

## **Emotional Quotient, Mental Toughness, Mathematics Anxiety, and Performance of Teacher Education Students**

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### **Abstract**

This study investigated the relationship of emotional quotient, mental toughness, mathematics anxiety, and mathematics performance using data coming from 160 second year BSED and BEED students who were enrolled in the first semester of SY 2012-2013 and had taken Fundamentals of Mathematics and Contemporary Mathematics. Using the descriptive correlational research method and four sets of instruments – Bar On Emotional Quotient Inventory: Short Version (Bar On EQi:s), Mental Toughness Questionnaire (MTQ48), Mathematics Anxiety Questionnaire, and Mathematics Achievement Test, results reveal that students have low emotional quotient, average mental toughness, and average mathematics anxiety and mathematics performance. Further, correlation analyses show that mathematics performance post significant positive relationship with emotional quotient and mental toughness, but significant negative relation with mathematics anxiety. Emotional quotient also registers significant positive correlation with mental toughness. Mathematics anxiety likewise reveals significant negative relationship with emotional quotient and mental toughness. Among the variables, mathematics anxiety is the significant predictor of mathematics performance.

*Keywords:* Emotional Quotient, Mathematics Anxiety, Mathematics Performance, Mental Toughness

Students' mathematics achievement has become a major challenge in many educational settings particularly in the Philippines. The assessment made by the Third International Mathematics and Science Study (TIMSS) has placed the country near the bottom in terms of mathematics performance. At the local scene, the Mathematics Teachers Association of the Philippines (MTAP) tested preservice teachers in arithmetic, algebra, and geometry, and discovered that the overall mean for high school preservice teachers was 16 out of 50 questions, while that of the elementary school counterpart was only 10. Hence, there must be to improve mathematics education.

Educators today are considering curricular reforms and professional development in order to raise students' mathematics performance to the desired level. Focus was given not only on the content of the course/subject but also on the processes and affective aspect of mathematics learning. As Bar-On (1997) contends, emotions play an important role in learning. The combination of academic learning and emotional learning is the most promising way of developing an individual's potential to the fullest and emotional intelligence affects not only how individuals get along with others, but also how they succeed in life, including success in academic achievement.

Peter Clough (in Strycharczyk, 2010) also claims that the ability to bear difficult situations determines how an individual succeeds in life. He reports the importance of mental toughness in the development of young people. His research shows that mental toughness is correlated with the performance of students in school examinations.

According to Ashcraft (2002), a negative attitude towards mathematics is a growing barrier for many students in learning mathematics. The feeling of tension and anxiety interferes with the manipulation of numbers and solving of mathematical problems. According to him, appreciation and enjoyment of mathematics in the teaching-learning process may be given emphasis so that mathematics anxiety will be minimized or eradicated.

The school as a social institution has the major task of educating the people. Based on the Theory of Constructivism (Ornstein & Hunkins, 2004), mathematics learning is best when students construct their own knowledge and conceptual understanding through their own activity. Albert Bandura's Social Learning Theory also asserts that learning takes place not only through imitation but also through observation (Schunk, 2004), making teachers in the classroom models for their students to emulate.

Mathematics education should consider not only the learning of students in terms of concepts, procedures, and instruction but also dealing with their emotions such as their anxieties in the learning situation- how they survive despite difficult situations. Hence, it is important that the cognitive and affective skills of the students should be developed. Teacher education programs should combine these knowledge of skills in order for teacher education students to be better prepared to contribute in the holistic development of their students.

### **Statement of the Problem**

This study investigated the relationship of emotional quotient, mental toughness, mathematics anxiety and mathematics performance among the second year teacher education students of a State College of Fisheries System in Iloilo, Philippines. Specifically, the study sought answers to the following questions:

1. What is the respondents' level of emotional quotient, mental toughness, mathematics anxiety, and mathematics performance?
2. Are there significant relationships between: (a) emotional quotient and mathematics performance; (b) mental toughness and mathematics performance; (c) mathematics anxiety and mathematics performance; (d) emotional quotient and mental toughness;(e) emotional quotient and mathematics anxiety; and (f) mental toughness and mathematics anxiety?
3. Which of such variables are predictors of mathematics performance?

### **Methodology**

#### **Research Design**

This quantitative study made use of the descriptive- correlational research design. It determined the relationships of emotional quotient, mental toughness, mathematics anxiety and mathematics performance among students taking education courses.

## **Participants**

The respondents were the 160 randomly selected second year Bachelor of Secondary Education (BSEd) and Bachelor of Elementary Education (BEEd) students of a State College of Fisheries system in Iloilo, Philippines who were enrolled during the first semester of SY 2012-2013. They took Mathematics 1 (Fundamentals of Mathematics) and Mathematics 2 (Contemporary Mathematics) in their first year.

## **Data-gathering instruments**

Four instruments were used in this study: two standardized and two researcher-made. The two standardized questionnaires are the Bar-On Emotional Quotient Inventory: Short Version (Bar-ON EQ-i: S) developed by Dr. Reuven Bar-On to measure EQ and the Mental Toughness Questionnaire (MTQ48) by Dr. Peter Clough and Dr. Keith Earle (2002) which measured the respondents' mental toughness. These instruments did not undergo factor analysis since the first instrument was based on over 20 years of research by Dr. Reuven Bar-On and tested on over 110,000 individuals worldwide. The MTQ48 was also recognized worldwide and has many applications for occupational, social, health and educational purposes.

The researcher-made instruments were the questionnaire to measure mathematics anxiety and the test to measure mathematics performance of the respondents in Mathematics 1 and Mathematics 2. These underwent face and content validation by experts in the field of psychology and mathematics. The reliability of the mathematics anxiety questionnaire using Cronbach alpha was .94 and Kuder Richardson of .92 for mathematics performance.

## **Data-gathering Procedure**

Permission to conduct the study was sought from the President of the state college. Upon approval, the instruments were administered by two psychometricians, assisted by the researcher and some proctors. To administer the tests in one setting, all respondents were gathered in one campus of the college.

Then answers to the MTQ48 were encoded online to AQR, the publisher, for analysis and interpretation of the results for each respondent. The answers in the EQ questionnaire were also initially processed by the West Visayas State University Testing Center for each respondent. Upon retrieval

of the results during the initial processing for MTQ48 and EQ along with the results for mathematics anxiety and mathematics performance, the data were tabulated, analyzed, and interpreted. All analyses were processed via the Statistical Package for the Social Sciences (SPSS) software.

### **Data Analysis Procedure**

The data gathered in this study were subjected to appropriate statistical analyses. All inferential statistics were set at  $\alpha = 5\%$ . Frequencies were used to determine the number of respondents belonging to each category of the variables considered in this study. Means were used to determine the profile of the respondents' emotional quotient, mental toughness, mathematics anxiety and mathematics performance. Standard deviation was used to determine the respondents' homogeneity or heterogeneity in terms of the variables used. Pearson's  $r$  was used to determine the relationship among the variables while regression analysis was used to determine which of the independent variables predict mathematics performance.

### **Results and Discussions**

The results as presented here include the descriptive and inferential findings. Results are discussed and presented in tabular form.

#### **Level of the Respondents Emotional Quotient, Mental Toughness, Mathematics Anxiety and Mathematics Performance**

The low emotional quotient of the students shows that generally they have underdeveloped emotional and social intelligence skills. They do not possess an emotionally and socially intelligent behavior needed for them to perform better academically and to cope with personal and environmental stressors. In the classroom, Goleman (1995) emphasized that emotions are critical ingredients for optimal information processing, social communications, written communications, motivation, attention, concentration, memory, critical thinking skills, creativity, and behavior. Matthews (2006) also argues that in order for optimum learning to take place, emotional growth of the students should also be considered. Drago (2004) likewise stresses that the better the students' abilities to identify, use, and handle their emotions, the higher is their academic achievement. Hence, it is important to incorporate emotional intelligence awareness into the academic programs so that students may obtain higher academic success.

An average mental toughness implies that students are able to cope with most of life's challenges, although, when faced with some difficult circumstances they may feel nervous and a little threatened. Students are quite confident in their abilities, but their self-belief may be affected by others' criticisms. They are likely to be comfortable in most social situations and would usually contribute to group activities. According to Clough and Earle (2002), a mentally tough person tends to be sociable and outgoing; being able to remain calm and relaxed. These persons are competitive in many situations and have lower anxiety levels than others.

In the study, mathematics anxiety is average. A student with mathematics anxiety has added difficulty working a problem that requires one to continually keep track of the different calculations being performed. This happens because students are unable to focus solely on performing the calculations, and to deal with negative thoughts and feelings toward mathematics (Perina, 2002). Also, students who are anxious about mathematics are less likely to continue working on problems if they fail to understand them the first time. Ramirez, Gunderson, Levine and Beilock (2010) suggested that addressing mathematics anxiety at the teacher training level is an effective starting point in ameliorating mathematics anxiety in young children, and thus improving their mathematics achievement.

The mathematics performance of the students is also average. This result implies that the students have a moderate understanding of the concepts contained in Fundamentals of Mathematics and College Algebra. Mastery of the concepts in these two subject areas was not fully achieved by the students. According to the National Council of Teachers of Mathematics (NCTM) (2000) those who can do mathematics will have opportunities and experience success in their lives than those who cannot do mathematics. Mathematical competence opens doors to productive and successful futures and a lack of it closes those doors. Results are shown in Table 1.

Table 1

*Respondents' Emotional Quotient, Mental Toughness, Mathematics Performance and Mathematics Anxiety*

Variables	SD	Mean	Description
Emotional Quotient	10.53	88.16	Low
Mental Toughness	1.05	4.25	Average
Mathematics Anxiety	0.48	2.43	Average
Mathematics Performance	7.72	27.75	Average

*Note:* The Emotional Quotient was interpreted based on the categories developed by Dr. Reuven Bar-On in his Inventory: Short Version (Bar-ON EQ-i: S) to measure EQ. Mental Toughness was interpreted based on the categories developed by Dr. Peter Clough and Dr. Keith Earle (2002) in their Questionnaire (MTQ48) used to measure Mental Toughness.

Emotional Quotient: 130.00 + = Markedly High, 120.00 – 129.99 = Very High, 110.00 – 119.99 = High, 90.00 – 109.00 = Average, 80.00 – 89.99 = Low, 70.00 – 79.99 = Very Low, Under 70.00 = Markedly Low

Mental Toughness: 8.00 – 10.00 = Above Average, 4.00 – 7.00 = Average, 1.00 – 3.00 = Below Average

Mathematics Anxiety: 3.00 – 4.00 = High, 2.00 – 2.99 = Average, 1.0 – 1.99 = Low

Mathematics Performance: 33.00 – 50.00 = High, 17.00 – 32.99 = Average, 1.00 – 10.99 = Low

### **Relationship of Students' Emotional Quotient, Mental Toughness, and Mathematics Anxiety to Mathematics Performance**

The emotional quotient of the students is significantly related to mathematics performance. This finding is consistent with the findings of Martin (2011), Parker, Summerfeld, Hogan, and Majeski (2004), and Rogers (2010) that there is a significant positive relationship between emotional intelligence and academic achievement. However, this result is in contrast with the findings of Veitch and Justice (2012) who found that no significant relationship exists between emotional intelligence skills and academic achievement.

There is a significant positive relationship between the mental toughness and mathematics performance of the students. This finding is in agreement with the result of the case study made by Clough (2008) with AQR Ltd where mental toughness was found to be correlated with cognitive ability as measured by College Admission Test (CAT) scores. Furthermore, this contention is supported by the study of Karimi and Venkatesan, (2009).

There was a significant negative relationship between mathematics anxiety and mathematics performance among the students. Students who have high mathematics anxiety tend to perform lower in mathematics. However, those who have low mathematics anxiety tend to perform high in

mathematics. This finding confirms the previous findings of Hembree (1990) and Ashcraft (2001) which reported significant negative relationship between mathematics anxiety and mathematics performance. Results are summarized in Table 2.

Table 2

*Correlations of Emotional Quotient, Mental Toughness and Mathematics Anxiety to Mathematics Performance*

	Performance	Mathematics
	r- value	<i>p</i>
Emotional Quotient	.167*	.034
Mental Toughness	.239**	.002
Mathematics Anxiety	- .435***	.000

Note: \*\*\* $p < .001$ . \*\* $p < .01$ . \* $p < .05$ .

**Relationships among Emotional Quotient, Mental Toughness, and Mathematics Anxiety**

It was revealed that a significant positive relationship existed between emotional quotient of the students and their mental toughness. This result implies that as students become emotionally and socially mature, as they possess a good emotional self-awareness, have good relationship with others, have developed good coping mechanism for stress and frustrations, have adapted well to changes, and have a positive outlook in life, their mental toughness develops. As a consequence, students consider challenge as an opportunity for self-development, and they are more committed to pursue their goals, feel that they are in control of their lives, and believe that they are worthwhile persons.

The emotional quotient of the students has a significant negative correlation with mathematics anxiety. This may mean that as the students develop their emotional and social skills, their mathematics anxiety decreases. These findings affirm those of Uusimaki and Kidman (2004) that a significant decrease in the participants' mathematics anxiety occurred as they became aware of their emotional state and feelings in relation to mathematics activities. They noted that being comfortable with mathematics is not solely dependent on ability; rather, it is anxiety that interferes with the learning of mathematics. The fear of failure and worry affects performance even when mathematics concepts



are well within the skill level of the students. These findings imply that a deeper understanding of the role emotion plays in learning mathematics is important.

This study reveals that there is a significant negative relationship between mental toughness and mathematics anxiety. As students become mentally tough, they become less anxious about mathematics. Furthermore, when students welcome challenges in their lives, show deep involvement in whatever they are doing, and feel that they can control their own destiny, their mathematics anxiety seems to lessen. This result is not in consonance with that in the study of Alexander (2010), that correlation between mathematics anxiety and hardiness is not significant. However, he noted that if a student is not confident in his abilities, this can eventually manifest itself as mathematics anxiety. According to him, mathematics anxiety and low self-efficacy create stumbling blocks in mathematics education while mathematics self-efficacy is the feeling of students that they can do mathematics. Patrick, et al. (2003 in Alexander, 2010) recommended that teachers should create a classroom environment where students gain confidence in their mathematics abilities, lower their mathematics anxiety, increase their mathematics self-efficacy, and participate in a healthy learning community. Having a positive attitude will build self-confidence and eventually reduce anxiety. Table 3 shows the data.

Table 3

*Correlations Among Emotional Quotient, Mental Toughness, and Mathematics Anxiety*

	Mental Toughness		Mathematics Anxiety	
	r- value	<i>p</i>	r- value	<i>p</i>
Emotional Quotient	.658**	.000	-.273**	.000
Mental Toughness			-.269**	.001

Note: \*\* $p \leq .001$ .

**Predictors of Students' Mathematics Performance**

The results in Table 4 show that mathematics anxiety is a significant predictor of mathematics performance. The prediction equation for the standardized variables is as follows:

$$\text{Predicted Mathematics Performance} = -.41 \text{ Mathematics Anxiety} + .16 \text{ Mental Toughness} - .05 \text{ Emotional Quotient}$$

As hypothesized, students who have lower mathematics anxiety tend to have higher mathematics performance. The correlation between mathematics performance and mathematics anxiety is  $-41$ ,  $t = 5.42$ ,  $p = .000$ , which means emotional quotient and mental toughness are not significant predictors of mathematics performance.

Table 4

*Multiple Regression Results of Emotional Quotient, Mental Toughness, and Mathematics Anxiety on Mathematics Performance*

Variables	Beta	t- value	<i>p</i>
Emotional Quotient	-.051	-.535	.593
Mental Toughness	.164	1.717	.088
Math anxiety	-.405	-5.423*	.000

Note: Dependent Variable: Mathematics Performance

\* $p < .001$ .

### Conclusions

The students have low emotional quotient. This shows that the students are not fully aware of their strengths and weaknesses. They have not fully developed their empathetic skills and generally they do not have a positive outlook in life.

The average mental toughness showed that the students are not fully aware of their talents and abilities and do not see challenges as opportunities for their development. The students have low levels in controlling themselves to achieve their goals.

The average mathematics performance of the students implies that they have not fully mastered the concepts in Mathematics 1 and Mathematics 2 and other factors, such as emotional quotient, mental toughness, and mathematics anxiety need to be explored to ascertain if performance in these two subject areas improves.

Students' mathematics anxiety is average; this implies that the students do not have a positive attitude toward mathematics and do not enjoy activities related to mathematics learning.

The significant positive relationship of emotional quotient and mental toughness to mathematics performance implies that these two variables affect the students' performance in mathematics thus developing Emotional Quotient (EQ) and Mental Toughness (MT) may lead to the improvement in the student's mathematics performance. Mathematics anxiety has a significant negative correlation to mathematics performance thus reducing or preventing mathematics anxiety may increase mathematics performance. The significant positive correlation of EQ to MT means that enhancing EQ may also enhance MT.

It was found that among the variables used in this study, mathematics anxiety is a significant predictor of mathematics performance. Hence, teachers need to strive to lower students' mathematics anxiety in order for students to perform well in mathematics.

### **Recommendations**

School administrators have to formulate and support intervention programs/activities that may develop Emotional Quotient and Mental Toughness and prevent/reduce mathematics anxiety. Teachers should be encouraged to integrate intervention programs in mathematics classrooms and to devise assessment mechanisms on the effects of these variables in mathematics performance.

Mathematics teachers need to employ teaching strategies that are student-centered, that will give students opportunities to oral or written reflections and expressions. Students should be exposed to cooperative learning to enhance their interpersonal skills and activities to hone qualities of persistence, goal setting, and using failures for self-development.

Parents and other stakeholders need to be informed of the intervention activities undertaken in classrooms or schools so that they could give proper support to such endeavors.

Guidance counselors should make themselves available for student orientations, trainings, or lectures to enhance students' Emotional Quotient and Mental Toughness and prevent or reduce Mathematics Anxiety.

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