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ANXIETY IN MATHEMATICS: A CASE STUDY OF GRADE 10 LEARNERS' LEARNING EXPERIENCE THROUGH COGNITIVE BEHAVIOR

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Abstract: Mathematics anxiety is a negative feeling that can interfere with one's mathematical abilities & potential, which can limit one's actualizations in the field of Mathematics. The researcher believes that the limited coverage of the courses has affected the students' performance, as they struggle to incorporate what they have learned into their current Mathematics topics and become mentally prone to Mathematics anxiety. Mathematics is a crucial component in every curriculum. In an effort to offer insight to this problem, the researcher conducted a systematically random sampling technique-based survey to determine the anxiety levels amongst select Grade 10 students. The survey was retrieved from Pearson Custom and was utilized in similar studies. The survey clearly determined Mathematics anxiety levels and this served as a basis for the follow-up interview given to purposively-selected students, chosen by the degree of their Mathematics anxiety. The study features detailed accounts of students with varying levels of Mathematics anxiety, with a limit of two representatives per math anxiety level in a track. The results of the Pearson Custom survey indicated that the respondents have low to moderate levels of Mathematics anxiety. Some respondents have a high level of Mathematics anxiety whereas only few of the respondents have no Mathematics anxiety at all. Section C has the highest average amount of Mathematics anxiety, as all of the respondents had some levels of anxiety. Section B, on the other hand, got the majority for low Mathematics anxiety levels. In comparison, "Mathematics-oriented" Section A has a relatively high percentage of non-existent Mathematics anxiety levels. A particular trend is observable in the Mathematics anxiety level results of Section A students: as the level of Mathematics anxiety increases, the percentage of their results decreases. These results suggest that there is a correlation between the amount of exposure to Mathematics and Mathematics anxiety levels. The data collected in the briefness of this study suggests that there is an indisputable correlation between a student's chosen track and their levels of Mathematics anxiety, probably because of the limited exposure as stated beforehand. The study encountered difficulty in acquiring willing participants, thus affecting the amount of data we've gathered, particularly during the interviews. Similar studies might be able to examine this correlation further if they have more respondents per track and conduct thorough interviews.

Index Terms: *Academic Performance, Correlation, Environment, Intellectual, Mathematical Anxiety, Personal, Teachers*

I. INTRODUCTION

Education has given individuals enough reasons to decide which among the topics for learning shall be retained and maintained throughout his life. The foundation subjects are enough for pupils to start anew and look at life in different perspective. However, of the various learning areas in basic education, Mathematics gives pupils problems coming from within or leading from without. Mathematics anxiety is real and can happen to anyone at any age regardless of his mathematical ability. Since mathematics is perhaps the most abstract among academic subjects, many students dislike and avoid it. Shores (2005) observes that this math avoidance can turn into a severe case of math anxiety that, in many cases, has been associated with temporary memory impairment and loss of self-confidence especially during tests or other mathematical tasks. In a 2006 study, Rossnan reports that even the best mathematicians are not exempt from bouts of math anxiety. Because math anxiety demonstrates a stubborn impediment in the development of mastery and performance in tasks that impact upon students' academic achievement, it has become an important research topic for mathematics educators and educational psychologists in the past 25 years.

Mathematics anxiety is generally defined as a state of discomfort caused by performing mathematical tasks. Mathematics anxiety can be manifested as feelings of apprehension, dislike, tension, worry, frustration, and fear. It is not clear what factors result in the appearance of Mathematics anxiety. Nevertheless, potential causal factors include environmental variables (e.g., negative

experiences in class, teacher characteristics), intellectual variables (e.g., the degree of abstract or logical thinking) and personality variables (e.g., self-esteem, learning style, attitude and confidence.

Of all of the negative effects that Mathematics anxiety has on learning and using mathematics, the relationship between Mathematics anxiety and mathematics performance has received the most attention. Past research has shown small negative correlations between mathematics performance and Mathematics anxiety (average correlations of -.27. and -.34 in two meta-analyses), indicating that those with high Mathematics anxiety show poorer mathematics achievement. However, it has been argued that mathematics achievement, when measured in test situations, is always confounded with Mathematics anxiety. That is, the mathematics performance of highly mathematics anxious individuals is impaired because of their "online emotional reaction to the testing situation". Consequently, the mathematics performance of an individual with high MA may appear lower than it actually is, when measured using a test. Furthermore, time-limited testing can negatively affect the performance of high and low math anxious individuals, but performance is not differentially affected in the two groups. However, individuals with high MA can perform similarly to individuals with low MA when mathematics problems are presented in a more relaxed format. Therefore, the depressed performance associated with high Mathematics anxiety and the reported negative correlations between Mathematics anxiety and performance may be exaggerated because of the context in which mathematics performance is measured. Nonetheless, the effect of Mathematics anxiety on 'online' mathematics performance is still pertinent, as mathematics achievement, particularly in secondary and tertiary education, is measured using time-limited tests and formal examinations. Therefore, the assessment of Mathematics anxiety in realistic test situations is highly important as these situations exert marked influence on individual career prospects and well-being.

Mathematics anxiety has been described as experiencing feelings of panic and helplessness when asked to solve a mathematical task or problem. Psychological as well as physiological symptoms may appear when feeling anxious about mathematics. Mathematics anxiety is known as a common problem in K-12 as well as tertiary education and, therefore, has received considerable attention as a researched topic among educational scientists. For instance, in the Program for International Student Assessment (PISA) 2012, across the 34 participating Organization for Economic Co-operation and Development (OECD) countries, 59% of the 15-year-old students reported that they often worry that math classes will be difficult for them and 31% reported they get very nervous doing math problems.

Presently, public secondary schools in the district of Bani adhere to the curriculum guide in teaching Mathematics for learners. Learning package for Grade 10 learners are religiously instructed to them in preparation for bigger and higher skills required of them in the next year. However, the researcher, a grade 10 Mathematics teacher, noticed that majority of the learners are not interested in numbers. To encourage them to participate, games and group activities were injected to motivate the pupils but assessment of their performance is still low, thus, the conduct of the study.

II. STATEMENT OF THE PROBLEM

This study sought to assess the level of anxiety in Mathematics of Grade 10 learners at Doyong-Malabago National High School, Calasiao II District, Schools Division Office I Pangasinan during the School Year 2023-2024.

Specifically, it sought to answer the following sub-problems:

1. Do you think that math is needed or can be applied in real life?
2. What is your ideal learning environment and style?
3. How did you fare in your math subjects this school year?
4. Where in particular did you experience difficulties? (these include teachers, lessons, etc.)
5. Who are your teachers and what do you think about their teaching styles?
6. Was there a particular teaching method that your previous/current teachers employed that you felt was very effective? Why?

III. METHODOLOGY

3.1 Research Design

This study on the causes of Mathematics anxiety on learners was done using a qualitative method. The data was encoded into a Microsoft Excel file, where it was analyzed. The survey was extracted from the Pearson Custom website, which was properly cited. There was also an additional question added by the researcher to validate and deepen their understanding on the result gathered from the respondents. The aim of this study was to find the causes of Mathematics anxiety in learnerss in order to propose the most effective solution to alleviate the condition.

3.2 Data and Sources of Data

The respondents of this study were the Grade `10 students of Doyong-Malabago National High School, Calasiao II District, Schools Division Office I Pangasinan during the school year 2023-2024.

3.3 Instrumentation and Data Collection

Specific class numbers were chosen to require certain students to complete the survey to avoid a lack of respondents. Research was carried out by distributing surveys to 10 respondents, for each room in Grade 10. Surveys were handed out to gain a better grasp of the responses and to reach more respondents, given the short amount of time. The survey was retrieved from Pearson Custom on account of the fact that it was evident that multiple sources from the review of related literature utilized the source. The general results of the survey have been proven and explained extensively by creating categories based on the sum of the learner's rating per statement. A question that focused on the student's perception of Mathematics was added to the survey to further study the reasons behind respondent's answers and results. A follow-up interview was carried out based on the results from the survey, which served as a prerequisite, in order to gather in-depth responses based from the results. There were six interviewees, which were selected from respondents with high levels of Mathematics anxiety. There were four interviewees that were selected from the

respondents with no levels of Mathematics anxiety. Lastly, there were seven interviewees, specifically selected from the list of respondents with moderate levels of math anxiety.

The systematic random sampling technique was used by picking specific class numbers to choose as respondents for the survey. For the interviews, the purposive non-probability sampling method was used. The interviewees were chosen by the degree of their Mathematics anxiety. Two interviewees were chosen per track from none, low, moderate, and high levels of Mathematics anxiety.

3.4 Tools for Data Analysis

The study was done through interviews, focus groups, surveys, observation notes, and phone calls. The statistical treatments used are 1) Content analysis. This refers to the process of categorizing verbal or behavioural data to classify, summarize and tabulate the data. 2) Narrative analysis. This method involves the reformulation of stories presented by respondents taking into account context of each case and different experiences of each respondent. In other words, narrative analysis is the revision of primary qualitative data by researcher. 3) Grounded theory. This method of qualitative data analysis starts with an analysis of a single case to formulate a theory. Then, additional cases are examined to see if they contribute to the theory.

IV. RESULTS AND DISCUSSION

This chapter deals with the presentation, analysis and interpretation of the data gathered relative to sub-problems in the study.

Determining Levels of Math Anxiety
Table 1
Scores and their Corresponding Level of Math Anxiety

Range of Scores	Level of Math Anxietty
40 – 50	High
30 – 39	Moderate
20 – 29	Low
10 – 19	None

In order to determine the level of Mathematics anxiety based on the assessment, Pearson Custom developed a method that the sum of the scores would determine the level of Mathematics anxiety. As seen in Table 1, there is a corresponding range of scores per level of Mathematics anxiety.

Table 2
Levels of Proficiency and their Equivalents

LEVEL OF PROFICIENCY	DESCRIPTION	NUMERICAL EQUIVALENT
Outstanding	The learner at this level exceeds the core requirements in terms of knowledge, skills, and understandings, and can transfer them automatically and flexibly through authentic performance.	98.00 – 100.00
		95.00 – 97.99
Very Satisfactory	The learner at this level has developed the fundamental knowledge, skills, and core understandings, and can transfer them independently through authentic performance tasks.	93.00 – 94.99
		90.00 – 92.99
		88.00 – 89.99
Satisfactory	The learner at this level has developed the fundamental knowledge, skills, and core understandings and, with little guidance from the teacher and/or with some assistance from peers, can transfer these understandings through authentic performance tasks.	86.00 – 87.99
		83.00 – 85.99
		81.00 – 82.99
Fairly Satisfactory	The learner at this level possesses the minimum knowledge and skills and core understandings, but needs help throughout the performance of authentic tasks.	78.00 – 80.99
		75.00 – 77.99
Needs Improvement	The learner at this level struggles with her understanding; prerequisite and fundamental knowledge and/or skills have not been acquired.	70.00 – 74.99

Table 2 shows the updated grading system effective by the start of school year. This table will be the comparative basis on the results yielded from the interviews since the grades of the interviewees in Mathematics was requested.

Summary of Data Gathered from the Surveys

The researcher distributed 90 surveys but only collected, summarized and analyzed 85 of it. The majority of respondents (73%) from the batch as a whole scored Low to Moderate in the survey, 18% scored High and only 9% scored none. Out of the 3 sections, respondents under Section C reported the lowest for the amount of math anxiety experienced, where out of the 29 respondents, 38% scored Low and 14% had none at all, 38% scored Moderate and 10% scored High. Section B had the second lowest percentage of students who displayed Mathematics anxiety. Out of 18 respondents, 11% scored None, 33% scored Low, 39% had scored Moderate and 17% had scored High. All 10 respondents had some level of anxiety, where 10% scored Low, 50% scored Moderate and 40% had scored High.

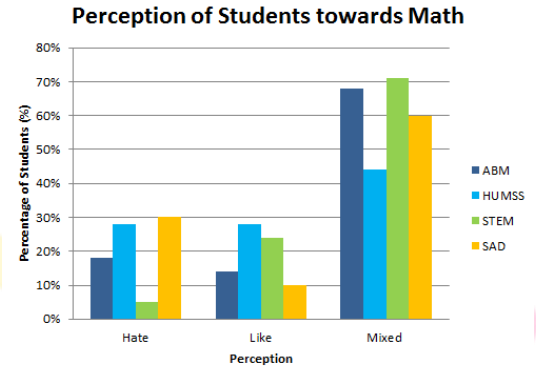

Figure 1. Perception of Learners Towards Math

Figure 1 shows the different perceptions of learners towards the subject of Mathematics. The Grade 10 learners were given three options to answer as their perception; those are namely hate, like, or mixed emotions. In examining all sections, it was seen that the Section D learners hate math the most, while the Section C learners seem to appreciate math the most. Then the learners of Section A, with Section B close behind, were observed to have mixed emotions towards the Mathematics subject. With these findings, it can be concluded that the majority of Section D does not enjoy math, whereas the opposite goes for the majority of Section A. As for Section C and Section B though, most of them are still contemplating about their love or hate towards Mathematics.

Table 3
Average Scores for the Second Part

QUESTION #	Section A	Section B	Section C	Section D
1	2.66	2.89	2.72	3.50
2	3.03	3.04	3.11	3.90
3	2.62	2.54	3.22	3.70
4	3.10	3.29	3.33	3.80
5	3.03	3.21	3.44	3.40
6	3.00	2.07	2.72	3.40
7	3.14	2.93	2.78	3.40
8	2.72	2.89	2.61	3.30
9	2.93	1.96	2.72	4.10
10	2.83	2.86	3.11	4.00

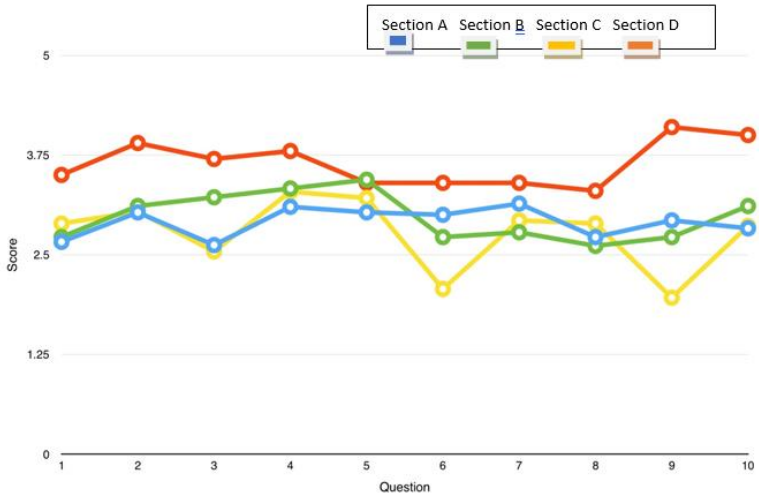

Figure 2. Average of Scores for the Second Part

Table 3 and and Figure 2 shows the average of scores of each section per question. The first survey question, I cringe when I have to go to math class. Out of the four sections, Section D was shown to have strongly agreed with the statement, leading with the highest average score of 3.50. Following Section D are: Section B, Section C, and Section A, with average scores of 2.89, 2.72, and 2.66 respectively. These findings overall suggest that learners in Section D do not look forward to attending Mathematics class as compared to the students of Section A who do not mind as much.

The second survey question, I am uneasy about going to the board in a Mathematics class. Based on the data, it is observable that the learners of Section D are the ones who feel most uneasy about carrying out the task, followed by Section C, Section B and Section A. Thus, it can be concluded that the Section D learners are not as confident in their abilities to solve board works in comparison with Section A, B, and C learners.

The third survey question, I am afraid to ask questions in Mathematics class. After conducting this specific question, it was noticed that mainly the Section D learners were afraid to ask questions in Mathematics class as compared to Section A, B, and C learners. Therefore, it can be said that Section D learners feel uncomfortable in seeking further clarification on Mathematics topics much more than other tracks such as Section A and B.

The fourth survey question, I am always worried about being called on in math class. With the highest average score, Section D can relate most with the given statement more than with Section A, B, and C. This data then implies that Section D learners are quite concerned about not being able to effectively or correctly answer if ever called upon, than learners of the other different tracks.

The fifth survey question, I understand Mathematics now, but I worry that it's going to get really difficult soon. Looking at Figure 2, it can be observed that Section C learners can connect to that statement the most, as they have the highest average score of 3.44. To follow Section C are: Section D, B and , and A with lower average scores of 3.40, 3.21, and 3.03. With these results, it is suggested that Section C more than any other section feels that they are currently capable of doing Mathematics, but fear that they would not be able to understand the Mathematics lessons later on if it gets more complex.

The sixth survey question, I tend to zone out in Mathematics class. In examining the data, it is shown that mostly Section D learners tend to zone out in Mathematics class as compared to the students of Section A, B and C. This may indicate that Section D learners have a harder time focusing in Mathematics class more than any other sections.

The seventh survey question, I fear math tests more than any other kind. Out of the four sections, Section D is the section who fears Mathematics tests the most following with Sections A, B, & C. It can then be inferred that the learners of Section D feel uncomfortable in undergoing math periodical tests much more than the other sections like Section C.

The eighth survey question, I don't know how to study for Mathematics tests. Looking at the data, it is seen that first Section D and then Section B learners can relate to the situation given in the question or statement. Looking at this, it can be concluded that these two sections often experience this situation more than other sections such as Section A and C.

The ninth survey question, It's clear to me in math class, but when I go home it's like I was never there. With the highest average score, Section D can connect with this statement the most as compared to Sections A, B and C. This data possibly conveys that the students of Section D easily forget what happens during their Mathematics classes more than their fellow batchmates in the rest of the sections.

The last survey question, I'm afraid I won't be able to keep up with the rest of the class. In observing Figure 2, it is evident that Section D strongly agrees with this statement as they have the highest average score among the four sections. These findings overall suggest that the learners of Section D, more than any other track, are nervous that they would not be able to catch up with the pacing of the Mathematics subject, and with the learning abilities of each other as well.

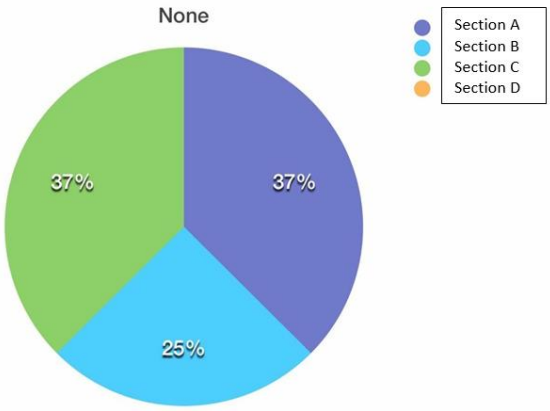

Figure 3. Percentage of Non-existent Math Anxiety Levels

Figure 3 refers to the percentage of students who do not have any levels of Mathematics anxiety. All the sections, 37% of both Sections C and A learners have no levels of Mathematics anxiety, while Section B follows by 25%. Section D however, is not considered in the pie chart. Therefore, it can be concluded that both Sections A and C are not exactly anxious when it comes to dealing with Mathematics. However, the same cannot be said for the track of Section D.

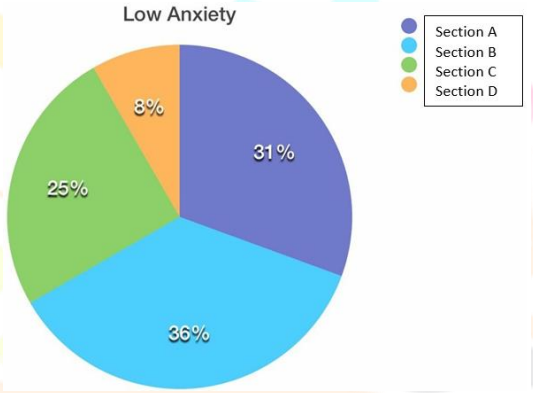

Figure 4. Percentage of Low Math Anxiety Levels

Figure 4 pertains to the percentage of learners who have low levels of Mathematics anxiety. Right now, 36% of students in Section B are experiencing low Mathematics anxiety levels the most following by Section A with 31%, Section C with 25%, and Section D lastly with 8%. Looking at the data, it is seen that mainly Section B learners are living with low math anxiety more than any other track.

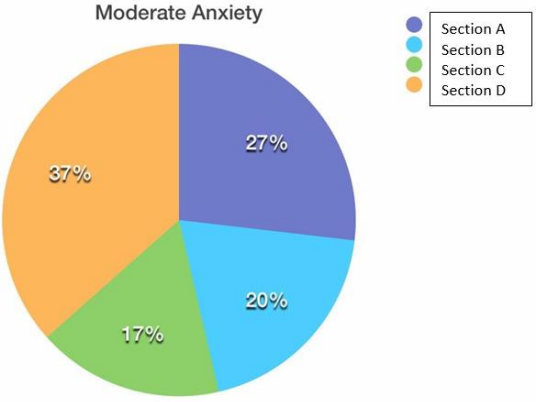

Figure 5. Percentage of Moderate Math Anxiety Levels

Figure 5 gives mention to the percentage of students who have moderate levels of math anxiety. Examining the pie chart above, it seems that the learners of Section D are the ones experiencing moderate Mathematics anxiety the most with the leading percentage of 37%.2 Then Section A comes after with 27%, Section B with 20%, and finally Section C with 17%.3 It can then be inferred that Section D learners for the most part, are living with more moderate math anxiety than Sections A, B and C.

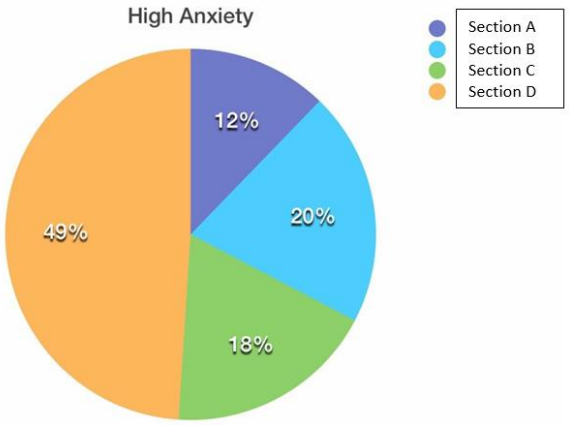

Figure 6. Percentage of High Math Anxiety Levels

Figure 5 shows the percentage of learners who have high levels of Mathematics anxiety. Section D taking up almost half of the graph above, is evidently the section that is going through high Mathematics anxiety most often. To follow after is then Sections B, C, and lastly A. Therefore, it can be concluded that Section D learners are the most anxious when it comes to dealing with Mathematics.

The significance of this study could be use by teachers and parents of the students. The study enables the researchers to identify causes and factors that affects math anxiety levels in students such as the Grade 10. Another data that the study contributes are the possible solutions in dealing with Mathematics anxiety issues. With the knowledge, teachers and parents of the students with math anxiety issues can help them cope and improve in Mathematics. These people can help the students develop a positive attitude in math and breed a better environment for learning since they play a great role in the learner's success in Mathematics.

The researcher feel that based on the data that was collected, several limitations could have influenced the data. The lack of time allocated in conducting the research. The distributions of surveys, interviews, and summarization of data were rushed. If time allotment were given more generously, the scope of the research could have been expanded and a more in-depth understanding of the relations of the factors related to math anxiety could've have been generated. The lack of cooperation from the respondents was another limitation to the study. During the course of surveying, the researchers struggled to distribute and collect the surveys since not all surveys were returned. The researchers also struggled to interview the chosen respondents due to the unavailability of the interviewees. This is one of the greatest limitation during the course of this study since the data needed can only be given by the respondents and the interviewees.

If the researcher were to complete this study again, there would be a few additions made to the process. One of these is to conduct a survey and interview the classroom's respective math teachers in order to identify their individual teaching style. Questions such as 'how often are quizzes and seatworks given?', and 'how many hours does it take to teach a lesson in math?'. If permitted, another addition to the process would be to look at the numerical grade the students received in math during the school year. This is to know accurately discover the effectivity of the teaching style to the students and identify the batch's preferred teaching style for math.

Multiple concepts and factors that were found in the review of the related literature was applicable to the results of the study. From the restricted analysis, the researchers highly recommend to focus on the interaction of the teacher with the students. This includes teaching style, personality of the teacher during math class, pacing of the teacher during lessons, and other similar to these. The results that were gathered from the surveys and interviews implied that the interaction of the student and teacher is one of the greatest cause and solution to Mathematics anxiety.

Math anxiety is a real problem facing learners, teachers, and parents. Learners who have math anxiety face real and long-lasting consequences. Thankfully, there are real methods that teachers and parents can use to help learners overcome their math anxiety. There are also ways of helping students realize their own math anxiety and work toward overcoming it. A better understanding of math anxiety is needed in order to help learners overcome this problem. The more research is done, the more learners, teachers, and parents will be able to work together to overcome this problem. As methods are found that help prevent and reduce math anxiety, the ideas and information should be shared so others can benefit from it as well. Mathematics is an extremely important subject and it is vital that learners succeed in it.

Recommendations

In the light of the findings and conclusions, this study recommended the following:

Based on the results found, it was observed that Section D had no results of no levels of Mathematics anxiety and had the highest averages in the 10 questions. They had the highest percentage with 49% of respondents had high levels of Mathematics anxiety. According to an interview with Section D in Table 4, she stated that "In art, it's mostly stuff like interpretation & understanding so I have more liberty there than in math wherein it's all about logic.". This finding implies for this is that their right brain is more dominant than their left brain.

It is believed in brain lateralization, our brains are divided into two parts: the left brain, and right brain. The left brain is associated with skills and characteristics of: reading and language, locating details and facts, logical, analytical, systematic, sequential, and etc. On the other hand, the right brain is associated with skills and characteristics of: Visualization, feelings and emotions, creativity, spatial relationships, art expression, and patterns. Both right and left brain have different preferred teaching style (Pogoy, 2015). This also helps explain why Sections C and A learners are less anxious than the rest of the tracks. As opposed to the more dominant right brain learners of Section D, Sections C, and A learners are more dominant with their left brain as they possess more skills and characteristics associated with it.

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