
Pathological Fear of Students in Mathematics: Gender Differences

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Abstract

The study explored the pathological fear in Mathematics of male and female college students. The study utilized the mixed method of research with 199 first year non-Math students as participants to determine the causes, effects, and ways of overcoming this fear. It made use of the cross-sectional design to explore the strategies of overcoming this pathological fear among the students. Results revealed that the students fear Math because of the influence of their friends, personal capacity, and the complex nature of Math. The male and female students differ in the prime cause of pathological fear. The cause as identified for the males is nature of the subject while personal capacity for the females. The students' fear in Mathematics affects their performance in the subject. The main effect of the students' fear in Math is recalling what had been learned when preparing for an examination. As a way of overcoming this fear, the female students cited that the teaching of mathematics should be made enjoyable. The male students suggested that they should be taught how mathematics is applied in everyday life situations. The students also need their parents' support, encouragement, and motivation. On the part of the teachers, the students suggest the use of appropriate teaching strategies to make mathematics learning more meaningful.

Keywords: pathological fear, mathematics, gender differences, mixed method

Introduction

Mathematics is a vital subject in all levels of education. It is a fundamental subject in the K-12 curriculum. In the Philippines, mathematics is a general education subject in the tertiary education. It is a required subject because of its role in a person's success in all fields like business, the humanities, the arts, social and behavioral sciences, and in technical

and non-technical fields. Mathematics is also a very crucial tool in the study of specialized courses like physics, chemistry, and engineering. Moreover, the importance of mathematical skills is seen in one's personal life like in daily life activities such as budgeting, marketing, payments, the filing of income tax returns, interpreting charts, and graphs, and

many others. In the article of (Mizell, 2015), he stresses the need to prepare students with skills for the 21st century. He strongly believes that new skills need to be developed for the students to be ready for global workforce due to the increased globalizations and innovation in technology. According to Mizell, the Pacific Policy Research Center reported that some of the 21st-century skills include mathematical literacy, critical thinking, creativity and problem-solving. He contends that mathematics is very important because major public issues all depend on data, projections, inferences, and the kind of systematic thinking that is the crux of quantitative literacy.

Despite the role of mathematics in education, profession, and routine activities particularly in the 21st century, Yahya and Fasasi (2012) report that many students are not interested in the subject. These students do not possess a positive attitude toward the subject. In Nigeria, Emenalo (2006) claims that students in most schools do not attend their classes in mathematics regularly. If they attend classes, they do not show their interest during class discussion. These students are found to have a fear in the subject. According to Philips (2015), fear in math is a very real problem that occurs in many people around the world. Pathological fear is one of the kinds of fear being experienced by students. In the study, "Perception of students" (n.d.), it was claimed that pathological fears in mathematics is a behavior disorder where a person cannot immediately struggle the effect of fear in the subject. It is an abnormal and insistent anxiety of mathematics. Those who have pathological fear experience unnecessary nervousness even if they know that the subject does not pose a threat to them. As cited in Yahya & Fasasi (2012), fear in mathematics is an academic infection although the faces of the students in their classes are the signs of this anxiety. This illness is also known as pathological fear. Stephen's study (as cited in Yahya and Fasasi, 2012), emphasized that when a student is afraid of something, he will do everything to avoid it.

In Nigeria, Yahya & Fasasi (2012) conducted a study on how to overcome fear in mathematics among the secondary students in Nigeria. The strategies suggested by the respondents that could be used to overcome fear in mathematics include use of games, heuristic method of teaching and the use of induction techniques.

In the Philippines, Cadorna, et al. (2013) determined the anxiety of non-Physics students in Mathematics. In this study, students' anxiety in thinking Math, taking a Math test, learning Math, and solving Math problems were measured. Findings showed that anxiety existed among the non-Physics students. The students experienced Math anxiety particularly in solving math problems, in taking math examinations and in thinking about math. Cadorna also cited Luo, et al. who investigated the mathematics anxiety of secondary students. The performance of the students was found to have a bearing on their level of fear. Furthermore, both interest and self-efficiency were found to be correlated significantly with mathematics anxiety. Gender comparison showed that female exhibited a significantly higher level of math anxiety than the male students.

In order for students to become successful in the global workforce, there is a need to prepare them with the 21st century skills. However, the teaching and learning of mathematics at the tertiary levels is in a depressing situation. This situation is not only true in Philippine setting but also true in other countries. Based on experiences, like how students find difficulty in understanding mathematics, teachers are hard up in finding ways and means to teach the subject the easy way. Students have anxiety and fears during examinations. The faces of these students reflect their lack of confidence in the subject. Many of them always look stuck as they read through the mathematics test papers. These problems have caused many students to develop phobia in mathematics from elementary to secondary and until tertiary levels. The researchers have seen the need for this academic fear to be

addressed, especially to the first year college students. It is, therefore, necessary to examine the contributing factors for the students' fear of mathematics, its effects on the students, and recommend ways that might reduce this fear for the purpose of building students' interest and developing a more positive attitude towards the subject which consequently improves academic performance in the subject.

On the part of the teachers, knowledge of the causes and effects of pathological fear in mathematics will make them fully understand the feelings of these students and their weaknesses in mathematics. They can also distinguish the characteristics of their students when they experience fear in their classes. Findings on the strategies to reduce pathological fear will make the teachers and parents select the appropriate strategies for their students/children to overcome this anxiety. This will be an avenue for the teachers to go over their teaching styles and reflect whether these develop the confidence of their students in developing their mathematical competencies.

Theoretical Framework

The study is anchored on emotional processing theory of Foa and Kozak (1985, 1986). This theory builds on Lang's concept of fear structure to explain the psycho-pathology and treatment of anxiety and its disorders. According to this theory, pathological fear structure contains associations among the stimulus, response, and meaning representations that distort reality and includes excessive response elements (Rothbaum, 2006).

Alexander (2010) considers fear in mathematics as a feeling of tension that affects students' accomplishment of mathematical tasks especially in solving mathematical problems. This kind of fear manifested by worry, high negative emotions, perspiring palms, or an increasing beat of the heart is called pathological fear.

Meanwhile, Stephen as cited in Yahya &

Fasasi, 2012, theorizes that fear in mathematics is called mathematics anxiety, mathemaphobia, or pathological fear in mathematics. Pathology, as defined by Tobias, as cited by Rossnan, 2006, is a scientific study and diagnosis of disease through examination of organs tissue, bodily fluids, and whole bodies. Whereas, fear is an emotional response to threats and danger. It is a basic survival mechanism occurring in response to a particular stimulus, which in this study could be mathematics tests or examination, and class discussion.

Rossmann (2006) supports the view of Tobias that fear in math is a learned emotional response through one or more of the following: participating in a math class, listening to a math lecture, working through mathematical tasks and discussing mathematics problems with friends. Rossmann further asserts that this fear or anxiety could exist in students at the elementary, secondary, and tertiary. On the other hand, Jain and Dowson (2009) define fear in mathematics as the effect of person's failure to manage frustration, poor self-efficacy, school absenteeism, negative attitude towards mathematics, and giving importance of learning using drill and practice without understanding.

The development of fear in mathematics is affected by intellectual capacity, personality, and environmental factors. Personality variables include self-esteem, self-concept, attitude, confidence and learning behavior. Meanwhile, intellectual variables comprise of concepts related to students' academic performance. On the other hand, environmental variables include experiences of the students outside of the school like in the house with their family members, environment with their friends and relatives, and extrinsic expectations.

Alexander (2010) cites Ho, et al. who claim that the problem of mathematics anxiety among students exists all over America and in many countries in the world. According to Hembree (1990), students' avoidance of mathematics is one of the most important consequences of anxiety on the subject.

In Nigeria, Emenalo (2006) maintains that insufficient teaching resources of teachers in the teaching and learning process are some of the causes of phobia in mathematics. Other causes of Phobia include an inappropriate system of examination, incompetent math teachers, and the inherent fear of the students in mathematics.

Phillips (2015) contends that fear in math is a very real problem that occurs in many people. Hence, this subject must be treated properly to overcome students' fear in the subject. Phillips suggests that teachers should assess the teaching strategies that do not match with the learning styles of their students. Mathematics teachers should use different ways of teaching the subject like role-playing, cooperative learning, use of visual aids, hands-on activities, and the utilization of technology. Once the students see learning of math as fun, they will enjoy it and will come to love it. In this way, the topic is inculcated not only in the minds of the students but also in their hearts.

To overcome mathematics phobia, Furner & Bernan, (2003) emphasizes the need for a proactive role of teachers in providing opportunities for their students to become actively involved in doing mathematical tasks. Active involvement in a learning task contributes to successful problem solving. The teachers must show that they like the subject, make math teaching enjoyable, show the use of math in routine activities, using teaching strategies that will boost the interest of students, and giving students successful learning activities that attain learning objectives.

Moreover, Woolfolk (1995) as cited in Rossnan (2006), strongly believes that teachers can best help their students overcome mathematics anxiety by careful use of competition in class, giving clear instructions, not to put too much pressure on their students especially on giving mathematical computations during examinations. The teaching of math should be made such that it fits the learning

style of the students. The active method is more effective in improving students' performance than passive ones.

This study has similarity with the studies aforementioned. However, it differs in many aspects. The methodology used is an improvement of the methods used in the previous studies (Yahya & Fasasi, 2012; Emenalo, 2016, Rossman, 2006; Cadorna, 2013) to determine the factors contributory to the pathological fear of students in mathematics and possible ways to overcome if not to reduce their fear.

Objectives of the Study

The study aimed to determine the pathological fear in mathematics of the first year students enrolled in non-mathematics courses. Specifically, it sought to unveil the characteristics of students with pathological fear in mathematics; the causes and effects of this fear on the students' performance. It also looked into the differences in the experiences of male and female students as to the causes and effects of pathological fear in mathematics; and recommend ways on how to overcome this fear.

Methodology

Research Design. The study utilized mixed methods of research: quantitative and qualitative. The findings of the quantitative part were needed to develop the qualitative phase. The quantitative method was employed to determine the students who have fear or anxiety in mathematics through the use of a questionnaire. This method was likewise utilized to determine the most common causes and effects of pathological fear in mathematics and the students' perceived ways of reducing this fear. The use of mixed method in this study makes it different from the previous studies conducted.

The qualitative research method, through the informal semi-structured interview method,

was employed to 18 randomly selected students to get a range of ideas as to the details of their experiences (three from each of the six colleges). The interview with the students was done for a period of one week. The study necessitated the use of mixed methods for purposes of triangulation and complementarity. Using mixed methods, convergence, corroboration and enhancement of results were done from the varied methods used. The mathematics teachers were likewise interviewed to get their ideas on how to reduce students' fear in mathematics. On this aspect of the study, ways of reducing or overcoming pathological fear in the subject, the cross-sectional research design was used in which the responses of the students and the teachers were analyzed separately.

Population and Sample. The respondents of the study were the 199 first year college students who were identified to have a high level of math anxiety from the 312 who answered the Test Anxiety Questionnaire during the first phase of the study. These were the first-year students enrolled in non-mathematics courses, which are BS Medical Science Laboratory and BS Nursing, BS Education, BS Criminology, BS Social Work, and BS Industrial Technology. The respondents composed of 119 females and 80 males. There were more females with a high level of anxiety in mathematics.

There were also 16 college math teachers who participated in the study. They were requested to answer the section on ways to reduce pathological fear. Also, they were also personally interviewed by the researchers for purposes of corroboration, enhancement, verification, and to capture other answers that are not found in the questionnaire.

Data Gathering Instrument

The study used the Mathematics Anxiety Rating Scale (MARS-R) used by Yucedag-Ozcan and Brewer (2011) to identify the students with high level of anxiety in mathematics. Some items in the questionnaire were removed, others

revised and additional items were constructed to suit the needs of the study. The adapted questionnaire was pilot tested to 360 first year college students to establish the reliability. Using the Cronbach Alpha, its reliability is very high at 0.924.

The Pathological Fear in Mathematics Questionnaire (PFMAT Q) of Yahya and Fassasi (2012) was utilized to determine the most common causes, effects, and ways of reducing pathological fear as experienced by the respondents. Since the questionnaire was used in a foreign country, it was subjected to pilot testing in Philippines setting using first-year college students to establish its reliability. The table below summarizes the reliability of the questionnaire using the Cronbach Alpha.

Questionnaire Part	Cronbach Alpha
Causes	.90
Effects	.95
Ways to reduce/overcome	.88
Whole	.91

Data Collection Procedure

The research flow followed a two-tiered process. Preliminary data gathering was first done to identify the respondents of the study. The 312 first-year college students answered the adapted and pilot-tested Math Anxiety Questionnaire. From the results of the survey, only those with a high level of anxiety were the respondents of the study. The PFMAT Q was then administered to the 199 students to ascertain the most common causes, effects, and ways of overcoming pathological fear based on their experiences.

The study also required the use of the exploratory method through the qualitative research to find out the students' experiences as to why they feared the subject and the consequences or results of that feeling to their performance in the subject. The researchers also asked the students how they were able to overcome the problem and what should their

parents do to help them reduce the fear in the subject. The students' responses during the interview were analyzed and discovery of new themes were done. Personal interview with the teachers was also conducted for purposes of triangulation and complementarity as regards to the ways of overcoming pathological fear in mathematics.

This study observed ethical considerations. Before the data gathering, the researchers sought informed consent from the respondents. They were, likewise, ensured of confidentiality of their personal identities.

Statistical Treatment of Data

The following statistical tools were utilized to analyze the data gathered in the study: the frequency count and percentage, weighted mean, and t-test of significant difference between means for independent samples to compare statistically the experiences of the male and female students as regards their pathological fear in mathematics.

The dimensions of the causes and the effects of pathological fear were determined to further explain the data gathered. The Factor Analysis using the varimax rotation were used to explore the dimensions which were as follows: environmental influence, personal capacity, and nature of math for causes; and, failure and absenteeism for the effects.

Results and Discussion

Characteristics of the Student-Respondents

The 199 first-year college students who were identified to have a pathological fear in mathematics were those who displayed high to very high level of anxiety through the MARS-R instrument. There were more females (60%) than males (40%). They were enrolled in health-related courses, social work, criminology, industrial technology, and other non-math

education courses. Their ages ranged from 16-23, but a majority were aged 17. Their fathers were mostly skilled workers, like farmers, tricycle drivers, carpenters, and fisherfolks. On the other hand, a majority of the mothers of the students were housewives. Only around 12 percent, of them, had mothers who worked in the government. Meanwhile, more than two-thirds of them resided in the barangays; the others stayed in the Poblacion and the city.

From the results of the MARS-R Questionnaire administered to the students, Table 1 shows that generally, these students have a high level of anxiety (M=3.95). By gender, the females obtained a higher score (M=4.08) than the males (M=3.82). They were very more anxious in mathematics evaluation (M=4.04, High) than in learning mathematics (M=3.86, High). It was in taking final and midterms examinations where both the male and female students were most frightened. The students tended to panic more when they took quizzes, long tests, midterm, and final examinations.

Table 1. Mean Math Anxiety Scores of the Students

Math anxiety	Female		Male		As a whole	
	M	DR	M	DR	M	DR
Math evaluation	4.19	High	3.88	High	4.04	High
Math learning	3.97	High	3.75	High	3.86	High
Overall	4.08	High	3.82	High	3.95	High

Note: M = Mean, DR = Descriptive Rating

The results of the survey corroborated with the results of an interview with some students. The students divulged that it when they took mathematics tests they were very anxious because they might not be able to perform well or get a low score in test. When they were asked whether they experienced sweating, slight trembling, and other manifestation of fears, the students affirmed that they did.

Level of Pathological Fear in Mathematics of the Students

The pathological fear of the students was assessed using the mixed methods, i.e., used of quantitative and qualitative methods of the mixed method. This section presents the most common causes, effects, and methods of overcoming pathological fear based from the responses of the students in the PFMAT-Q, and the semi-structured personal interview conducted by the researchers. Also presented is the transcript of some students' responses during the interview.

A. Causes

The causes of pathological fear in math were based on the results of the quantitative assessment. There were three identified causes, namely; environmental, personal capacity or self-efficacy, and nature of math.

Results of the PFMAT-Q showed that the female students considered personal capacity or self-efficacy as the prime cause of pathological fear ($M=3.91$). These students claimed that they could not see the relationship between their knowledge in mathematics with real-life situations. Also, they divulged that they lack confidence in solving word problems. They, likewise, accepted that they had a poor background in mathematics. Meanwhile, the second most common cause of pathological fear among the female students was the nature of mathematics ($M=3.75$). These students perceived that due to the abstractness of mathematics they were anxious when confronted with formulas and mathematical symbols. This group of students was not definite whether what they felt was due to environmental influence like parental indoctrination or peer group effect.

The males, on the other hand, considered the nature of mathematics as the prime cause of pathological fear ($M=3.88$). They believed that the study of mathematics required a

lot of thinking. This result implies that the male students do not have enough patience to think. Like the female students, they also accepted that they were also anxious about the use of mathematical symbols and formulas in solving math problems. As shown in Figure 1, personal capacity is the number one cause of pathological fear in math among the female students while this ranks second among the male students. Similar with the female students, the difficulty in relating math to real life situations and the lack of self-confidence in solving math problems were the root causes of pathological fear under personal capacity. Unlike the female students, the male students considered environmental influence as a cause of pathological fear. This group identified that their anxiety in mathematics was due to the influence of their peer and the indoctrination of their parents. Results also showed that their teachers also instilled in them fear in the subject during class discussions.

Presented below is the transcript of the interview with some students about the reasons for their fear in math. (Note: F and M after the students' number refer to female and male respectively)

StudentB10-F: *Some topics and formulas are hard to memorize.*

StudentB9-M: *I tend to forget the equations to use in solving equations, the lessons are very confusing because they seem to be the same. Some of the solutions are very long. Sometimes I don't understand the lesson.*

StudentB5-M: *I always hear others complaints about the difficulty of math topics, and I am carried away by the feeling that math is really a hard subject. Another reason is the presence of some teachers who cannot teach the lesson in a simpler way. They teach math in a complex way.*

StudentB2-M: *I fear math because of the complicated equations and formulas in solving problems and because I am not good at math.*

The responses of the students during the interview strengthens the above claim that the causes of fear in mathematics are low level self-efficacy or personal capacity, the influence of others, and the complexity of equations and formulas involved in solving math problems.

Significant Difference in the Causes of Pathological Fear Between the Male and Female Students

The mean scores of the male and female students on the causes of pathological fear in Mathematics were compared statistically using the t-test of significant difference for independent samples. Table 2 presents the results of the analysis.

It can be gleaned from the table that the results reveal that generally, the male and female students do not differ significantly in their responses as to the causes of pathological fear in Math ($t\text{-value}=0.643$, $p>0.05$). However, regarding the three dimensions, the difference is statistically significant on the environmental causes of pathological fear ($t=3.169$, $p<0.05$) but not on personal capacity and the nature of math.

This result means that the male and female students varied in their experiences as regards their fear of mathematics as a result of environmental influence like the influence of their peers, parents, and teachers.

This outcome is consistent with earlier findings as regards with the descriptive analysis

of the causes of pathological fear between the male and female students.

The overall responses of the students confirm the results of the study of Yahya and Fasasi (2015) for the secondary Nigerian students. However, Yahya and Fasasi did not mention the differences between the male and female students regarding the specific causes of pathological fear.

B. Effects on Performance

There are two dimensions of effects of pathological fear that came out based on the factor loadings after doing factor analysis of the items. These are failure and absenteeism. An assessment of the responses of the students across gender, as regards the effects of pathological fear in mathematics on their performance in the subject is illustrated in Figure 2.

For the female students, the most common effect of pathological fear in mathematics among the female students was the failing in the subject. Because of their fear on the subject, the students accepted that they could not recall what was learned before taking examinations, and they could not fully concentrate during class discussions in mathematics. They also claimed that they also tended to fear other subjects that dealt with numbers like science subjects. The female students were doubtful whether absenteeism was an effect of their fear in the subject. However, some students claimed to have been paying others to do their math assignments and problem sets.

Table 2. Results of t-test of Significant Difference in the Mean Responses of male and female Students on the Causes of Pathological Fear

Causes of pathological fear	<u>Mean</u>		<u>Mean</u> Difference	t-value	Sig. (2-tailed)
	Males	Females			
Environmental Influence	3.40	3.07	0.33	3.169	.002 ($p<0.05$)
Personal Capacity	3.83	3.91	0.08	1.259	.209 ($p>0.05$)
Nature of Mathematics	3.85	3.89	0.04	0.332	.740 ($p>0.05$)
Overall	3.69	3.62	0.07	0.643	.521 ($p>0.05$)

The males, on the other hand, agreed that both failure and absenteeism were the effects of their pathological fear in mathematics. Like the female students, the male students accepted that they had the inability to remember what they had learned before the examinations. Because of their fear to fail in the subject, they resorted to copying answers of their assignments from their classmates without understanding and cheated during math examinations. Aside from failure, absenteeism was another effect of pathological fear among the male students. They accepted that they usually absent themselves from their math subjects. Moreover, they divulged about paying other students who could solve problem sets and assignments in mathematics.

The following transcript shows the students' responses when asked during the interview about the effects of their pathological fear in mathematics.

StudentB3-F: *I have a very low self-esteem, stress, and fear of not being able to graduate on time, failing family expectation (sic).*

StudentB2-F: *I got low grades. I cannot concentrate on the lesson given by my teacher, and I keep on thinking of the negative result of quizzes.*

StudentB9-M: *It makes me feel that I am not good at math. My brain does not function too well. It makes me jealous of my brother who excels in math and makes me compare myself to him (sic). I also feel ashamed because my mother is a CPA in Ilocos Sur Capitol.*

StudentB5-M: *I don't attend my class regularly because I will not learn anything regardless of what I do to understand the lessons.*

Based on the responses of the students, self-confidence and absenteeism are not the only possible effects of pathological fear in mathematics. Other reasons include jealousy

over a sibling's success in math and the feeling of not being able to meet family expectations. *Significant Difference in the Effects of Pathological Fear Between the Male and Female Students*

The results of t-test for the effects of pathological fear in Mathematics as experienced by the male and female students are reflected in Table 3.

The difference in the overall mean responses of the two groups of students is not statistically significant ($t\text{-value}=0.616$, $p>0.05$). This is also true for the two dimensions of pathological fear in mathematics ($t\text{-prob}>0.05$).

Table 3. Results of t-test of Significant Difference in the Mean Responses of male and female Students on the Effects of Pathological Fear

Effects of pathological fear	Mean		Mean Difference	t	Sig. (2-tailed)
	Males	Females			
Failure	3.56	3.80	0.24	1.415	0.158 ($p>0.05$)
Absenteeism	3.43	3.38	0.05	.588	0.557 ($p>0.05$)
Overall	3.50	3.59	0.09	.616	.538 ($p>0.05$)

As shown in the table, the findings indicate that the male and female students do not vary in their responses and experiences as regards to the outcomes of pathological fear on their performance in the subject. Both groups experienced failure in the subject as an effect. Based on earlier findings, the male students agreed to have experienced absenteeism as a result of their fear in the subject, but the females did not identify this as an effect. However, the statistical comparison showed a difference which was not statistically significant.

C. Methods of Overcoming Pathological Fear

It was also the concern of this study to look into the possible ways of reducing, if not, overcoming pathological fear among the students. The researchers gathered data from the teachers, students, and parents on what they could do to help solve their problem of fear in mathematics.

On the part of the students, Table 4 exhibits the five items with the highest means. The male and female students share the same view that making the teaching of mathematics enjoyable and the use of appropriate methods of teaching will make them overcome their fear of the subject.

Other strategies considered by the male students include teachers' display of love and interest in the subject they are teaching, developing a more positive attitude towards the subject and encouraging active participation and confidence among the students. The female students also viewed that students' engagement in varied activities as the use of mathematics games could also help the students overcome their fear of the subject.

The following are the answers of some students, especially those with a high level of pathological fear when they were interviewed and asked what they could do to manage their fear in Mathematics.

StudentB8-F: *I have to think that I can pass the subject even if it is difficult.*

StudentH5-M: *I have to pay attention and listen to my teacher during class discussions.*

StudentB2-F: *I have to review a lot of my lessons; and in solving problems, I have to understand carefully the situations, the formulas, and the equations.*

Table 4. Students' Responses on the Strategies to Reduce/Overcome Pathological Fear in Mathematics

Rank	Male	Mean	Female	Mean
1	Mathematics teachers should make the teaching of mathematics enjoyable.	4.71	Mathematics teachers should make the use of mathematics in careers and everyday life.	4.56
2	Mathematics teachers should use an appropriate method of teaching so that math make sense.	4.59	Mathematics teachers should make the teaching of mathematics enjoyable.	4.42
3	Mathematics teachers must show that they like mathematics.	4.55	Mathematics teachers should use an appropriate method of teaching so that math make sense.	4.24
4	Mathematics teachers should promote a positive attitude towards math among students.	4.54	Students must be engaged in exploring, conjecturing and thinking rather than engaging only in rote learning of rules and procedures.	4.24
5	Teachers must handle incorrect responses in a positive way to encourage students' participation and confidence.	4.48	Mathematics should be taught for fun by using games in the class.	4.20

The students were, likewise, asked how their parents could help overcome their fear. Support, motivation, encouragement, and assistance in understanding the lessons were the answers of most of the students. One student responded, "Maybe, they should hire me a tutor." while another replied, "Nothing."

Regarding a question on how their teachers can help them with their problem, the following were their answers:

StudentH7-F: *Our teacher must be approachable in entertaining our concerns.*

StudentH6-M: *Our teacher should discuss the lessons slowly.*

StudentH8-M: *Our teacher must be willing to answer questions from students and should be willing to explain further topics which are difficult to understand.*

The above responses of the students suggest that their teachers should pay attention to their weaknesses. The students feared the subject because they felt they were not good in it, and might not understand the topics. Hence, it is important on the part of the teachers to attend on the specific needs of their students. They should be taught efficiently and effectively.

The 16 teachers of the students in mathematics were interviewed to determine their views on what they could possibly do to reduce, if not, to overcome this fear among their students in the subject. The teachers mentioned different teaching strategies like engaging students in hands-on activities, making the class interesting and providing their student's opportunities to develop their interest and attitude towards the subject. The following are responses of some teachers in an interview on what they could do to help their students overcome their fear in mathematics.

Teacher1: *To be honest, I don't know what possible method will yield the best result.*

But what I am going to do is to engage my students in hands-on activities and field work. I will make them active participants in class discussions, and I will provide them opportunities to collaborate actively with their classmates. I know, this will be a difficult task to do on their part, but I know they will enjoy it.

Teacher2: *I have to prepare very well not only with the lesson but also on how to let them understand it with ease. Lessons will be made engaging. I will give them hands-on activities with the use of technologies like a mobile phone, which I know they will enjoy. I will show them that they have to like mathematics the way I do. I will also make connections between our lessons and the real world.*

Teacher 3: *I will erase their notion that math is difficult. I will lessen the pressure in doing their tasks and make sure that every lesson presented is clear. I will make my classes enjoyable. Though they are already college students, it is still helpful to adapt engaging activities in applying the lessons.*

The above statements are all in support to the views of the students as reflected in their responses to the questionnaire. These are focused on strategies to reduce pathological fear in mathematics. The answer of Teacher 1 is in line with the method of providing the students with learning tasks for them to explore and consequently develop their critical thinking skills. Teacher2 is also interested in making the teaching of mathematics more engaging and also more meaningful. Meanwhile, Teacher 3 is more interested in promoting a positive attitude towards Mathematics.

Conclusions

The study determined the pathological fear of college students in mathematics. It unveiled the causes of their fear in the subject. The students fear math because of the influence of

their friends. It is also due to their self-efficacy that they cannot do problem-solving tasks. The complexity of mathematics, the formulas, and equations caused them to fear the subject. The prime cause of pathological fear among the male students is the nature of the subject, but it is personal capacity for the females. The students' fear in mathematics affects their performance in the subject. Recalling what has been learned when preparing for examinations is the main effect of the students' fear in math. Statistically, the responses of the male and female students on the causes and effects of pathological fear do not significantly differ. To overcome fear in the subject, the teaching of mathematics should be made enjoyable and applied to everyday life situations. The students also need the support of their parents as well as their encouragement and motivation. The teachers also suggest the use of varied and appropriate teaching strategies that make mathematics learning more effective and meaningful.

Recommendations

The teachers can do a lot in helping the students overcome their fear of the subject. They can implement varied ways to boost students' interests in class, establish the confidence of their students and make math easier to understand. It is a challenge for every math teacher to make this happen to overcome the fear of students in mathematics. Teachers may recognize the capabilities of their students and identify their strengths and weaknesses. Teachers may consider encouraging students to possess positive attitudes toward math by engaging each of them in active class discussions, exploration activities, and in doing collaborative tasks. Also, teachers may apply suitable teaching strategies where students can learn most effectively. They may provide learning opportunities where students can alter their reluctance into willingness, fear into fun, and anxiety into an adventure. When they are to face difficult tasks in math, their developed interest and confidence can help them succeed. On the part of the students,

they should earn the courage to approach their teachers whenever they need to ask or clarify things out. About this, math teachers may build an open classroom environment. On the part of the parents, they may share an active role in supporting their children by giving continuous motivation and constant guidance in their studies. They may help their children see the relevance of mathematics at home. Lastly, teachers, students, and parents may deem working together in developing motivated learners and bring competence in mathematics.

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