



(RESEARCH ARTICLE)



## Student's anxiety level towards mathematics: Basis for intervention program

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### Abstract

This study, entitled Students' Anxiety Level Towards Mathematics: Basis for Intervention Program, investigated Math anxiety among Liceo de Pagsanjan students via pre-interviews with teachers and students, utilizing random sampling of Grade 10 sections. The respondents of the study were composed of sixty-eight (68) Grade 10 students at Liceo de Pagsanjan. A quantitative method with online questionnaires was employed, analyzing data using Pearson r correlation and Chi-Squared correlation analysis to measure the anxiety level of the grade 10 students towards Mathematics. As the responses from the online questionnaires were converted into data, the mean, Pearson r, and chi-squared correlation analysis were used for statistical treatment. Significant links were found between students' experiences and Math anxiety, emphasizing the need for comprehensive support networks. This suggests that students' experiences have an impact on their anxiety levels about the subject. The significant relationship between experiences at home, school, and among peers underscores the need for comprehensive support networks. The "Math Anxiety Termination Program" (MATP) was proposed to address issues. However, Chi-Squared analysis showed no significant correlation between demographic factors and Math anxiety levels. Recommendations include tailored interventions and enhancing communication in a supportive environment.

In light of the findings and conclusion, some recommendations, such as building upon the findings of this study and developing their own action plan or intervention program tailored to addressing math anxiety and making programs aimed at enhancing student communication and empathy, can also be adopted, creating a supportive environment where individuals feel heard and valued for their perspectives.

**Keywords:** Mathematics anxiety; Intervention program; Student's math anxiety; Mathematics anxiety level

### 1. Introduction

Anxiety is the response of the body and mind to stressful, dangerous, or unfamiliar circumstances. It's the uneasiness, distress, or sense of imminent tragedy you experience before a significant event. Its common characteristics are excessive fear and worry, which can have negative behavioral and emotional effects (Jovanovic, T., PhD., 2022).

This research study aims to determine the anxiety level of Liceo de Pagsanjan students towards Mathematics. It seeks to determine the experiences of the students that resulted in their anxiety in Mathematics specifically, in their home, school, and among their peers. This research also aims to identify possible factors that contribute to the Math anxiety of the students. The study used a Quantitative Method and adapted questionnaires to gather the necessary information to address the statement of the problem.

Thus, the purpose of this study is to assess and determine the anxiety level of grade 10 students towards Mathematics.

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### Objectives of the study

This study aims to;

- Identify the demographic profile of the students,
- Identify the experiences of the students that resulted to their anxiety in Mathematics,
- Identify the anxiety level of the students towards Mathematics,
- Determine if there is a significant relationship between the experiences of the students and their anxiety level in Mathematics,
- Determine if there is a significant relationship between the demographic profile of the students and the anxiety level in Mathematics, and
- Be able to design a program to reduce students' Math anxiety.

## 2. Materials and methods

### 2.1. Design

Researchers who aim to quantify data are the ones who drive the quantitative research approach. It involves using a statistical or numerical approach to research design (Creswell, 2003). In this study, a Quantitative Method and Quantitative approach will be utilized, employing a descriptive research design to gather the necessary data and information to assess students' anxiety levels towards Mathematics as a basis for an intervention program. Descriptive research is a component of quantitative research that involves conducting survey research using quantitative variables. In a descriptive study, data are gathered without changing the environment (Sage-Advices, 2020). According to Bhandari (2020), quantitative research is known as the process of gathering and interpreting numerical data. It can be used to identify patterns and averages, formulate hypotheses, examine relationships, and generalize the findings to a wider population. The researcher considers this method to be the most suitable for this study as it includes statistical analysis, data interpretation, and examination of relationships between the variables provided in this study.

### 2.2. Participants

In the selection of the respondents, the researchers employed a stratified sampling method. Stratified sampling involves dividing the population into homogeneous subgroups or strata based on specific characteristics. Each stratum is then sampled using purposive sampling, ensuring that the sample represents the characteristics of the population accurately. This technique is used when the population exhibits diverse characteristics, and researchers aim to obtain a representative sample that reflects the different traits of the population (Thomas, 2020).

Among the one hundred and thirty-six (136) Grade 10 students in Liceo de Pagsanjan for the academic year 2022-2023, the researchers determined that a total of sixty-eight (68) students should be included in the study. The sample size was calculated using Slovin's formula with a margin of error of 8.6% or 0.086. The stratified sampling method will be used to select the sixty-eight respondents. These selected students will be given a questionnaire to gather the necessary information for the research.

**Table 1** Population and Sampling of Survey Questionnaires

Position	Respondents	Population	Sample
Liceo de Pagsanjan Students	St. Francis	40	20
	St. Dominic	33	17
	St. Patrick	33	16
	St. Benedict	30	15
Total		136	68

### 2.3. Data Collection and Analysis

To collect data, the researchers utilized Google Forms to create an online survey questionnaire, which was distributed to the selected students at Liceo de Pagsanjan. The researchers provided an explanation of the research procedure to the respondents and requested their cooperation in completing the survey. The researchers also explained the purpose

of the study to the respondents. Data were collected through the survey questionnaires, ensuring that the respondents answered all the provided questions. Subsequently, all the collected data were evaluated.

**Table 2** Scoring Range of Likert Scale of the Survey

Range	Value	Interpretation
4.20 – 5.00	5	Always
3.40 – 4.19	4	Often
2.60 – 3.39	3	Sometimes
1.80 – 2.59	2	Rarely
1.00 – 1.79	1	Never

### 3. Results and discussion

Distribution of Respondents according to their Demographic Profile

**Table 3** Demographic Profile of the Respondents in terms of Age

Age	Frequency	Percentage
15	28	41%
16	38	56%
17	2	3%
18 and above	0	0%
Total	68	100%

Table 3 presents the demographic profile of Grade 10 students from Liceo de Pagsanjan based on their age. The table indicates that out of the sixty-eight (68) respondents, twenty-eight (28) or forty-one percent (41%) are fifteen (15) years old, thirty-eight (38) or fifty-six percent (56%) are sixteen (16) years old, two (2) or three percent (3%) are seventeen (17) years old, and there are no respondents who are eighteen (18) years old or above. The total frequency of respondents is sixty-eight (68), representing one hundred percent (100%) of the sample. This indicates that the majority, fifty-six percent (56%), of Grade 10 students from Liceo de Pagsanjan are sixteen (16) years old.

According to Shane (2022), the typical age range for students entering the 10th grade is between 15 and 16 years old. They should be 15 years old at the beginning of the school year and 16 years old at the end. This age range is generally followed in the US educational system. However, it's important to note that not all students in the 10th grade fall within this age range. There can be instances where a student in this grade may be older or younger than the typical age ranges mentioned.

**Table 4** Demographic Profile of the Respondents in terms of Sex

Sex	Frequency	Percentage
Male	29	43%
Female	39	57%
Total	68	100%

Table 4 displays the demographic profile of Grade 10 students at Liceo de Pagsanjan in terms of gender. The table shows that out of the total respondents, twenty-nine (29) or forty-three percent (43%) are male, while thirty-nine (39) or fifty-seven percent (57%) are female. The total frequency is sixty-eight (68) with a percentage of one hundred percent (100%). This indicates that the majority of the respondents, representing fifty-seven percent (57%), are female, suggesting that females are the predominant gender among Grade 10 students at Liceo de Pagsanjan.

According to Reysio-Cruz (2019), a global assessment on gender equality across 153 nations reveals that Filipino women have higher enrollment rates in high school and college compared to males. The World Economic Forum's (WEF) 2020 Global Gender Gap Report states that 71.3 percent of women are enrolled in secondary school, while only 60.2 percent and 40.4 percent of males are enrolled at the same level.

**Table 5** Demographic Profile of the Respondents in Terms of Monthly Family Income

Monthly Family Income	Frequency	Percentage
Poor	18	26%
Low-income class	16	24%
Low-middle income class	15	22%
Middle-middle income class	13	19%
Upper-middle income class	4	6%
Upper-income class	0	0%
Rich	2	3%
Total	68	100%

Table 5 presents the demographic profile of Grade 10 students at Liceo de Pagsanjan based on their monthly family income. The table shows that out of the sixty-eight (68) respondents, eighteen (18) or twenty-six percent (26%) have a monthly income of less than Php 12,082. Sixteen (16) or twenty-four percent (24%) have a monthly income ranging from Php 12,082 to Php 24,164. Fifteen (15) or twenty-two percent (22%) have a monthly income ranging from Php 24,164 to Php 48,328. Thirteen (13) or nineteen percent (19%) have a monthly income ranging from Php 48,328 to Php 84,574. Four (4) or six percent (6%) have a monthly income ranging from Php 84,574 to Php 144,984. There are zero (0) respondents with a monthly income ranging from Php 144,984 to Php 241,640. Lastly, two (2) or three percent (3%) of the respondents have a monthly income of Php 241,640 and above. The total frequency is sixty-eight (68) respondents, representing one hundred percent (100%) of the sample. This indicates that the majority of Grade 10 students at Liceo de Pagsanjan have a monthly family income of less than Php 12,082.

According to the Philippine Statistics Authority (2023), the poverty incidence among the population in the First Semester of 2021 was estimated at 23.7 percent. This means that 26.14 million Filipinos lived below the poverty threshold during that period. The poverty threshold was estimated at Php 12,082, on average, for a family of five per month in the first semester of 2021.

**Table 6** Mean Level of Experiences of Students that Resulted to their Anxiety in Mathematics

Mean Level of Experiences of Students that Resulted to their Anxiety in Mathematics in terms of	General Weighted Mean	SD	Adjectival Rating
Home	2.68	1.24	Sometimes
School	2.56	1.03	Rarely
Peers	2.97	1.20	Sometimes

Table 6 presents the experiences of Grade 10 students at Liceo de Pagsanjan that contribute to their anxiety in Mathematics, categorized into home, school, and peers. The experiences related to home have an overall weighted mean of 2.68 and a standard deviation of 1.24, indicating a general adjectival rating of "sometimes." The experiences related to school have an overall weighted mean of 2.56 and a standard deviation of 1.03, indicating a general adjectival rating of "rarely." Lastly, the experiences related to peers have a general weighted mean of 2.97 and a standard deviation of 1.20, indicating a general adjectival rating of "sometimes."

According to Deng (2022), parental involvement and education have an impact on how parents interact with their children and manage their behaviors and cognitive development. This, in turn, influences their children's behavior and performance towards them. Therefore, the attitudes, understanding, and perspectives of parents are crucial in parent-child interactions. When parents have positive attitudes, the relationship between them and their children tends to be

better compared to when they do not. Parents' responses to their children's unpleasant emotions can be categorized as supportive or non-supportive in various ways. Children who receive support from their parents are more likely to express their emotions and learn how to recognize and cope with situations that elicit certain emotions. Conversely, negative behaviors such as downplaying the child's emotional experience, scolding the child, or showing concern over the child's behavior can teach the child that expressing negative emotions is wrong or unacceptable.

**Table 7** Mean Level of Anxiety Level of the Students Towards Mathematics

Mean Level of Anxiety Level of the Students Towards Mathematics in Terms of	General Weighted Mean	SD	Adjectival Rating
Physiological	2.49	1.38	Rarely
Emotional	3.38	1.24	Sometimes
Mental Stability	3.08	1.18	Sometimes

Table 7 presents the anxiety level of Grade 10 students of Liceo de Pagsanjan towards Mathematics in terms of physiological, emotional, and mental stability. As shown in the table, the anxiety level of the students towards Mathematics in terms of physiological gained an overall weighted mean of 2.49 and a standard deviation of 1.38 with an overall adjectival rating of rarely. The anxiety level of the students towards Mathematics in terms of emotional gained an overall weighted mean of 3.38 and a standard deviation of 1.24 with an overall adjectival rating of sometimes. The overall weighted mean for the anxiety level of the students towards Mathematics in terms of mental stability is 3.08 and a standard deviation of 1.18 with an overall adjectival rating of sometimes. The general weighted mean for the anxiety level of the students towards Mathematics in terms of physiological, emotional, and mental stability is 2.49 with a standard deviation of 1.38 and a general adjectival rating of rarely.

According to Luu-Thi et al. (2021), anxiety is characterized by trembling, dread, and an elevated heart rate, as well as bodily symptoms such as muscular soreness and tremors. Anxiety is a fundamental human emotion that elicits physical responses to stress when the "fight or flight" defense response is triggered to protect the person from a potentially dangerous item or event.

**Table 8** The Significant Relationship Between the Experiences of the Students and the Anxiety Level in Mathematics

	Degree of freedom (df)	Computed r-value	p-value	Remarks
Relationship between the Experiences of the Students and the Anxiety Level in Mathematics.	66	0.2577	0.0339	Significant

Table 8 presents the significant relationship between the experiences of the students and the anxiety level in Mathematics. It can be observed that the computed r-value is 0.2577. Furthermore, the p-value of 0.0339 is found to be greater than the 0.05 level of significance. This indicates that the test hypothesis is not true or should be rejected. The results indicate that there is a significant relationship between the experiences of the students and the anxiety level in Mathematics. Therefore, the null hypothesis stating that there is no significant relationship between the experiences of the students and the anxiety level in Mathematics is rejected.

According to Musa et al. (2018), Math Anxiety refers to the experience of emotional disorders or negative emotions when dealing with mathematical situations in learning or daily activities. Individuals who experience Math Anxiety often exhibit psychological symptoms such as tension, negative thinking, and avoidance of mathematical situations. They may also experience physiological symptoms such as sweating, nervousness, paleness, or high blood pressure. As a result, individuals with Math Anxiety perceive math-related problems or activities as burdensome due to the emotional gap and a tendency to anticipate negative effects and consequences.

The Significant Relationship between the Demographic Profile of the Students and the Anxiety Level in Mathematics

**Table 9** The Significant Relationship between the Demographic Profile of the Students and the Anxiety level in Mathematics in Terms of Physiological

	$\chi^2$	p-value	Interpretation
Age	0.4672	0.632	Not Significant
Sex	0.4234	0.811	Not Significant
Family Income (Monthly)	0.2870	0.423	Not Significant

Table 9 presents the degree of significant relationship between the demographic profile of the students and the anxiety level in Mathematics in terms of physiological. Since the demographic profile is nominal data and the anxiety level is also considered nominal data, the chi-square test of independence was used for statistical treatment. The results show that there is no significant relationship between the anxiety level in terms of physiological and the demographic profile in terms of age ( $\chi^2=0.4672$ , p-value=0.632, where  $p>0.05$ ). Similarly, there is no significant relationship between the anxiety level in terms of physiological and the demographic profile in terms of sex ( $\chi^2=0.4234$ , p-value=0.811, where  $p>0.05$ ). Furthermore, there is no significant relationship between the anxiety level in terms of physiological and the demographic profile in terms of family income ( $\chi^2=0.2870$ , p-value=0.423, where  $p>0.05$ ).

The findings of the research by Sari, M., et al. (2021) show that there is no interaction between math anxiety and gender on mathematical connection ability. Regardless of gender, there is a widespread behavior among pupils. According to the study, exam anxiety is a physiological issue. Any policy intervention program should, it is advised, be created by either the public or private sector and must be gender neutral (Omoyemiju, 2021). According to Zavrou, S., et al. (2019), family accommodation was present in every single case in the sample and was strongly connected with kids' externalizing tendencies but not with anxiety intensity or parental discomfort.

**Table 10** The Significant Relationship between the Demographic Profile of the Students and the Anxiety level in Mathematics in terms of Emotional

	$\chi^2$	p-value	Interpretation
Age	0.7392	0.632	Not Significant
Sex	0.3056	0.811	Not Significant
Family Income (Monthly)	0.5170	0.423	Not Significant

Table 10 presented the degree of the significant relationship between the demographic profile of the students and the anxiety level in Mathematics in terms of emotional. Since the demographic profile is nominal data and anxiety levels are counted to be nominal data as well, the chi-square test independence was used for statistical treatment. As a result, the age at ( $\chi^2=0.7392$ ), p-value of 0.632, where  $p>0.05$  shows that anxiety level in terms of emotional is not significantly related to the demographic profile in terms of age. The sex at ( $\chi^2=0.3056$ ), p-value of 0.811, where  $p>0.05$  shows that anxiety level in terms of emotional is not significantly related to the demographic profile in terms of sex. Family income at ( $\chi^2=0.5170$ ), p-value of 0.423, where  $p>0.05$  shows that anxiety level in terms of emotional is not significantly related to the demographic profile in terms of family income.

According to the research of Kucian et al. (2018), it highlights the wide-ranging effects that emotional factors in mathematical cognition can have and encourages researchers and educators to consider math anxiety to avoid negative long-term effects on academic performance and quality of life, particularly in students at a young age and those with developing dyscalculia.

The results of the research conducted by Sokolowski et al. (2019) revealed that processes within the spatial domain, but not the mathematical domain, mediate the relationship between sex and math anxiety, while controlling for general anxiety and cognitive ability. The research conducted by Garvey et al. (2021) demonstrates that anxiety levels increase when both material and emotional well-being, such as sleep quality, fear, and the experience of the death of a relative, are severely impacted. Conversely, the findings indicate that maintaining positive interpersonal connections with family members and focusing on personal growth through routines and habits that promote well-being contribute to lowering anxiety levels. Additionally, during periods of rigorous confinement, female students in the sample experienced higher levels of anxiety compared to male students.

**Table 11** The Significant Relationship between the Demographic Profile of the Students and the Anxiety level in Mathematics in terms of Mental Stability

	$\chi^2$	p-value	Interpretation
Age	0.5071	0.632	Not Significant
Sex	0.3142	0.811	Not Significant
Family Income (Monthly)	0.6144	0.423	Not Significant

Table 11 presented the degree of significant relationship between the demographic profile of the students and the anxiety level in Mathematics in terms of mental stability. Since demographic profile is a nominal data and anxiety level are counted to be nominal data as well, chi-square test independence was used for statistical treatment. As a result, the age at ( $\chi^2=0.5071$ ), p-value of 0.632, where  $p>0.05$  shows that anxiety level in terms of mental stability is not significantly related to the demographic profile in terms of age. The sex at ( $\chi^2=0.3142$ ), p-value of 0.811, where  $p>0.05$  shows that anxiety level in terms of mental stability is not significantly related to the demographic profile in terms of sex. Family income at ( $\chi^2=0.6144$ ), p-value of 0.423, where  $p>0.05$  shows that anxiety level in terms of mental stability is not significantly related to the demographic profile in terms of family income.

In the research of Turkcapar, U., and Yasul, Y. (2021), there was no discernible relationship between university students' anxiety levels and their gender, athletic branch, class, age, academic achievement, or department of study. However, it was discovered that the students' family income levels had an impact on the participants' anxiety levels. This study came to the conclusion that a student's family income may have a significant impact on how anxious they are. According to Xin, S., et al. (2020), indicators of economic conditions (Gini coefficient and residents' consumption level), general threat (crime rate), and social connectedness (divorce rate, urbanization level, and family size) were also significantly correlated with mean anxiety scores, suggesting that social changes may be to blame for the rise in anxiety among Chinese adolescents.

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#### 4. Conclusion

The study has concluded the following based on the aforementioned findings:

- The experiences of the students in terms of home, school, and peers have a significant relationship to their anxiety level in Mathematics,
- There is no significant relationship between demographic factors and physiological anxiety levels,
- There is a significant relationship between age and emotional anxiety level,
- There is no significant relationship between sex and emotional anxiety levels,
- There is a significant relationship between family income and emotional anxiety levels,
- There is a significant relationship between family income and mental stability anxiety levels, and
- There are no significant relationships between age, sex, and mental stability anxiety levels.

#### Recommendation

In light of the above findings and conclusion, the following recommendations are respectfully endorsed:

- Future researchers should consider expanding the sample size and including students from lower year levels to obtain a more comprehensive understanding of anxiety levels towards Mathematics,
- Future researchers may develop a suitable rubric to analytically measure the effectiveness of the action plan,
- Future researchers can build upon the findings of this study and develop their own action plan or intervention program tailored to addressing math anxiety, and
- Interventions can focus on providing parents and family members with resources and support to promote a healthier and more relaxed approach to academic performance.

Additionally, strategies can be developed to assist teachers and schools in managing student workload more effectively, ensuring that tests and assignments are spaced out to prevent students from feeling overwhelmed. Programs aimed at enhancing student communication and empathy can also be adopted, creating a supportive environment where individuals feel heard and valued for their perspectives.

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## Compliance with ethical standards

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The authors Lady Claudette Garcia Rivera, Mark Rogel Tumanlao Auguis, Jayvee Eliserio Leron, Sheenilyn Baduel Mondez, John Llyod Ellaga Palencia, and Jhon Jhon Pamilacan Zotomayor show no conflict of interest.

### *Statement of ethical approval*

The present research work does not contain any studies performed on animals/humans subjects by any of the authors

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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