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MATHEMATICS ANXIETY AND ITS IMPACT ON THE COURSE AND CAREER CHOICE OF GRADE 11 STUDENTS

Mariella Espino[1]
Jubille Pereda[1]
Jesamie Recon[1]
Elizabeth Perculeza[1]
Clarice Umali[1]

[1]University of Batangas Lipa City, Batangas.

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Abstract: *This study evaluates mathematics anxiety and its impact on the career choice of grade-11 students. The descriptive method of research was used to determine the impact of Mathematics anxiety over their choice of track for Senior High. A structured questionnaire was made by the researchers for the purpose of gathering information for the study. It includes the causes of students' Mathematics anxiety, and the effects of Mathematics anxiety on the course and career choice among Grade-11 students. Before constructing the questionnaire, the researchers made an interview to those Grade- 11 students. Based on the interview the researchers found out the factors that causes students mathematics anxiety. And these factors are: the teachers, students' perception towards Math, students' behaviour/ attitude towards Math, students' experiences in attending math class, and taking math exams. It helps the researchers to make the questionnaire. After retrieving the accomplished copies of the questionnaire, result were tallied, tabulated and treated statistically. The researchers made use of a four-point scale in which one (1) corresponds to the lowest and four (4) corresponds as the highest. Other statistical tools that were used in the study are ranking, weighted mean and composite mean. The results show that there is a significant relationship between mathematics anxiety and the course and career choice of Grade-11 students. Because of mathematics anxiety, most of the respondents tend to choose Humanities and Social Sciences (HUMMS) as their study track. The researchers found out that mathematics anxiety has a big effect on the course and career choice of Grade-11 students. The foregoing findings and conclusions paved way for the researchers to recommend measures to solve students' mathematics anxiety.*

Keywords: *Mathematics Anxiety; Course; Career Choice*

Introduction

Math anxiety is the feeling of worry, frustration, agitation, and a fear of failure about taking a math class, completing math problems, and taking a math exam. Being anxious about math can begin when a child is in fourth grade and generally increases when students are in middle and high school. Some studies have focused on students as young as first-grade experiencing math anxiety (Harari, Vukovic& Bailey, 2013). It also involves feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations. Many adults, with and without disabilities, do not feel confident in their ability to do math (Duffy & Furner, 2002). The most intuitive definition of math anxiety is a fear of math. Quantiphobia (Goldberg & Waxman, 2003), mathophobia (Hilton, 1980), math phobia (Pan & Tang, 2005), and Mathematics Learning Distress (MALEI, 2006) are descriptive phrases that represent the same phenomenon.

One of the common goals of all mathematics teachers at all levels of education is that students should understand and learn mathematics. Various factors are involved in shaping the understanding and learning of mathematics. Teachers' attitudes and behaviors have a great impact to the students when it comes to educational growth (Demanet & Van Houtte, 2012). Attitudes and behaviour shown by the teachers shapes their students' performance in the class, be it negative or positive. However, teachers can reduce math anxiety and are an important element in encouraging students to attain high level mathematics (Scapello, 2007). Whenever students feel that teachers have a low expectation for them, they show less interest on the subject. This affects their performance and shows a slow academic progress. However, one of the prerequisites for understanding mathematics is interest in math and the desire of students to learn it. Interest is a stimulus that increases the activity power. Simultaneous to active learning, students should be interested in the subject they are learning and students may resort to it in order to understand the materials and apply them. Therefore, it is necessary to further examine the factors involved in making students interested in math so that no one would hear statements such as "Not too sweet course of math!," "Wow! The boring math class!," "Monster math!" Now the question is, why should these students often lose interest and may be forced to put up a math class?

Beilock (2008) stated that when students are put in stressful environments that induce strong feelings of pressure, they tend to perform poorly and sometimes below their actual ability which, consequently, can contribute to mathematics anxiety. She explained that mathematics anxiety coupled with stressful situations compromises one's mathematical working memory, "a short-term system involved in the regulation and control of information relevant to the task at hand" (Maloney &Beilock, 2012, p. 404). Two theories were proposed to justify how pressure can have negative effects on performance: the explicit monitoring theory and the distraction theory. When students are presented with a mathematical task in a highly stressful situation, the explicit monitoring theory proposes that mathematics-anxious students have a tendency to focus on their worries and self-doubts (Beilock& Carr, 2001). These intrusive thoughts may preoccupy the students with thoughts of "one's dislike or fear of mathematics or one's low selfconfidence, thus, acting like a secondary task and distracting attention away from the math" (Cavanagh, 2007, p. 10). The distraction theory describes highly stressful situations in which

the students' working memory needed to carry out the mathematics in a task is superseded by the pressure of accurately completing the tasks as well as the consequences that may follow as a result of performing below expectations. As a result, students who rely heavily on their working memory to execute mathematical tasks often falter.

Furner and Gonzalez-Dehass (2011) explained that "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" (p.227). Meece, Wigfield, and Eccles (1990) added that strong mathematical backgrounds are critical for many careers in our every demanding technical society. Our changing world is becoming more economically competitive and doors of opportunity are closing for students who struggle in mathematics. Occupations that require analytical thinking and math skills become unattainable as fearful students rule out higher level math courses. The national movement of increasing the numbers of students entering science, technology, engineering, and math (STEM) related career fields is critical. Sharpe (2012) reported about 43% of employers report a problem recruiting staff with the right STEM skills. Reasons for not attaining STEM type skills is explained by Bekdemir (2010), who believed many events in a person's life determine the mindset of thinking negatively about mathematics. Geist (2010) stated that math anxiety and negative attitudes towards mathematics are serious obstacles for children in all levels of schooling. This negative attitude toward mathematics is creating a disparity between levels of mathematics achievement. Hence, this study is initiated.

Theoretical Framework

According to Maxwell (2005), the theoretical framework of a study is "the systems of concepts, assumptions, expectations, beliefs, and theories that support and inform research" (p. 33).

In the early 1950's, researchers (Dreger and Aiken, 1957; Gough, 1954; Hembree, 1990) suggested that factors of math anxiety were influenced by non-intellectual factors such as math anxiety. Several studies also examined the direct effect math anxiety had on student achievement at the middle school. Ashcraft (2002) described highly math-anxious individuals who avoid math and lower their competency and even ultimately alter their career path. Mathematics anxiety is creating a discrepancy between the proficiency levels in mathematics achievement (Ashcraft, 2002; Geist, 2010; Hembree, 1990; Scarpello, 2007).
Peters Mayer (2008) stated, "Anxiety is a mind-body reaction that occurs instantaneously, and its effects are felt physiologically, behaviorally, and psychologically all at the same time" (p. 4). Peters Mayer then defined anxiety as a state of intense agitation, tension, or dread occurring from a perceived threat of danger. The American Psychological Association (2014) defined anxiety as "an emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure." Tyrer (1999) explained that "anxiety covers a range of experience, a large deal of which is normal and experienced by all at some time in their lives, and some of which is pleasurable" (p.1). At the other end of the spectrum, anxiety can become unpleasant and stressful. Anxiety can cause stress, an emotional experience that takes over our mind and body. Tyrer (1999) explained anxiety and its effect on performance: As demands increase, anxiety does also, and is rewarded by an improvement in performance. Eventually, however, a plateau of activity is reached in which performance cannot improve anymore. In

these circumstances the individual feels tense and anxious and under pressure but is able to cope with this without improving any further in performance. Once anxiety levels increase beyond this point, performance disintegrates rapidly. Concentration deteriorates, the ability to perform coordinated physical and mental activities is lost, and the person ceases to have any control over the task in hand. (Tyrer, 1999, p. 3)

Math anxiety is a key problem in the educational setting. Ashcraft (2002) expressed that math anxiety interferes with math performance. Students with high levels of math anxiety took fewer math courses in high school and college. Math-anxious students had negative attitudes toward math and possessed negative outlooks on their mathematical aptitude. Ashcraft (2002) expressed that there was no surprise that people with math anxiety avoided career paths depending on math skills. These same students typically sidestepped college majors involving math. Richardson and Suinn (1972) explained that manipulating numbers in a wide variety of ordinary life and solving math problems in the academic setting were reasons for math anxiety. Math anxiety may prevent a student from passing fundamental mathematics courses or prevent the pursuit of advanced courses in mathematics.

Review of Related Literature

In the early 1950's, researchers (Dreger and Aiken, 1957; Gough, 1954; Hembree, 1990) suggested that factors of math anxiety were influenced by non-intellectual factors such as math anxiety. Several studies also examined the direct effect math anxiety had on student achievement at the middle school. Ashcraft (2002) described highly math-anxious individuals who avoid math and lower their competency and even ultimately alter their career path. Mathematics anxiety is creating a discrepancy between the proficiency levels in mathematics achievement (Ashcraft, 2002; Geist, 2010; Hembree, 1990; Scarpello, 2007).

Wigfield and Meece (1988) highlighted the need for researchers to examine the negative effects math anxiety has on student achievement in mathematics. They found that individuals with high math anxiety showed smaller working memory. Math anxiety affects math related tasks and typically occurs during the classroom instruction whether working on class work, homework or in a group discussion involving finding solutions to math problems. Understanding the material during class is critical, but taking a math test can trigger even higher levels of math anxiety resulting in a student forgetting everything they learned about a certain mathematical topic. According to Bower (2001), "by about age 12, students who feel threatened by mathematics start to avoid math courses, do poorly in the few math classes they do take, and earn low scores on math achievement tests. Some scientists have theorized that kids having little math aptitude in the first place justifiably dread grappling with numbers." (p. 159). Ashcraft and Kirk (2001) found substantial evidence that math anxiety affects student performance. They found "substantial evidence for performance differences as a function of math anxiety. These differences typically are not observed on the basic whole number facts of simple addition or multiplication (e.g., 7 + 9, 6 x 8) but are prominent when somewhat more difficult arithmetic problems are tested." (Ashcraft & Kirk, 2001, p. 224)

Furner and Gonzalez-DeHass (2011) added that mathematics anxiety is not the sole reason for low math achievement but is a "critical academic problem that educators should be informed of its nature as well as of its solutions" (p.231).

In addition to the academic concerns, Ruffins (2007) found math anxiety had psychological symptoms. These symptoms included panicking, a feeling of helplessness, and nervousness before a math class. Speilberger (1995) stated little attention had been given to the emotional and cognitive process of math anxiety. Research on math anxiety has often been directed on the treatment and not on understanding the nature of math anxiety.

Methodology

This study examined the impact of mathematics anxiety on the course and career choice of Grade-11 students. The respondents of the study were 40, Grade-11 students.

In this study, the descriptive method of research was used to determine the impact of Mathematics anxiety over their choice of track for Senior High. According to Polit & Hungler (2004), descriptive research refers to research studies that have as their main objective the accurate portrayal of the characteristics of persons, situations or groups. This approach is used to describe variables rather than to test a predicted relationship between variables.

A structured questionnaire was made by the researchers to gather information in this study. It includes the causes of students' mathematics anxiety, and the effects of mathematics anxiety on the course and career choice among Grade-11 students.

Before constructing the questionnaire, the students were interviewed and their answers were used to construct the questionnaire. They prepared a preliminary draft of the questionnaire. The draft was sent to the adviser for some comments and suggestions. After the remarks, the researchers applied the given suggestions.

To administer the questionnaire, the researchers selected 40 Grade- 11 students to answer the said questionnaire. After that, the questionnaire was collected, tallied, and the results were evaluated.

The researchers statistically treated the results using a four-point scale in which one (1) corresponds to the lowest and four (4) corresponds as the highest. The scale is as follows.

Option	Scale	Verbal Interpretation
4	3.25 – 4.00	Great Extent/ Strongly Agree
3	2.50 – 3.24	Moderate Extent/ Agree
2	1.75 – 2.49	Less Extent/ Disagree
1	1.00 – 1.74	Least Extent/ Strongly Disagree

Other statistical tools that were used in the study are ranking, weighted mean and composite mean.

This part of the paper deals with the presentation, analysis, and interpretation of data obtained from the respondents. The data gathered through the questionnaire are presented in tables. The data were then tabulated, analysed and interpreted.

Gender

Table 1: Gender

Gender	F	%
Male	25	62.50
Female	15	37.50

Among the 40 student respondents of the study, 25(62.50%) were male, and only 15 (37.50%) were female. The majority of the respondents were male.

Study tracks

Table 2: Study Tracks

Academic Tracks	F	%
HUMSS *(Humanities and Social Sciences)*	15	37.50
ABM *(Accountancy, Business and Management)*	13	32.50
STEM (*Science and Technology, Engineering and Mathematics)*	7	17.50
TECH-VOC *(Technical-Vocational Livelihood Track)*	3	7.50
GAS *(General Academic Subjects)*	2	5.00

As to the intended study tracks by the respondent, 15 (37.50%) were HUMSS, 13 (32.50%) were ABM, 7 (17.50%) were STEM, 3 (7.50) were Tech-Voch and 2 (5.00%) were GAS.

The result indicates that majority of the respondents were intended to study HUMSS.

Achievement level in mathematics

Table 3: Achievement Level in Mathematics

Level of Achievement	Class Limits	F	Cf	Cf %
68-74	67.5 – 74.5	0	0	0
75-80	74.5 – 80.5	14	14	35.00
81-85	80.5 – 85.5	23	37	92.50
86-90	85.5 – 90.5	2	39	97.50
91-95	90.5 – 95.5	1	40	100.00

As to the achievement level of respondents in mathematics, 100% of the students has a level of achievement below 95.5, 97.50% were below 90.5, 92.50% were below 85.5 and 35.00% were below 80.5 level of achievement.

The result indicated that 97.50% (37) of the respondents has a level of achievement below 85.5.

Teachers' factors

Table 4.1: Teachers' Factors

Teachers' Factor	Weighted Mean	Verbal Interpretation
Way of teaching math	**2.55**	**Moderate Extent**
Becomes angry or frustrated when his class does not understand the problem	**2.275**	**Less Extent**
May have unrealistic expectations of his students.	**1.975**	**Less extent**
Giving written work every day	**3.35**	**Great Extent**
Assigning mathematics problems as punishment for misbehaviour.	**2.425**	**Less Extent**
Made students helpless in trying to understand the concepts.	**2.30**	**Less Extent**
Has a weak teaching strategy.	**2.30**	**Less Extent**
Promotes fear for students to perform in class.	**2.825**	**Moderate Extent**
Pressure students to perform well in the subject.	**2.65**	**Moderate Extent**
Teaching approach or "explain-practice-memorize.	**2.45**	**Less Extent**
General Weighted Mean	**2.51**	**Moderately Extent**

Legend:

3.25 – 4.00 Great Extent
2.50 – 3.24 Moderate Extent

1.75 – 2.49 Less Extent
1.00 – 1.74 Least Extent

As shown in table 4.1, the teachers' great extent of giving written works everyday, 3.35; moderately extent promotes fear for students to perform in class, 2.825; moderately extent pressure students to perform well in subject, 2.65;moderately extent of teachers' way of teaching math, 2.55; less extent of teaching approach or "explain-practice-memorize, 2.45; less extent assigning mathematics problems as punishment for misbehaviour, 2.425; less extent of making students helpless in trying to understand the concepts and has a weak teaching strategy., 2.30; less extent of becomes angry or frustrated when his class does not understand the problem, 2.275.

The respondents really see their teachers as one of the factors that cause mathematics anxiety with a general weighted mean of 2.51 which is verbally interpreted as moderately extent. It has been observed that when teachers do not show good attitudes and behavior when teaching students, there is a great possibility that students in return will have unbecoming behaviour as a way of showing their displeasure on the teacher's attitude. (Demanet & Van Houtte, 2012) Some reasons are their behaviour like being easily angered, having high expectations, making their students feel helpless in trying to understand Mathematics, teaching techniques and approaches like giving too much activities that are not suited to the learning skills of the students and the teachers' attitudes and performance in teaching Mathematics. Teachers need to be sensitive to the different needs of the students. Every child learns differently. They also respond differently to different instructional approaches (Leedy, LaLonde, & Runk, 2003). They must be approachable at all times, give only enough seat works that can be answered by the students in the given time and provide variety of activities aside from written works that students can work on.

Students perception towards math

Table 4.2: Students Perception towards Math

Students' Perception	Weighted Mean	Verbal Interpretation
Students may believe he or she is incapable of doing Mathematics problem.	2.80	Moderate Extent
Students' misconception that they should be able to do mathematics quickly.	2.35	Less Extent
Math is often associated with pain and frustrations.	2.50	Moderate Extent
Math is often taught as "there is only one way to do this, and you need to do learn it and do it right.	2.50	Moderate Extent
When heard the word "Mathematics", students have the feeling of dislike	2.175	Less extent

Working on numbers upsets the students.	2.30	Less Extent
General Weighted Mean	2.44	Less Extent

Legend:

3.25 – 4.00	Great Extent
2.50 – 3.24	Moderate Extent
1.75 – 2.49	Less Extent
1.00 – 1.74	Least Extent

As shown in table 4.2, students' perception towards math, moderate extent that students may believe he or she is incapable of doing Mathematics problem, 2.80; moderate extent that Math is often associated with pain and frustrations and Math is often taught as "there is only one way to do this, and you need to do learn it and do it right, 2.50; less extent that Students' misconception that they should be able to do mathematics quickly, 2.35; less extent that working on numbers upsets the students, 2.30; less extent that When heard the word "Mathematics", students have the feeling of dislike, 2.175.

As also shown in the table 4.2, students perception towards Mathematics contributes to the students' mathematics anxiety with a general weighted mean of 2.44 which is verbally interpreted as less extent. Adults, with and without disabilities, do not feel confident in their ability to do math (Duffy & Furner, 2002). The feeling of unconfident made the students feel that they cannot do any task related to Mathematics. As a result many students believe that they are incapable of answering Mathematics problems which results of having Mathematics fear or anxiety. Most of the students' perceptions and ideas about Math can also be affected by their interaction in the environment as well as the people in the surroundings. These ideas will serve as their foundation in early math which they will be using later in their formal schooling and high level of mathematics. This is affirming with the claim of Geist, (2003) that children begin to construct the foundations for future mathematical concepts during the first few months of life. According to Pajares and Miller (1995) and Lou et al. (2009), learning mathematics is about a student's emotional state. Students feeling of high level of anxiety about mathematics will lower their success in the subject.

Students' behavior/attitude towards mathematics

Table 4.3: Students' Behavior/Attitude towards Mathematics

Attitude Towards Mathematics	Weighted Mean	Verbal Interpretation
Scared of understanding the concepts.	2.525	Moderate Extent
Bad attitude towards mathematics.	3.50	Great Extent
When in mathematics class, he may be nervous.	2.475	Less Extent
There is a greater fear of answering a teacher questions incorrectly.	2.925	Moderate Extent

Inability or unwillingness to complete difficult assignments.	3.00	Moderate Extent
Worried about being called in Math class.	2.875	Moderate Extent
Not feeling confident about the subject.	2.725	Moderate Extent
Worried that the other students might understand the problem better than you.	2.825	Moderate Extent
Dread having to do the math.	2.825	Moderate Extent
Often think, "I can't do it," when in a mathematics class.	2.775	Moderate Extent
General Weighted Mean	2.845	Moderately Extent

Legend:

3.25 – 4.00	Great Extent
2.50 – 3.24	Moderate Extent
1.75 – 2.49	Less Extent
1.00 – 1.74	Least Extent

As shown in table 4.3, students' attitude towards Mathematics, great extent is the bad attitudes of students towards mathematics, 3.50; moderate extent on scared of understanding the concept, 2.525; moderate extent on being nervous in mathematics class, 2.475; moderate extent on there is a greater fear of answering a teacher questions incorrectly, 2. 925; moderate extent on the inability or unwillingness to complete difficult assignments, 3.00; moderate extent on being worried about being called in math class, 2.875; moderate extent on not feeling confident about the subject, 2.725; moderate extent on being worried that the other students might understand the problem better than you, 2.825; moderate extent on dread having to do math, 2.825; moderate extent on often think "I can't do it" when in mathematics class, 2.775.

It only shows that the students' behaviour/attitudes towards mathematics with a general weighted mean of 2.85 and verbally interpreted as moderately extent are factors as to why students have mathematics anxiety. A negative attitude toward mathematics is a growing barrier for many children in mathematics (Ashcraft, 2002; Popham, 2008; Rameau & Louime, 2007). Some studies made by Harari, Vukovic & Bailey, (2013) have focused on students as young as first-grade experiencing math anxiety. It also involves feelings of tension and anxiety that interfere with students' capability in manipulating numbers and solving mathematical problems in academic and real life situations. Students' inability and unwillingness to do solve math problems contribute to their negative behaviour towards mathematics. If that inability and unwillingness become too much, it may rise to their uncomfortable feeling and lack of confidence in performing activities related to Mathematics.

Students' experiences in attending math class

Table 4.4: Students' Experiences in Attending Math Class

Students' Experiences	**Weighted Mean**	**Verbal Interpretation**
Students experienced embarrassment when attending math class.	2.325	Less Extent
Students receive hurtful comments directly from the teacher.	2.25	Less Extent
Students experienced frustration when attending math class.	2.40	Less Extent
Students' prior negative experiences in Math class.	2.55	Moderate Extent
Scared to ask for help.	2.975	Moderate Extent
General Weighted Mean	2.5	Moderately Extent

Legend:

3.25 – 4.00	Great Extent
2.50 – 3.24	Moderate Extent
1.75 – 2.49	Less Extent
1.00 – 1.74	Least Extent

As shown in table 4.4, students experiences in attending math class, moderate extent on students prior negative experiences in math class, 2.55; moderate extent on scared to ask help, 2.975; less extent on experiencing embarrassment when attending math class, 2.325; less extent on receiving hurtful comments directly from the teacher, 2.25; less extent on experiencing frustration when attending math class, 2.40.

The table shows that students experiences in attending Mathematics class has a general weighted mean of 2.5 which is verbally interpreted as moderately extent can be a factor that contributes to the students anxiety in Mathematics. Whenever students feel that they are uncomfortable and have negative experiences in attending math class, it can affect their intellectual capacity to perform better in Math. Teachers are the persons that greatly influence the performance of the students. Teachers' attitude and encouragement toward mathematics was an important factor to children for having a good performance and achievement in Mathematics. It affirms the claim of Scarpello (2007) that teachers can reduce math anxiety and are considered an important element in encouraging students to attain good performance in Mathematics. Teachers must be sensitive also to the feelings of the students. They must choose a right words or comment for the students, praise them for their hard work and understand that students have a different learning styles so students learn indifferently sometimes below their expectations.

Taking math exams

Table 4.5: Taking Math Exams

	Weighted Mean	Verbal Interpretation
Scared of taking tests, especially timed tests.	2.95	Moderate Extent
When a student knows he will be having a test in the future.	2.80	Moderate Extent
When taking Math tests, students feel nervous.	2.65	Moderate Extent
General Weighted Mean	2.8	Moderately Extent

Legend:

3.25 – 4.00	Great Extent
2.50 – 3.24	Moderate Extent
1.75 – 2.49	Less Extent
1.00 – 1.74	Least Extent

As shown in table 4.5, taking math exams, moderate extent on scared of taking tests, 2.95; moderate extent on having a test in the future, 2.80; moderate extent on students feel nervous when taking math exams, 2.65.

The table shows that taking Mathematics examinations contribute to students Mathematics anxiety with a general weighted mean of 2.8 and verbally interpreted as moderately extent. When students are put in stressful environments that cause strong feelings of pressure, they tend to reduce engagement with tasks related to mathematics making these tasks harder to solve by reducing the capacity of the mathematical memory and sometimes below their actual ability which, consequently, can contribute to mathematics anxiety (Beilock, 2008)

Effects of mathematics anxiety

Table 5: Effects of Mathematics Anxiety

	Weighted Mean	Verbal Interpretation
Students may enrol in strands that require minimal courses in mathematics.	3.275	Strongly Agree
Students avoid mathematics-related task.	3.00	Agree
It has a negative impact on the self-esteem of the students.	3.10	Agree
Students' didn't enjoy attending mathematics classes.	3.10	Agree

Students feel inferior to their mathematical anxiety and are unable to move forward in their mathematical potential.	3.10	Agree
Students avoid studies in mathematics and therefore limit their career options.	2.775	Agree
General Weighted Mean	3.05	Agree

Legend:

3.25 – 4.00	Strongly Agree
2.50 – 3.24	Agree
1.75 – 2.49	Disagree
1.0 – 1.74	Strongly Disagree

The results indicated that math anxiety has a great impact on the course and career choice of Grade-11 students. The researchers found out that the factor that causes students' mathematics anxiety are the teachers, students' perception towards math, students' behaviour/ attitude towards math, students' experiences in attending a math class, and taking math exams.

Among those factors, mathematics anxiety is mostly caused when the teacher gives a written work every day, as well as students' bad attitude towards mathematics.

Mathematics anxiety really affects the course and career choice of Grade-11 students. Many students who suffer from mathematics anxiety have little confidence in their ability to do mathematics and tend to take minimum number of required mathematics courses, which greatly limits their career options.

As a result of their fears, more and more students are avoiding careers in math related fields. "Individuals with high math anxiety take fewer math courses, earn lower grades in the classes they do take, and demonstrates lower math achievement and aptitude than their counterpart with low math anxiety" (Ashcraft & Kirk, 2001, p. 224). Ashcraft and Kirk (2001) stated before a student is able to feel success in mathematics, they must believe in their ability to understand the subject matter and be able to construct meaning of numbers. These opportunities first take place around adults in the home environment and then progress in the school environment. Either way, the math learning environments need to be supportive and non- threating. Differentiated instruction, manipulatives, math talk, and meta- cognition techniques, are some ways to help students learn complex mathematics. Proficiency and mathematical success is the ultimate outcome for students at a time when math is a priority in our society.

Math anxiety is a key problem in the educational setting. Ashcraft (2002) expressed that math anxiety interferes with math performance. Students with high levels of math anxiety took fewer

math courses in high school and college. Math-anxious students had negative attitudes toward math and possessed negative outlooks on their mathematical aptitude. Ashcraft (2002) expressed that there was no surprise that people with math anxiety avoided career paths depending on math skills. These same students typically sidestepped college majors involving math. Richardson and Suinn (1972) explained that manipulating numbers in a wide variety of ordinary life and solving math problems in the academic setting were reasons for math anxiety. Math anxiety may prevent a student from passing fundamental mathematics courses or prevent the pursuit of advanced courses in mathematics.

Conclusions and Directions for Future Use

This study aimed to determine mathematics anxiety and its impact on the course and career choice of Grade-11 student. Specifically it sought answer to the following questions.

(1) distinguish what caused students' Mathematics anxiety;
(2) identify if Mathematics anxiety affects course and career choice among Grade-11 students;
(3) propose measures that may result to student's development of Mathematics efficacy.

Researchers found out that the causes of students mathematics anxiety are the teachers, students perception towards math, students behavior/ attitude towards math, students experiences in attending math class and taking math exams.

Mathematics anxiety has a big effect on the career choice of Grade-11 students. Because of mathematics anxiety students tend to enrol in strands that requires minimal courses in mathematics; students may avoid mathematics- related task; it causes a negative impact on the self-esteem of the students; students do not enjoy attending math classes; students feel inferior to their mathematical anxiety and are unable to move forward in their mathematical potential and students avoid studies in mathematics therefore limit their career options.

The result reveals that there is a significant relationship between mathematics anxiety and the course and career choice of Grade-11 students. Math anxiety can cause students to avoid challenging math courses and may limit their career choices. It is important for teachers, parents and students to be aware of the effects of math anxiety so that if a student is affected, the student can receive the support necessary to lessen or eliminate it. Teachers must incorporate strategies in teaching that may help their students to boost their self-confidence and reduce the anxiety. In short, if the teachers employ best teaching strategies, students' anxiety can be lessen.

Because of mathematics anxiety most of the respondents tend to choose Humanities and Social Sciences (HUMMS) as their study track. HUMMS is one of the strands in the K+12 programs which include the subjects Creative Writing, Philippine Politics and Governance. We can imply from these that this strand doesn't have too much mathematics related subjects. That's why most of the respondents choose this strand.

Another strand in the K+12 program is Accountancy, Business and Management (ABM). Some of this strand's subjects are Business Finance and Principles of Marketing. Science, Technology, Engineering and Mathematics (STEM) is also another strand in the K+12 program. Examples of mathematics related subjects of this strand includes Basic Calculus and General Chemistry 1. Based on the findings, the strands STEM and ABM are not the first choice of students because of a number of mathematics related subjects in these strands.

The foregoing findings and conclusions paved way for the researchers to recommend the following to prevent students' mathematics anxiety.

1. Asking students to record each day on a calendar something new that they learned from their math class.
2. Drawing students' attention to their growth and complimenting them on their specific skills.
3. Helping students to improve their lack-of-effort explanations when they perform poorly.
4. Calling attention to student ability when students succeed at meaningful and reasonably difficult task.
5. Letting students help decide on how to chunk larger goals into smaller, attainable ones.
6. Considering variety of ways in teaching mathematics by the teachers.
7. Making mathematics interesting.
8. Thinking that mathematics is more of a game than a hard work.
9. Catching the attention of students by the teachers.
10. Enjoying learning math through a variety of activities.
11. Encouraging the pursuit of mathematics by parents.

References

Beilock, S. L. (2008). Math performance in stressful situations. Current Directions in *Psychological Science*, 17, 339-343.

Cates, Gary, et al., *Journal of Behavioural Education* Vol. 12, No. 1, pp 23-24., March 2003.

Furner, J. M., & Duffy, M. L. (2002). Equity for All Students in the New Millennium: Disabling Math Anxiety. Intervention in School and Clinic, 67-74.

Harper, Norma Wynn, et al., Action in Teacher Education Volume 19, 1998

Hembree, Ray, The nature, effects, and relief of mathematics anxiety- *Journal for Research in Mathematics Education* Vol.21 No. 1, pp.33-46., National Council of Teachers of Mathematics, January 1990

Ma, X., A meta- analysis of the relationship between anxiety towards Mathematics and Achievement in Mathematics- *Journal for Research in Mathematics Education*., 1999.

Newstead, Karen., Aspects of Children Mathematics Anxiety- Educational Studies in Mathematics, pp. 56-71., June 1998.

Popham, W. J. (2008). Timed tests for tykes? *Educational Leadership*, *65*(8), 86-87.

Richardson, F. & Suinn, R. The Mathematics Anxiety Rating Scale: Psychometric data-*Journal of counselling Psychology*, pp.551-554., 1972

Scarpello, G. (2007). Helping Students Get Past Math Anxirety. Techniques: Connecting Education and Careers, 34-35.

Trujillo, K. & Hadfield, O., Tracing The Roots Of Mathematics Anxiety Through In-Depth Interviews With Preservice Elementary Teachers, College Student Journal, pp.219-233., 1999

Wigfield, Allan, et al., *Journal of Educational Psychology*, 1988.

Wigfield, Allan, et al., *Journal of Educational Psychology* Vol. 82, No.1, pp.60-70., 1990

Woodard, Teresa, The Effects of Mathematics Anxiety on Post-Secondary Developmental Students as Related to Achievement- Inquiry, Gender, and Age, Volume 9, Number 1., Spring 2004

APPENDIX

QUESTIONNAIRE

This questionnaire is presented to find out the impact of mathematics anxiety on the career choice of Grade-11 students. Indicate your honest and accurate responses to the best of your ability by checking and supplying the needed information.

General Directions: Kindly put a check mark (/) that corresponds to your answer.

1. Name (Optional):_____

2. Gender: Male ( ) Female ( )

3. Intended study track:
   - STEM ( )
   - ABM ( )
   - HUMMS ( )
   - GAS ( )
   - Tech-Voc ( )

4. Self-Report Achievement Level in Mathematics
   - 68-74 ( )
   - 75-80 ( )
   - 81-85 ( )
   - 86-90 ( )
   - 91-95 ( )
   - 96-99 ( )

I. Causes Students' Mathematics Anxiety

Directions: Kindly put a check mark (/) on the column opposite each item that corresponds to your answer based on the following scales.

4- Great Extent 3- Moderate Extent 2- Less Extent 1-Least Extent

The factors that causes students' Mathematics anxiety are:	4	3	2	1
• **The Teachers**				
1. Way of teaching math.				
2. Becomes angry or frustrated when his class does not understand the problems.				

3. May have unrealistic expectations of his students.				
4. Giving written work every day.				
5. Assigning mathematics problems as punishment for misbehaviour.				
6. Made students helpless in trying to understand the concepts.				
7. Has a weak teaching strategy.				
8. Promotes fear for students to perform in class.				
9. Pressure students to perform well in subject.				
10. Teaching approach or "explain-practice-memorize."				
• **Students Perception Towards Math**				
1. Students may believe he or she is incapable of doing Mathematics problem.				
2. Students' misconception that they should be able to do mathematics quickly.				
3. Math is often associated with pain and frustrations.				
4. Math is often taught as "there is only one way to do this, and you need to do learn it and do it right."				
5. When heard the word "Mathematics", students have the feeling of dislike.				
6. Working on numbers upsets the students.				
• **Students' Behaviour Towards Mathematics**				
1. Scared of understanding the concepts.				
2. Bad attitude towards mathematics.				
3. When in mathematics class, he may be nervous.				

4. There is a greater fear of answering a teacher questions incorrectly.				
5. Inability or unwillingness to complete difficult assignments.				
6. Worried about being called in Math class.				
7. Not feeling confident about the subject.				
8. Worried that the other students might understand the problem better than you.				
9. Dread having to do math.				
10. Often think, "I can't do it," when a mathematics				
• **Students' Experiences in Attending Math Class**				
1. Students experienced embarrassment when attending math class.				
2. Students receive hurtful comments directly from the teacher.				
3. Students experienced frustration when attending math class.				
4. Students' prior negative experiences in Math class.				
5. Scared to ask for help.				
• **Taking Math Exams**				
1. Scared of taking tests, especially timed tests.				
2. When a student knows he will be having a test in the future				
3. When taking Math tests, students feel nervous.				

II. Effects of Mathematics Anxiety on the Career Choice

4- Strongly Agree 3- Agree 2- Disagree 1-Strongly Disagree

Effects of Mathematics Anxiety are:	4	3	2	1
1. Students may enrol in strands that require minimal courses in mathematics.				
2. Students avoid mathematics-related task.				
3. It has a negative impact on the self-esteem of the students.				
4. Students' didn't enjoy attending mathematics classes				
5. Students feel inferior to their mathematical anxiety and are unable to move forward in their mathematical potential				

III. Proposed Measures to Develop Students' Mathematics Efficacy

4- Strongly Agree 3- Agree 2- Disagree 1-Strongly Disagree

Students' mathematics efficacy can be developed by:	4	3	2	1
1. Asking students to record each day on a calendar something new they learned that day or something by the teacher				
2. Drawing students' attention to their growth and complimenting them on their specific skills.				
3. Help students to practice lack-of-effort explanations when they perform poorly.				
4. Call attention to student ability when students succeed at meaningful and reasonably difficult task.				
5. Let students help decide on how to break up larger goals into smaller, attainable ones.				
6. Teachers should consider a variety of ways in teaching mathematics.				
7. Makes mathematics interesting.				
8. Think that mathematics is more of a game than it is hard work.				
9. Teachers should catch the attention of students.				
10. Students' must enjoy learning math through variety of activities.				
11. Parental encouragement to pursue mathematics.				

Interview Questions

1. Can you tell a positive and a negative experience of learning mathematics in elementary schools?

2. Can you tell a positive and a negative experience of learning mathematics in middle school?

3. Do you like to take mathematics classes?

4. What do you feel when taking math exams?

5. How your teacher teaches mathematics?

6. What are the strategies used by your teacher in teaching mathematics?

7. What are your perceptions regarding on mathematics?

8. What were your reasons for choosing your strand?

9. How your attitudes towards mathematics affect your course and career choices?