

Test Anxiety and College Students' Performance on Mathematics Departmental Examination: Basis for Mathematics Achievement Enhancement

Myrna D. Reyes (Ed. D), Aida C. Castillo

College of Education Arts and Sciences, Lyceum of the Philippines University, Batangas City, Philippines

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ABSTRACT

The study aimed to determine the relationship of performance of the students in the area of Mathematics specifically in Algebra and Trigonometry and their test anxiety. The researchers used the descriptive correlation research method that could best present and analyze information on the documentary analysis in students' mathematics performance and descriptive survey about math test anxiety. The data was gathered from the departmental examination given in Algebra and Trigonometry for the academic year of 2013-2014. The respondents of the study were 120 students who took Algebra in the first semester before they took Trigonometry for the second semester of the said year. The statistical tolls used were frequency, weighted mean and Pearson product moment of correlation. The results revealed that the students who took the subjects were obtained a poor performance rating. On the other hand, test anxiety in mathematics moderately felt by the students that is considered a factor that might affect the students' mathematics performance. The researchers also formulated an action plan for the enhancement of mathematics achievement to improve the passing rate in the departmental examination. The action plan focused on conducting/attending seminars regarding different learning strategies; conducting tutorial session or peer tutoring especially for those who have low performance in mathematics subjects; conducting seminar on reduction of test anxiety; conducting stress briefing to the students through the proctor before taking the exam; providing reward system in mathematics classes; and adapt fun learning techniques in teaching mathematics. And also, the researchers recommended to the math teachers to develop different learning strategies in all mathematics subjects and to provide relaxation techniques before giving the exam to their students.

Keywords: *enhancement, performance, strategies*

INTRODUCTION

Mathematics education is a necessity in almost all careers especially in the fields of technology, commerce, science, and economics and other related living and learning aspects of life. Evidently, it provides the basis on which technological advances are built upon. However, the attainment of the goals and objectives of mathematics education is impossible without the interests and capabilities of learning by the students. Moreover, mathematics is the core of knowledge from which critical and analytical skills are acquired and developed. Mathematics develops logical thinking which is necessary to maximize full productive uses of the benefits of science and technology.

Mathematics is a subject accepted as the mother of all learning with other subjects deriving their concepts from it, in both the arts and sciences. It is also an international language and is vital in almost every field like in handling money, measurements in fashion, angles in sports such as bowling and billiard, technology and economics. Hence, a good academic achievement in this subject is significantly important.

Good academic achievement is very important not only to students and their parents, but also to the learning institutions. The quality of students' academic achievement is influenced by psychological factors such as test anxiety. According to Chapell et al. (2005) test anxiety plays a significant role in academic settings and may prevent some students from realizing their fullest academic potential.

Mathematics requires the students to use analytical reasoning skills, problem solving skills and critical thinking skills. These higher order thinking skills are needed to be developed among college students in order to cope up with their major subjects. But still, these college students had low performance both in Algebra and Trigonometry as revealed on the result of departmental examination from the school year 2010 to 2013 done by College of Education, Arts and Sciences. Because of this, the researchers considered it necessary

to study the factors that may influence mathematics achievement. Based on the observations of the researchers, the students got worried if they will take a departmental examination for the reasons such as they don't know the content of the test, how difficult the test and afraid for unfamiliar test items.

Students' performance lies on the examination results, many students experience some nervousness or apprehension before, during, or after the exam. This kind of state anxiety can be a powerful motivator. However, some students experience test related anxiety to such degree that it can lead to poor performance and interfere with their learning. These students suffer from test anxiety also called examination anxiety. That's why; the researchers would like to find out the effects of the test anxiety on students' performance on departmental examination.

This study aims to serve as basis for the improvement of mathematics teaching and learning strategies. This study will also help the students to overcome mathematics test anxiety that will enable them to have a better academic achievement in mathematics. In addition, this study will be the backbone of the college in order to enhance the students' performance.

OBJECTIVES OF THE STUDY

The study generally aimed to determine the relationship of performance of the students in the area of Mathematics and their test anxiety. More specifically, to present the performance of the students on departmental examination in Algebra and Trigonometry for school year 2013-2014; to determine the respondents' test anxiety in Algebra and Trigonometry; to find the relationship between test anxiety and student performance ; and propose plan of action for mathematics achievement enhancement to address the issue of test anxiety.

LITERATURE REVIEW

Test and examinations at all stages of education, especially at higher education level have been considered an important and powerful tool for decision making in our competitive society, with people of all ages being evaluated with respect to their achievement, skills and abilities (Rana & Mahmood, 2010).

Test anxiety is a physiological condition in which people experience extreme stress, anxiety, and discomfort during and/or before taking a test. These responses can drastically hinder an individuals' ability to perform well and negatively affects their social

emotional and behavioral development and feelings about themselves and school (Salend, 2012).

As well, characteristics of the test environment such as nature of the task difficulty, atmosphere, time constraints, examiner characteristics, mode of administration and physical setting can affect the level of anxiousness felt by the student. A low anxious test taker is able to focus greater attention on the tasks required of them while taking the test, while a high anxious test taker is focused on their internal self, and anxiety they are feeling. Anxious test takers do not perform adequately on the test as their attention is divided between themselves and test. Therefore, students with high test anxiety are unable to focus their full attention on the test. Furthermore, anxiousness is evoked when a student believes that the evaluative situation, such as an assessment, exceeds his or her intellectual, motivational and social capabilities (Putwain, Woods & Symes, 2010).

Test anxiety negatively affects students' performance as revealed by the recent studies. For instance, Barrows, Dunn and Lloyd (2013) found that a strong relationship between both test anxiety and exam grades, and self-efficacy and exam grades. Further, multiple linear regression analyses showed that exam grade could be predicted by test anxiety and self-efficacy level, and that self-efficacy moderated the effects of anxiety.

Similarly, Yildirim (2012) found that high math self-efficacy is positively related to math achievement and high test anxiety is negatively related to math achievement. Hsieh, Sullivan, Sass, and Guerra (2012) found that self-efficacy and test anxiety both predicted students' final grades in a math class. Nelson and Knight's (2010) study showed that students can avoid negative outcomes of test anxiety by thinking of past achievement, which will build courage and endurance, and in turn will increase their self-efficacy. Those who focus on the area that they are skilled at, cope better and have lower anxiety. Positive thinking techniques can transfer into the classroom and help students excel in academic achievement as well. Students who perceive themselves as being competent will more likely strive to learn how to do better on challenging tasks such as exams. Those with high level of self-efficacy show lower levels of test anxiety, possibly because they believe in themselves and are able to imagine a successful outcome.

Rana and Mahmood (2010) found that a significant negative relationship exists between test anxiety scores and students' achievement scores. Results showed that a cognitive factor (worry) contributes more in test anxiety

than affective factors (emotional). Therefore, it is concluded that test anxiety is one of the factors which are responsible for students' underachievement and low performance but it can be managed by appropriate training of students in dealing with factors causing test anxiety.

Oludipe (2009) conducted a study to explore how test anxiety affects students' performance levels in the sciences, especially in Physics, and concluded that low test-anxious students performed better than high test-anxious students on both numerical and non-numerical tasks in Physics.

Test anxiety is known to develop into a vicious cycle. After experiencing test anxiety on one test, the student may become so fearful of it happening again they become more anxious and upset than they would normally, or even than they experienced on the previous test. If the cycle continues without acknowledgement, or the student may begin to feel helpless in the situation (Kendra, 2012).

According to Tsui and Mazzocco (2007) math performance was found to be less accurate during timed than untimed testing conditions. In fact, when students were not time in taking the sample test, they took twice as long to complete it as opposed to when they were timed. By looking at these results, test anxiety may be provoked by having to finish a set of math problems in an allotted amount of time. If one is affected by math anxiety as well as test anxiety, both anxieties may combine causing a student's performance to drop significantly.

In connection with this, Kesici and Ahmet (2009) found that test anxiety was a significant predictor for math anxiety; about 18% of the variance in mathematics anxiety was explained by test anxiety. Although this finding could lead to the explanation that some student's math anxiety may be due to a generalized test anxiety. Thus, those students who experience anxiety while taking tests may be at a heightened risk for experiencing math anxiety.

Similarly, Abdi et. al. (2012) tested 127 randomly chosen high school students with the Spielberger test anxiety scale. Correlations and regression analyses found a relationship between test anxiety and overall grade point average. Hassanzadeh, Ebrahimi, and Mahdinejad's (2012) study added to this literature in that the students' level of test anxiety can cause the students' academic performance to suffer even more depending on the length of time they suffer from test anxiety. These results show that test anxiety inhibits students' ability to focus on academics which negatively influences grades.

To overcome this, a small literature suggests that music is an effective means to reduce test anxiety. For instance, a study found a reduction in test anxiety with high school students and college students studying with background music for 10 minutes before an exam (Sezer, 2009). Additionally, music may refocus attention away from more aversive physiological stimuli and play a role in arousal control (Barwood, Weston, Thelwell & Page, 2009).

Erbe (2007) discussed various measures and strategies which can be applied by faculty members to reduce test anxiety among their students. The strategies which can be contextually relevant and useful for teachers can be; task orientation and preparation, positive thinking, seeking social support, avoidance, relaxation training, coaching/guided imagery, self-instructional training, establishing purpose, affirmation, modalities, positive anchors, mental simulations, use of humor and study skills training.

METHODS

Research Design

The study used the descriptive correlation research. It is concerned with functional relationships between variables and the testing of hypotheses. It aimed to find the relationship between mathematics performance and test anxiety.

Participants

The data of the study consisted of rating performance of all students who took Math subjects such as Algebra and Trigonometry for the school year 2013 - 2014. The researchers administered the questionnaire about test anxiety to 120 students out of 426 students who had taken the departmental examination in Algebra and Trigonometry for the school year 2013 - 2014.

Instrument

The main data were the results of the departmental examinations in Algebra and Trigonometry for the school year 2013 - 2014 and the test anxiety questionnaire. This questionnaire was developed by Nist and Diehl (1990) and Maloney et. al. (2010) to determine the student experiences on how mild or severe case of math test anxiety. It consisted of 15 items using five Likert scales such as: Never (N), Rarely (R), Sometimes (S), Often (O) and Always (A). On the other hand, items were given Likert scale values of 1 - 5 with 1 as the lowest and 5 as the highest.

To interpret the scores in weighted mean test the following value range was used: 4.5 – 5.0: Always/Very High; 3.5 – 4.49: Often/High; 2.5 – 3.49: Sometimes/Average/Moderate; 1.5 – 2.49: Rarely/Low; 1.0 – 1.49: Never/Very Low.

The given scale was used to analyze the result of Mathematics Departmental Examination: 96 – 100: Highly Proficient/Very Good; 90 – 95: Proficient/Good; 84 – 89: Progressing Towards Standards/Fair; 83 – below: Not Met/Poor.

Procedure

Researchers formulated the objectives and rationale based from the title and had it validated. Then the researchers collated some related literatures to support the topic through the use of books, journals and some electronic references. The researchers distributed test anxiety questionnaire to the participants of the study while documentary analysis was used together with the results of the departmental examination in Math from the office of CEAS.

Data Analysis

The data that were gathered were presented in graphical and tabular form to interpret the results, descriptive statistics such as frequency distribution, weighted mean and Pearson r were used. Frequency distribution and weighted mean were utilized to determine the performance of students and students’ test

anxiety. Pearson r was used to determine the relationship between test anxiety and students’ performance in mathematics departmental examination. All data were treated using SPSS version 18 to further analyze the result using 0.05 alpha level.

RESULTS AND DISCUSSION

Performance of the Students on Departmental Examination

Based from the graph, it shows that there is poor performance with regards to Algebra since “not met” obtained the highest frequency from different colleges. It is followed by progressing towards the standard then by proficient. The results revealed that students find hard time in analyzing and learning mathematical concepts. As Algebra finds use to everyday life, continued education and daily living, students must be successful in their activities using algebra, not only those students who are highly capable in mathematics but more important used in nearly every scientific discipline. Algebra is found related to business, industry, science and technology. As Chapell et al. (2005) cited that test anxiety plays a significant role in academic settings and may prevent some students from realizing their fullest academic potential.

It had the same result to the performance of the students in departmental examination in Algebra last school 2012 – 2013.

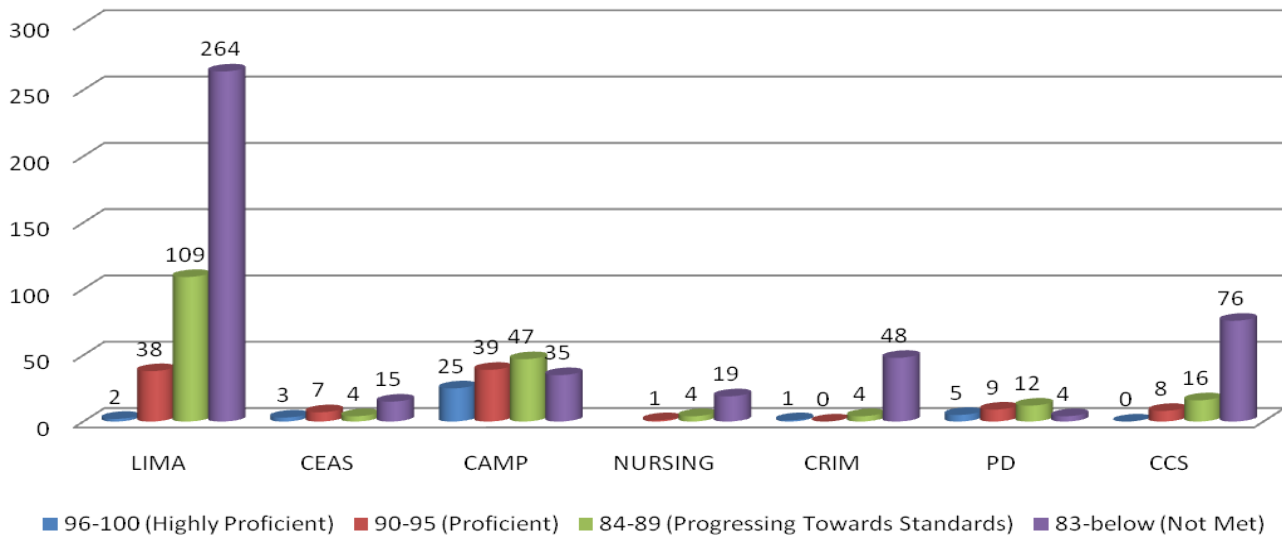


Figure 1. Frequency Distribution of Departmental Exam Results in Algebra (1st Sem. SY 2013-2014)

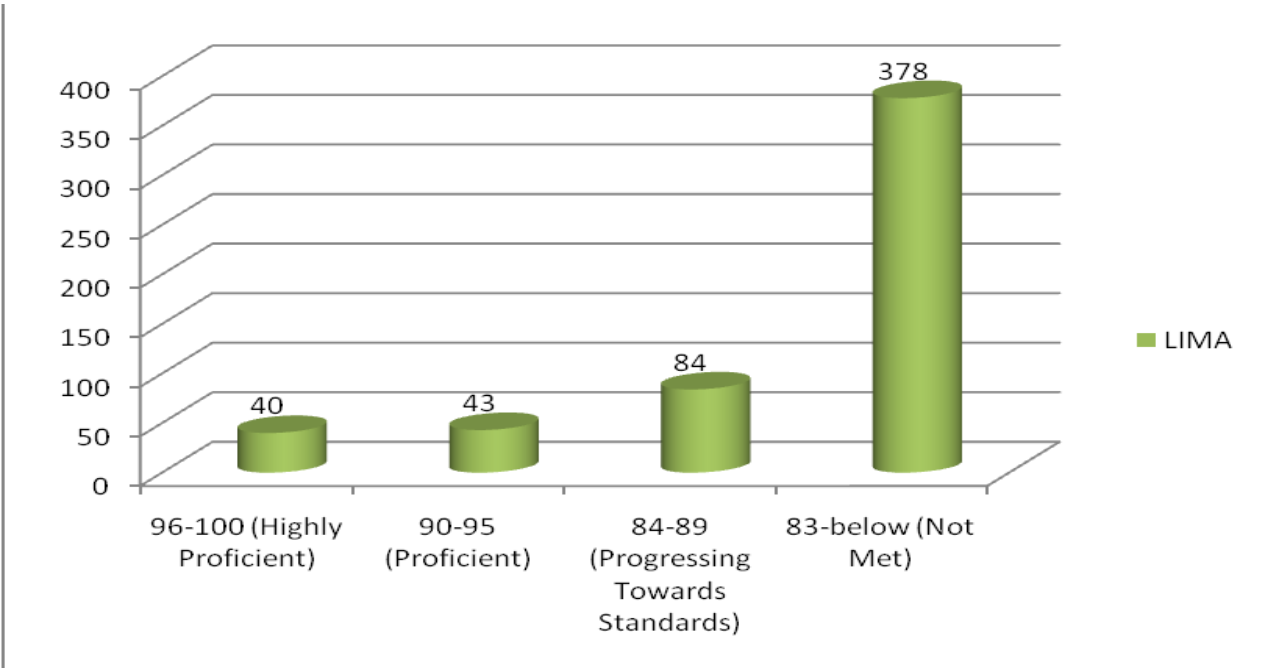


Figure 2. Frequency Distribution of Departmental Exam Results in Trigonometry (1st Sem. SY 2013-2014, LIMA)

Graph revealed that 378 students who took the exam in Trigonometry from Lyceum International Maritime Academy were not able to meet the standard for the subject, however, 40 of them were highly proficient, 43 were proficient and 84 were progressing towards standards. Students have find difficulty understanding the principles and concepts of trigonometric functions. There is a need to develop mathematical attitude, objectivity and patience through problem solving and analysis. As supported by Knight

and Nelson (2010) that positive thinking techniques can transfer into the classroom and help students excel in academic achievement as well. Students who perceive themselves as being competent will more likely strive to learn how to do better on challenging tasks such as exams. Those with high level of self-efficacy show lower levels of test anxiety, possibly because they believe in themselves and are able to imagine a successful outcome.

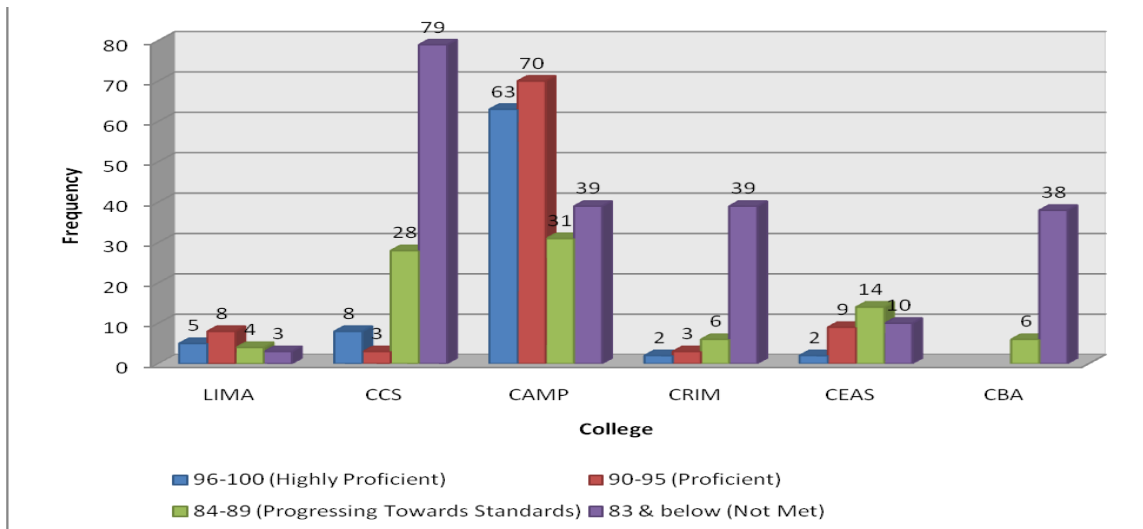


Figure 3. Frequency Distribution of Departmental Exam in Trigonometry (2nd Sem. SY 2013-2014)

From the six colleges who were taking Trigonometry, graph revealed that College of Computer Studies got the highest frequency of 79, College of Allied Medical Professions and College of Criminology got the same frequency of 39 followed by College of Business Administration with the frequency of 38 that fall under the criteria of not met. However, CAMP obtained the highest frequency of proficient and progressing towards standards. The failure of the students in the departmental examination may due to test anxiety. A low anxious test taker is able to focus greater attention on the tasks required of them while taking the test, while a high anxious test taker is focused on their internal self, and anxiety they are feeling. Anxious test takers do not perform adequately on the test as their attention is divided between themselves and test. Therefore, students with high test anxiety are unable to focus their full attention on the test. Furthermore, anxiousness is evoked when a student believes that the evaluative situation, such as an assessment, exceeds his or her intellectual, motivational and social capabilities (Putwain, Woods & Symes, 2010).

Table 1 presents the mean score of the mathematics test anxiety of students in Algebra and Trigonometry. It can be gleaned from the table that respondents sometimes felt test anxiety in mathematics with a

composite mean of 2.50. The items registered high to very high mean ranging from 2.07 – 2.84 interpreted as “sometimes” and “rarely”.

The results revealed that thinking about an upcoming math test one day before is the highest in rank with a weighted mean of 2.84 interpreted as “sometimes”. Most of the respondents feel like they need to prepare much more math tests than for other subjects and math tests are much more stressful to them than other tests both obtained 2.78 and tend to do very poorly on math tests with weighted mean 2.60. However, among the mathematical test anxiety, the lowest 2 and rarely felt by the respondents are they don’t know how to study math test (2.07) and when they studying for a math test, they find themselves showing anxious behavior (2.16).

This implies that the students have find mathematics test an anxiety; they really encountered difficulty in learning Mathematics. Test anxiety is a physiological condition in which people experience extreme stress, anxiety, and discomfort during and/or before taking a test. These responses can drastically hinder an individuals’ ability to perform well and negatively affects their social, emotional and behavioral development and feelings about themselves and school (Salend, 2012).

Table 1. Assessment on the Mathematics Test Anxiety of Students in Algebra and Trigonometry

Indicators	WM	VI	Rank
1. I tend to do poorly on math tests.	2.60	Sometimes	5
2. I feel like I need to prepare much more math tests than for other subjects.	2.78	Sometimes	2.5
3. Math tests are much more stressful to me than other tests.	2.78	Sometimes	2.5
4. I feel that I understand certain math concepts in class but do poorly on tests.	2.52	Sometimes	8.5
5. I have trouble concentrating math test (racing thoughts, can’t focus, “blinking out”, etc.).	2.55	Sometimes	7
6. I do not feel confident when taking math tests no matter how much I study.	2.43	Rarely	10
7. I feel that I can’t trust my intuition and often second guess myself during math tests.	2.52	Sometimes	8.5
8. When studying for a math test, I find myself showing anxious behavior (fidgeting, pacing, making excuses, avoiding the situation, etc.).	2.16	Rarely	14
9. During the math test, I find myself comparing my progress to those around me.	2.63	Sometimes	4
10. I think about an upcoming math test one day before.	2.84	Sometimes	1
11. I tend to zone out in math test.	2.40	Rarely	11
12. I fear math tests more than any other kind.	2.33	Rarely	13
13. I don’t know how to study for math tests.	2.07	Rarely	15
14. When I am taking math tests, I usually feel nervous and uneasy.	2.58	Sometimes	6
15. I feel scares when taking math tests.	2.38	Rarely	12
Composite Mean	2.50	Sometimes	

Legend: 4.50 – 5.00 = Always; 3.50 – 4.49 = Often; 2.50 – 3.49 = Sometimes; 1.50 – 2.49 = Rarely; 1.00 – 1.49 = Never

The students are anxious about their upcoming math test; as supported by Nelson and Knight's (2010) study this showed that students can avoid negative outcomes of test anxiety by thinking of past achievement, which will build courage and endurance, and in turn will increase their self-efficacy.

Students perceived that math test were much more stressful than other tests. Rana and Mahmood (2010) found that a significant negative relationship exist between test anxiety scores and students' achievement scores. Results showed that a cognitive factor (worry) contributes more in test anxiety than affective factors (emotional). Therefore, it is concluded that test anxiety is one of the factors which is responsible for students' underachievement and low performance but it can be managed by appropriate training of students in dealing with worry and emotional factors causing test anxiety.

Based from the result of Table 2, it was found out that there is a significant relationship between math test anxiety and performance in Trigonometry. This means

that the students' math test anxiety is affected by their performance in Trigonometry.

Table 2. Relationship between the Performance in Trigonometry and Mathematics Test Anxiety

Performance in:	r-value	p-value	Decision
Trigonometry	0.484	0.000*	Rejected

*Legend: Significant at p-value < 0.01; * Highly Significant*

As revealed by the recent studies, test anxiety negatively affects students' performance. Barrows, Dunn and Lloyd (2013) found that there is a strong relationship between test anxiety and exam grades, also self-efficacy and exam grades. Similarly, Yildirim (2012) found that high math self-efficacy is positively related to math achievement and high test anxiety is negatively related to math achievement. These results show that the test anxiety inhibits students' ability to focus on academics which negatively influences grades.

Table 3. Proposed Action Plan for Mathematics Achievement Enhancement

Key Result Area	Objectives	Proposed Plan of Action	Persons Involved	Outcomes
Mathematics Performance	To update mathematics professors about the innovative learning strategies for the improvement of the students' performance.	Conduct/attend seminars regarding different learning strategies.	Mathematics professors HRMD office	Mathematics professors will gain innovative teaching/learning strategies.
	To boost self confidence and mathematics performance of the students.	Provide reward system in mathematics classes.	Mathematics professors	Students will develop more positive attitudes toward the subject.
		Adapt fun learning techniques in teaching mathematics.	Mathematics professors	Students will actively participate in their mathematics class.
		Conduct tutorials session or peer tutoring especially for those who have low performance in mathematics subjects.	Students Unified in Mathematics (SUM) officers	Students develop peer bonding and become more open to ask questions and work tasks they find confusing and difficult.
Test Anxiety	To lessen test anxiety during the exam.	Conduct seminar on reduction of test anxiety.	Department Chair, Mathematics professors and students	Students show calm and self assurance that they may take the test, complete it and pass it.
	To develop relaxation technique among students	Conduct stress briefing to the students through the proctor before taking the exam.	Mathematics professors and students	Students become relaxed and have calm composure before and during examination.

CONCLUSIONS AND RECOMMENDATIONS

The students obtained a poor performance rating in Algebra and Trigonometry. The students moderately felt test anxiety in mathematics. Test anxiety is considered a factor that might affect the students' mathematics performance. A plan of action for the enhancement of mathematics achievement to improve the passing rate in the departmental examination is proposed.

Teachers may develop different learning strategies in all mathematics subjects. Teachers may provide relaxation techniques before the exam. One of the student outcomes (SO) should be required for students to accomplish their academic pursuit is the ability to apply knowledge of mathematics and science to solve problems (Laguador, 2013). The proposed plan of action may be implemented and evaluated for mathematics achievement enhancement. Future researchers may conduct similar study using other variables that are covered in this paper.

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