

Mathematics Anxiety's Impact on Grade 11 General Mathematics Performance

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Date received: February 28, 2024

Date revised: May 14, 2024

Date accepted: May 21, 2024

Originality: 85%

Grammarly Score: 90%

Similarity: 15%

Recommended citation:

Moroscallo, T. (2024). Mathematics anxiety's impact on grade 11 General Mathematics performance. *Journal of Interdisciplinary Perspectives*, 2(7), 283-288. <https://doi.org/10.69569/jip.2024.0100a>

Abstract. This study investigates the relationship between math anxiety levels and the academic performance of Grade 11 students in General Mathematics. Utilizing a descriptive-correlational design, the research aims to delineate the profile of respondents concerning their math anxiety levels and academic performance. The sample comprised forty-nine Grade 11 students. The primary research instrument was Ellen Freedman's standardized Self-Test for Math Anxiety. Findings indicate that the respondents exhibited moderate levels of math anxiety and their academic performance in General Mathematics was generally satisfactory. Notably, a significant relationship was found between math anxiety and the respondent's sex. Additionally, the study revealed a negative correlation between math anxiety and academic performance, indicating that higher levels of math anxiety are associated with poorer academic performance in General Mathematics, and conversely, lower levels of math anxiety correlate with better academic performance. The study concludes with recommendations for educational practice and suggestions for future research directions.

Keywords: Mathematics anxiety; Mathematics performance; Grade 11

1.0 Introduction

Students face challenges in understanding math. They continue to fall behind of math achievement standards, lose interest, and eventually give up learning math (Yeh et al., 2019). This symptom can make students anxious when studying math. Math anxiety is known to be a common problem in K-12 and higher education (Ashcraft & Moore, 2009; Luttenberger et al., 2018; Yamahani, et al., 2018). It is also found to be a common and vulnerable problem among high school students and affects them at school (Cebu et al., 2023). When it's time to learn math, most students feel scared, lack motivation, lack confidence, hate math, and avoid the subject. This situation illustrates students' negative thoughts, feelings, and behaviors toward math.

On the other hand, the negative effects of math anxiety led to lower students' math performance. As highlighted by the Nuffield Foundation (2017), the negative impact of anxiety on student performance increases over the years as the school progresses. Anouti, Shehayeb, and Mchiek (2018) highlighted that low math skills harm students' anxiety in timed exams, and other researchers argue that high math anxiety is mainly associated with poor performance and is associated with low-achieving students. Additionally, high levels of anxiety can create anxious memories, which directly impact students' long-term and short-term performance in mathematics and other subjects (Buckley & Reid, 2013). Students' negative attitude towards this subject has led to poor performance in mathematics. This long-term negative fear becomes a math problem and causes anxiety in students.

Furthermore, in the context of Bulawan Integrated School most students especially those in the 11th-grade general mathematics class, dislike the subject of mathematics because they believe that mathematics is difficult and not easy to understand. Through my awareness of the subject of mathematics, I realized that other students were also

afraid to answers, nervous, and sweaty on their faces when they showed their answers on the board. It was also found that scores on formative and summative assessments were low. Even if the math teacher talks a lot and advances the lesson. It is very interesting to conduct study about the negative reactions of students in the field of mathematics and their psychological and behavioral manifestations toward mathematics. Therefore, the researcher decided to conduct this study to determine the mathematics anxiety's impact on the 11th-grade general mathematics performance of the students in Bulawan Integrated School.

2.0 Methodology

2.1 Research Design

This study used a descriptive correlational research design. It is descriptive because it describes the respondent's profile, level of mathematics anxiety, and academic performance in general mathematics. On the other hand, it is correlational because it investigates the relationship between the variables of mathematics anxiety, the demographic profile of the respondents, and the general academic performance in mathematics.

2.2 Research Participants

The total population of 49 Grade 11 students enrolled in the first semester of the School Year 2022 – 2023. In which 15 students enrolled in Agri Crop Production NC – II, 16 students enrolled in Electrical Installation and Maintenance NC – II, and 18 students enrolled in Computer System Services NC – II. No sampling technique was used in this study because all Grade 11 enrolled in the first semester of the School Year 2022 – 2023 were used as a respondent in this study.

2.3 Research Instrument

This study used an adapted ten (10) items and a five-point – Likert scale survey questionnaire of the standardized items of Ellen Freedman's Self-Test, Do You Have Math Anxiety (Freedman, 2006). These standardized items are designed to help students deal with the kind of math-related anxiety that affects the performance of students in mathematics. This study followed ethical guidelines, and respondents' participation was voluntary. To validate the instruments, several steps were taken. To ensure study objectives were met, an education expert reviewed the adapted questionnaire. Second, a pilot test with a small sample of respondents identified and assessed the instrument's clarity and comprehensiveness.

2.4 Data Gathering Procedure

This study used specific steps to collect the data. A letter was sent to the school head to inform and secure approval to conduct data collection. After securing the approval, the researcher asked to access the master list of all Grade 11 enrollees from the Principal's Office to be used as the respondents in the study. A parent's consent was given to the Grade 11 students who served as a respondent in the study.

2.5 Ethical Considerations

This research study followed ethical guidelines. In compliance with the research ethics protocol, the researcher gives consent from the parents/guardians of the respondents. This ethical consideration ensured that the survey respondents, with the consent of their parents/guardians, signify their awareness and understanding of the study objectives, their agreement to participate as survey respondents, their freedom to disclose or not to disclose information, their freedom to stop their participation anytime if they do not feel comfortable, their right to the confidentiality of information and anonymity of their identity as respondents of the researchers, their rights to understand about the study and ask questions about it, their right to know its benefits and the activities expected of them in the study.

3.0 Results and Discussion

Table 1. Frequency and percentage distribution of respondents in terms of sex

Sex	Frequency	Percentage (%)
Male	29	59.18
Female	20	40.82

Table 1 presents the demographic profile of the respondents in terms of sex. It shows that twenty – nine (29 or 59.18%) of the respondents were males while twenty (20 or 40.82%) were females. This implies that most of the

enrolled Grade 11 in the School Year 2022 – 2023 were males. These results support Ganley and Vasilyeva's (2011) study that spatial skills predict math ability in boys but not in girls and that math attitudes show a stronger relationship with academic performance in girls compared to boys. Additionally, Maloney et al. (2012) suggest that women may have more math anxiety than men when faced with tasks that involve math and arithmetic skills. Moreover, Khesht-Masjedi et al. (2019) found that girls are more anxious about math than boys.

Table 2. Frequency and percentage distribution of respondents in terms of age

Age	Frequency	Percentage (%)
16-17	36	73.47
18-19	10	20.41
20-above	3	06.12

Table 2 presents the demographic profile of the respondents in terms of age. It shows that thirty – six (36 or 73.47%) of the respondents were aged 16 – 17, ten (10 or 20.41%) aged 18 -19, and three (3 or 06.12%) whose age were 20 - above. This implies that most of the ages of the enrolled Grade 11 in the School Year 2022 – 2023 were 16 - 17. The finding supports the study of Jabor et al. (2011) found that students in the age group “under 19 years old” have higher math grade point averages (GPA) than students in the above age group. However, recent studies have shown that there is a negative relationship between math anxiety and academic performance in young adults (Wu et al., 2017; Gunderson et al., 2018). Moreover, Khasawneh et al., (2021) indicate that students with an age below or equivalent to nineteen (19), had a mean anxiety score of 26.52, and were more anxious than those in adulthood age with a mean score of 25.33.

Table 3. Level of Math Anxiety

Statements	Mean	Interpretation
1. I cringe when I have to go to math class.	2.63	Moderately anxious
2. I am uneasy about going to the board in a math class.	3.49	Very anxious
3. I am afraid to ask questions in math class.	2.73	Moderately anxious
4. I am always worried about being called on in math class.	3.30	Moderately anxious
5. I understand math now, but I worry that it's going to get difficult soon.	3.63	Very anxious
6. I tend to zone out in math class.	1.78	A little anxious
7. I fear math tests more than any other kind.	1.68	A little anxious
8. I don't know how to study for math tests.	1.90	A little anxious
9. It's clear to me in math class, but when I go home it's like I was never there.	3.57	Very anxious
10. I'm afraid I won't be able to keep up with the rest of the class.	2.37	A little anxious
Overall Mean	2.71	Moderately anxious

Scale: 1.00 – 1.79 = not all anxious, 1.80 – 2.59 = a little anxious, 2.60 – 3.39 = moderately anxious, 3.40 – 4.19 = very anxious, 4.20 – 5.00 = extremely anxious.

Table 3 presents the level of math anxiety of the respondents with an overall weighted mean of 2.71 interpreted as moderately anxious. The table revealed the top three statements such as “I understand math now, but I worry that it's going to get difficult soon” with a mean of 3. 63 described as very anxious, “It's clear to me in math class, but when I go home it's like I was never there” with a mean of 3.57 described as very anxious and “I am uneasy about going to the board in a math class” with a mean of 3.49 described as very anxious. On the other hand, the last statement “I fear math tests more than any other kind” with a mean of 1. 68 described as a little anxious. The findings supported by the Programme for the International Student Assessment (PISA) (2012), 59% of 15-year-old students said they often worry that math will be difficult for them and 31% said they are very nervous when thinking about math problems. Additionally, Ruff and Boes (2014) highlight that math anxiety is a persistent and important theme that leads to math avoidance and low achievement. Lyons and Beilock (2012) point out that many people feel anxious when doing math in their daily work. More importantly, they also found that individuals with high levels of math anxiety had significantly lower performance in math compared to non-math subjects. Moreover, Buckley (2013) points out that due to anxiety, students may develop negative attitudes toward mathematics, as many people with anxiety often try to avoid subjects, courses, and careers related to mathematics.

Table 4 shows the academic performance of the respondents in General Mathematics with a mean of 77.27 described as fairly satisfactory. Based on the results, it reveals that there were 39, or 79.59 percent whose academic performance belongs to the range of 75 – 79 described as fairly satisfactory, and 9, or 18.37 percent whose academic performance belongs to the range of 80 – 84 described as satisfactory. Meanwhile, only 1 or 2.04 percent whose academic performance belongs to the range of 85 – 89 described as very satisfactory. This implies that most of the

grades in General Mathematics of the respondents fall within 75 – 79 described as fairly satisfactory. This finding is corroborated by Ruff and Boes (2014), according to which low results in mathematics are a frequent weakness of many students. This tendency to underperform is associated with students' low interest in learning mathematics (Khasawneh et al., 2023). Low student performance in math is an indicator of subject anxiety. Students' academic performance and well-being in the classroom are both linked to math anxiety (Shaikh, 2013; Mutegi, 2021).

Table 4. Academic performance in General Mathematics

Descriptor	Range	Frequency	Percentage (%)
Outstanding	90-100	0	00.00
Very Satisfactory	85-89	1	02.04
Satisfactory	80-84	9	18.37
Fairly Satisfactory	75-79	39	79.59
Did not meet Expectations	0-74	0	00.00

Table 5 presents the relationship between the level of math anxiety and the demographic profile of the respondents. In terms of sex, the chi-square result was 51.957 with a degree of freedom of 4, and the computed p-value was 0.000. This implies that the p-value (0.000) result was less than the significance level of 0.05. Therefore, math anxiety and the respondent's sex have a significant relationship. Thus, the null hypothesis is rejected. In terms of age, the chi-square result was 8.734 with a degree of freedom of 8, and the computed p-value was 0.365. This implies that the computed p-value (0.365) result was greater than the significance level of 0.05. Thus, the null hypothesis is accepted. The results support the study of Maloney et al. (2012) suggesting that women may experience more math anxiety than men when faced with tasks that involve math and arithmetic skills. In contrast, Khasawneh et al. (2021) showed that age did not significantly influence math anxiety scores.

Table 5. The Relationship between the level of math anxiety and the demographic profile of the respondents

Variables	X ²	df	p-value	Interpretation	Decision
Sex	51.97	4	0.000*	Significant	Reject Null
Age	8.734	8	0.365	Not Significant	Accept Null

Table 6 presents the significant relationship between math anxiety and the respondent's academic performance in General Mathematics. When analyzed using the Pearson Product – Moment Coefficient Correlation between the level of math anxiety and the academic performance in General Mathematics of the respondents the result shows that the computed coefficient correlation is -0.33 interpreted as a negative correlation while the computed p-value (0.0351) was less than the significance level of 0.05 which was statistically significant. This implies that math anxiety has a negative relation concerning academic performance in mathematics. Mutegi's (2021) study found that there was a significant negative relationship between students' math anxiety and their math performance. It found that when anxiety levels are medium/low, math performance is high. When anxiety levels are high, math performance will be low.

Table 6. The Relationship between the level of math anxiety and the academic performance of the respondents

Variables	Coefficient Correlation	p-value	Interpretation	Decision
Math Anxiety and Academic Performance	-0.33	0.035*	Significant	Reject Null

4.0 Conclusion

The following results were revealed in this study: Out of 49 respondents, 29 or 59.18% were male. This shows that the number of male respondents is more than the number of female respondents. The majority of respondents were between the ages of 16 and 17, the appropriate age for 11th grade, accounting for 36 or 73.47% of the total respondents. The respondent's level of mathematics anxiety was 2.71, which is interpreted as moderate anxiety, while the respondent's academic performance in general mathematics was 77.27, which was described as quite satisfactory. The results also showed that there was a significant relationship between mathematics anxiety and respondents' gender characteristics. At the same time, there was no significant relationship between math anxiety and respondents' age. It was revealed that there is a negative correlation, but there is a significant relationship between math anxiety and academic performance in math in general. The results demonstrated that high levels of math anxiety lead to poor academic performance in high school math or low levels of math anxiety lead to good academic performance in high school math.

5.0 Contributions of Authors

The authors indicate equal contribution to each section. The authors reviewed and approved the final work.

6.0 Funding

This work received no specific grant from any funding agency.

7.0 Conflict of Interests

The authors declare no conflicts of interest about the publication of this paper.

8.0 Acknowledgment

The researcher would like to thank the Almighty Father, the source of everything and who made this study possible. He is thankful to his parents whose love and guidance are with him in whatever he dreams. They are his ultimate inspiration.

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