaluation methods and ineffective teaching materials. Sometimes common teaching techniques can be an instructional problem. Beside instructional problem, past experience also can be an immense cause of Math Anxiety, for examples, lack of success with Math, inadequate number of Math course and misinformation about Math. Sometimes parents pass their anxiety to their children as well as teachers (Furner & Duffy, 2002).

Students and teachers both face problem with Math Anxiety. Unwillingness to do a Mathematical problem is one of the symptoms of Math Anxiety. It can happen at different age for different reasons. The main cause of Math Anxiety is teacher or instructor (Smith, 2004). Emotion and intellect towards Mathematics may act as a cause of Math Anxiety like teachers' behaviors towards Mathematics, though it can not be conclusively said that a teacher who has Math Anxiety or disliking about Math has also disliking about teaching Mathematics (Widmer & Chavez, 2001). Students' attitude towards Mathematics depends on the teacher's attitude with Mathematics (Malinsky, Ross, Pannells, & Mcjunkin, 2006). It also can not be ignored that Math Anxiety may come from bad class room experiences, parental influence and poor Math performance of past (Scarpello, 2007).

Effect of Math Anxiety in Career

Math Anxiety affects students' achievement as well as future career (Malinsky, Ross, Pannells, & Mcjunkin, 2006). Students having Math Anxiety try to avoid the subjects

those are related to Mathematics. Sometime students try to avoid some career like accounting, business, medicine, psychology, programming because they need to handle some Mathematical problems with these occupations (Widmer & Chavez, 2001). Not only career choice, but also daily and professional life both might get affected by the Anxiety (Smith, 2004). More than seventy percent Americans stop studying Mathematics before they complete their education. Math Anxiety is now a big concern for the students of high school and technical education because when a student suffers from Math Anxiety, they try to avoid Mathematics and have little confidence in their ability to solve Mathematical problems. Student starts taking minimum number of Math courses which limits their career choice. Students having high level of Math Anxiety achieve less in Math compared to the students having less Math Anxiety. It indicates that Math Anxiety has a correlation with the Math achievement of students (Scarpello, 2007). With high Math Anxiety, students become less motivated to do Math hence their achieved scores in Mathematics decrease. There is a significant relationship with the Math Anxiety and the motivation to do Mathematics (Lee, 2009). If students are not motivated to do Math, their achievement cannot be satisfactory. Without reducing Math Anxiety, it is difficult to motivate students to do better in Mathematics and to improve their Math achievement (Zakaria & Nordin, 2008).

Math Anxiety and Gender

There is no relation between Math Anxiety and gender difference (Ruben, 1998). But cultural experience and expectation have impact on it. There is a popular myth saying "Mathematics is for boys". Therefore, some preconceptions are there in mind of both teachers and students that girls face problems with Mathematics and girls have to struggle harder with Mathematics than boys do although this is also true that several teachers also feel girls can do better in all subjects including Mathematics (Widmer & Chavez, 2001). Society often portrays an impression that women are of poor memories compared to men (Furner & Duffy, 2002). Though there is no significant relationship between gender and Math Anxiety in early grades, female suffer more with Math Anxiety in secondary and tertiary education. The interesting matter is that non-traditional aged group also suffers more than traditional aged group with Math Anxiety and there is a correlation between age and Math Anxiety (Malinsky, Ross, Pannells, & Mcjunkin, 2006)

Reduce Math Anxiety

Better understanding of Mathematical problems can reduce the Anxiety (Henderson, 2000) and for that reason, different teaching methods like using games and one to one help can be useful against Math Anxiety (Widmer & Chavez, 2001).Students facing Math Anxiety can be benefitted from proper ideas and information about Mathematics as
importance of Mathematics may play significant role in students' future success (Smith, 2004). Anthropologist and psychologist have a belief that causes and cures of mental illness like anxiety may vary from culture to culture. There is a great contribution of ethnicity and gender to the belief about any anxiety. Financial status and stress have significant role on it (Atkinson, Abreu, Bush, & Brewer, 1998).

Math Achievements among Bangladeshi students

In 2007, learning achievement of the students of grade X (n = 3,014) was assessed by Campaign for Popular Education (CAMPE), Bangladesh, with an instrument based on learning objectives set by National Curriculum Coordination Committee (NCCC). Bangla, English, Mathematics and Everyday Science were covered in the test. Each subject contained 20 items, which made the whole test comprises of 80 items. Students showed the worst performance in Mathematics followed by English, Bangla and Everyday science (Table-1.1). For instance, 16.4% of the students in Mathematics, 26.8% in English, 30.0% in Bangla and 42.8% in Everyday science satisfied the criteria of 50% correct items. 35.5% students fall below the cut-off mark of pass grade in Bangla, while the percentage is 40.1% in English, 53.1% in Mathematics and 22.8% in Everyday Science. Fail rate of girls was higher than boys (Nath, et al., 2007).It indicates a possibility of having a common cause behind the worst performance in Mathematics.

Table 1.1-Percentage of students satisfying minimum criteria for achieving skills in various Subjects under test (n = 3,014) (Education Watch report 2007)

Criteria	Subjects				
	Bangla	English	Mathematics	Everyday Science	All
50% correct items	30.0	26.8	16.4	42.8	7.5
40% correct items	53.8	46.8	33.3	66.6	17.9
33% correct items	64.4	59.9	46.9	77.1	27.1

Methodology

The research was designed following mixed method approach included more than one technique to collect and analyze data.

Sampling Techniques and Sample Size

A purposive sampling technique was used for a total of 122 respondents. Students' past academic results was collected with the consent of Headmaster of National Bangla High School, Dhaka. Respondents who had poor achievement in Mathematics for a long time became the participants of this study. Poor achievers of grade IX and X were the participants for this research including 75 girls and 47 boys. A total of 59 students were from grade IX and 63 from grade X. All the selected students (n=122) participated in Math Anxiety Questionnaire survey and among them 28 students (17 girls and 11 boys) participated in Self Rating Scale which was intensive and semi structured questionnaire.

Development of Research Tools

This research applied two data collection tools including Math Anxiety Questionnaire (MAQ) and Self Rating Scale. MAQ was adapted from Allan Wigfield (1988) (Wigfield & Meece, 1988). The permission of using MAQ was given by the author through e-mail. This MAQ was used on "Math Anxiety in Elementary and Secondary School Students". It was in English and later has been translated and adapted in Bangla Language by the researcher and checked by a panel of experts including Math educators and faculty members of Educational Psychology and Guidance and necessary adjustment was done. A priory judgmental technique and field testing was conducted to finalize the translation.

Self-rating Scale was prepared with the help of experts in educational psychology field. Firstly, a number of ideas were generated based on aims of the research. Secondly, a semi-structured questionnaire was developed based on the ideas generated earlier. Thirdly, the semi-structured questionnaire was sent to three education psychology researchers and required alteration was done following their suggestions. Fourthly, after preparing the draft self-rating scale, it was applied involving a pilot group and being finalized on the basis of feedback generated from the field.

Data Collection Procedure

MAQs were distributed by the help of the class teachers to the selected students and collected by the class captains. After distributing the MAQs, oral instruction was provided to all the students. There were six sections in each shift. Students took 45 minutes on average to complete the MAQ.

From the whole sample (n=122) only 28 students gave their consent to take part in the Self Rating Scale. Similarly, to complete the scale, each student required 45 minutes on average.

Data Processing and Analysis

The data collected by MAQ was analyzed by following quantitative data analysis and the Self Rating Scale was analyzed by following descriptive analysis technique.

There were 11 questions in MAQ with seven alternate choices of response for each question. Question 2 and 4 were designed in opposite direction. Among the 7 multiple answers, the 1st answer was marked as 1 while the 7th answer was marked as 7 and the rest five answers 2nd, 3rd, 4th, 5th and 6th were marked 2,3,4,5, and 6 respectively. For question 2 and 4 the marks for 1st answer was 7, last answer was 1 and rest of the answers were 6,5,4,3 and 2 for 2nd, 3rd, 4th, 5th and 6th respectively. Math Anxiety score was counted by adding every single marks of a single questions. Consequently, for the 11 questions 11 marks were added and the sum of the marks was considered as the Math Anxiety score. Hence, there were 11 questions and mark 1 was defined as the lowest, 11 were the lowest possible Math Anxiety score and highest possible score was 77. To differentiate the Math Anxiety level the Math Anxiety scores were divided in six levels. Students who scored 11 to 22 in the MAQ their anxiety level were

pointed as "No Math Anxiety", 23 to 33 were pointed "Very Low Math Anxiety", 34 to 44 were indicated" Low Math Anxiety", 45 to 55 were referred to "Moderate Math Anxiety", 56 to 66 were pointed "High Math Anxiety" and 67 to 77 were interpreted as "Extremely High Math Anxiety". Students were classified by their Math Anxiety level and also a relationship was drawn with their achievement and Math Anxiety score in the analysis. Boy's scores and girl's scores of Math Anxiety level was also compared. To make a clear concept on student's achieved marks, mean, median, mode, standard deviation and coefficient of variation of achieved marks were calculated and mean, median, mode, skewness of distribution of Math Anxiety scores were analyzed. To make a relation between achieved marks and anxiety score, correlation coefficient were used.

Data collected through the Self Rating Scale was interpreted descriptively. Self-Rating Scale was consisted of 15 questions. Individual interpretation for each and every question's response was described separately.

Findings

All the students whose Math achievement were not satisfactory for a long time are suffering from Math anxiety and almost half of them have high and extremely high level of Math anxiety where very few of them have low level Math Anxiety and there is no one who has No Math Anxiety. Math achievement is increasing when Math anxiety level is decreasing among the low achiever students.

Figure 1: Percentage of Students with Different Math Anxiety Level
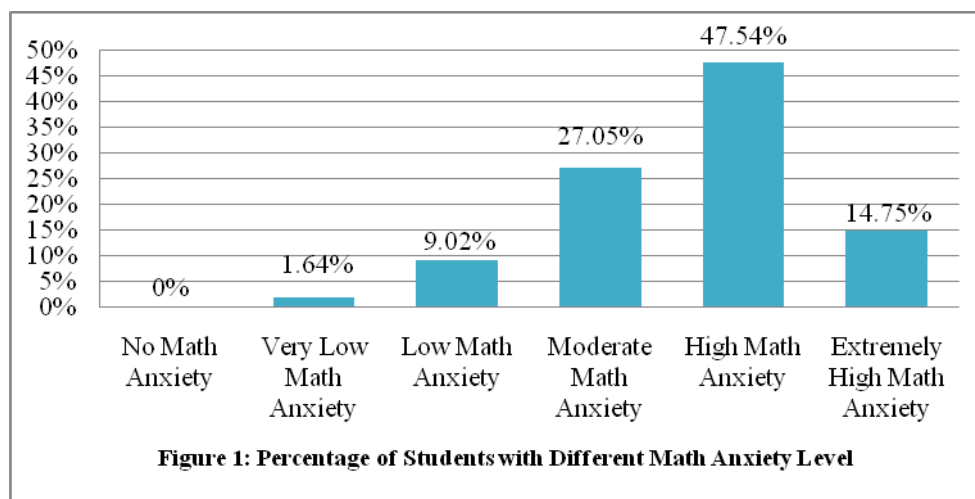
The self-rating scale is indicating the causes of Math Anxiety. Most of the students do not understand Mathematical problems as well as the examples of the text books when they are studying alone. Some female students' responses indicating that the teaching style of teacher was not comprehensible for them though male students did

not feel so. Many of them stated that the feelings about Math classes were 'moderate' which indicates they are neither happy nor unhappy with their Math classes. When they were asked about their favorite class/subject, their replies were Bangla (mother language) and English but they do like the Math classes when teachers do not look like angry men and can teach any Mathematical problem in an interesting way. They feel pressure from family for expecting good marks in Mathematics often which also make them worried about Mathematics.

Some of them also said that their confidence level became loer because they were getting poor marks in Mathematics for last two or three years. In order to improve their achievement in Mathematics, these students feel they need extra care; it could be a tutor at home or extra classes at school. All female respondents need help in Mathematics because they want suggestion before Math examinations. Actually, they want short syllabus for Math examinations, so that they can memorize the Mathematical problems easily.

On the other side, all the male respondents need help to understand the Mathematical problems. They are less confident to solve any Mathematical problems alone and that's why they want extra care at home or school. Most of them also perceived that their performance could be better in Mathematics if their Math teachers could teach the hard problems creatively.

Girls and boys had some difference in Math Anxiety but this difference is not significant enough. The correlation coefficient between achieved marks and Math Anxiety of girls is -0.3 and of boys is 0.00016 which indicates that there is no relation between achieved marks and Math Anxiety among boys and there is a negative relation among girls. The skewness is -0.48 for boys and -0.54 for the girls which indicate that the Math Anxiety score has skewed to left, so, most of the students has scored more than mean Math Anxiety score.

Discussions and Recommendations

Worldwide a common problem of students is Math Anxiety which can be a big obligation for the students to get good marks in Mathematics. It is a general view of Bangladeshi society that student who is good in Mathematics and English is a good student. Therefore, parents are sending their children in the school with a pressure on them for getting good marks both in Mathematics and English which is the primary cause of making the pupil worried about Mathematics. Beside that most of the parents are not able to give proper guidance to the students in Mathematics at home as well as teachers in the schools.

Every selected student has Math Anxiety in this study. Therefore, Math Anxiety can be a reason to perform poorly in Mathematics in last two or three years for these students. Students are unhappy with their text books and class time but they don't feel these as reasons for their poor performance in Mathematics. All the reasons that respondents had mentioned as their bad performance are representation the cause of Math anxiety and the reasons are- ineffective teaching style, less number of reader friendly text books, improper parental guidance and past bad experience about Mathematics though teaching techniques and family pressure have been found as the main causes of Math Anxiety.

Women or girls are afraid about Mathematics or they are not good in Mathematics is nothing but a myth as there is no significant correlation found among gender and Math anxiety.

Based on the findings presented in the previous sections this paper wants to shed light on few issues related to Math Anxiety which included:

a) Math teachers need advanced training on teaching techniques where they can learn about different types of teaching style, student's psychology, Math Anxiety and the techniques to avoid Math Anxiety.
b) Curriculum should be developed in such a way so that the text books become more attractive, explaining and easy to understand. More practical problem solving approaches need to be incorporated in Mathematics courses.
c) Evaluation System should not only depend on written examination, rather, different evaluation techniques like class performance, group work, assignment, open book exams should be incorporated.
d) Parents should be discouraged to put any kind of physical and mental stresses on the students. If necessary, the parental training should be introduced to have the parents aware about child psychology, Math Anxiety and other psychological issues.
e) Students should get aware about the Math Anxiety and its basic symptoms so that they could have a basic idea of whether they are suffering from this problem or not. Students should also have a clear vision about the importance of Mathematics in their academic and daily life and should be encouraged to talk about their problems.

f) School administrations as well as all concerned bodies related to education in the country should be concerned and notified about this problem and all concerned should actively participate to mitigate this problem.
g) Educational psychologists should be introduced in each school for better understanding of this kind of psychological problem of the students and to provide a quick solution to the problem through proper guidance and counseling.

Conclusion:

The Math achievements of students is not satisfactory in Bangladesh as their Math Anxiety is consistently very high, but there is no sufficient data and research work on this topic. It is anticipated that this study might help the students who are suffering from Math Anxiety and the teachers who have limited idea about students' Math Anxiety. This research also can be a reference for future study on Math Anxiety. Although this research work conducted in a small area, it can be a first step towards in-depth studies in the field of Math Anxiety in Bangladesh. There should be large scale studies on Math Anxiety in Bangladesh to ensure the quality education for all students in near future.

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