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Mathematics Anxiety and Mathematics Self-Efficacy among Senior High School Students in Public Secondary Schools

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Abstract:-

Background/Objectives: This study explored mathematics anxiety and mathematics self-efficacy of senior high school students in Botolan District of Zambales during the academic year 2020-2021. The students are female, belong to young adults, and are Grade 11 senior high school students.

Methods/Statistical analysis: Descriptive research was employed in the study, using ANOVA, T-test, and Pearson r to test the significant difference and relationship of variables.

Findings: Findings revealed a high positive level of Mathematics anxiety and Mathematics self-efficacy. Students stated that learning Mathematics made them feel nervous. Students acknowledged that Mathematics is a complex and challenging subject, and they lack mathematical skills to solve complex problems. Students' perceptions according to age do not differ significantly for mathematics anxiety. When attributed to sex, perceptions vary significantly on the Face Expression, while perceptions on the Appraisal, Arousal, and Action Tendencies are the same. In terms of the strand, perceptions differ significantly on the Arousal and Face Expression. The significant difference only matters on the Action Tendencies in terms of school. For Mathematics self-efficacy, perceptions according to age on the Mastery Experience, Vicarious Learning, and Affective State aspect of Mathematics self-efficacy differ significantly, while perceptions on Social Persuasion are the same. When grouped according to sex, perceptions on Vicarious Learning and Affective states vary significantly. In terms of school, perceptions only differ significantly on Physiological State. Moreover, the perceived level of Mathematics anxiety and Mathematics self-efficacy vary significantly. The paper also concludes that Mathematics anxiety and mathematics self-efficacy influence students' academic performance.

Improvements/Applications: A follow-up study may be conducted on the difference in age, school, and Mathematics self-efficacy to validate the result of the findings.

Keywords: anxiety, descriptive, mathematics, self-efficacy, senior high school

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1. Introduction

Mathematics is an active part of the curriculum and is helpful in daily life and studying other subjects, yet students consider this a complex issue [1]. It is a significant concern about how it could be taught and understood in the education system since students differ in study orientations [2]. Students have a hard time learning mathematical concepts. Because students differ in their abilities to acquire mathematics, one learns quicker than the other. Students are concerned and feel anxious about studying mathematics [3].

Meanwhile, Filipino students struggle to learn mathematical concepts. Furthermore, Paris [4] reported on the Rappler website that the Philippines ranked in the low 70s in the 2018 Programme for International Student Assessment (PISA), a student assessment of 15-year-old learners conducted by the Organization for Economic Cooperation and Development (OECD) across 79 countries. Filipino students also performed poorly in mathematics, scoring 353 points compared to the OECD average of 489 points in both categories [4]. According to Magsambol [5] in Rappler, the Philippines scored 'significantly worse' than any other country that participated in grade 4 math and science examinations in the Trends in International Mathematics and Science Study (TIMSS) 2019. According to the Trends in International Mathematics and Science Study 2019, Filipino students trailed behind other nations in the international evaluation for mathematics and science for grade 4. The country received the lowest score out of 58 in both examinations. Only 19 percent of Filipino pupils met the Low standard in mathematics, which suggests they possessed "some fundamental mathematical understanding," while 81 percent did not achieve this level [5].

Addressing the above findings is necessary because this would significantly affect the future. Students and teachers need to widen their views and perspective in teaching and learning mathematics. In this time where students need attention and focus in understanding mathematics as a subject and as a discipline, the researcher wants to seek the level of mathematics anxiety and mathematics self-efficacy of the students and if these affect the students' performance in mathematics. The study would also determine the sources of mathematics anxiety in today's learning modality. This study would enlighten every stakeholder, especially teachers, to be more aware of how the students feel learning mathematics and address their needs to improve their learning capability, especially in mathematics.

2. Objective of the Study

The study aimed to determine the level of mathematics anxiety and mathematics self-efficacy related to the mathematics performance of Grade 11 Senior High School students in Botolan District during AY. 2020-2021. Specifically, the researcher wanted to answer the following questions:

1. What is the profile of the student-respondents with regards to age, sex, strand, and school?
2. What is the level of academic performance of the student-respondents in General Mathematics?
3. How can the student-respondents describe mathematics anxiety in terms of Appraisal, Arousal, Face Expressions, and Action Tendencies?
4. How can the student-respondents describe mathematics self-efficacy in terms of Mastery Experience, Vicarious Learning, Social Persuasion, and Affective State?
5. Is there a significant difference in the perception of the students-respondents towards mathematics anxiety when grouped according to profile?
6. Is there a significant difference in the perception of the student-respondents towards mathematic self-efficacy when grouped according to profile?
7. Is there a significant relationship between mathematics anxiety and the academic performance of the student-respondents?
8. Is there a significant relationship between mathematics self-efficacy and academic performance of the student-respondents?
9. Is there a significant difference between mathematics anxiety and mathematics self-efficacy of the student-respondents?
10. What are the sources of mathematics anxiety of the students?

3. Hypotheses

The researchers tested following null hypotheses below:

1. There is no significant difference in the perception of the students-respondents towards mathematics anxiety when grouped according to profile.
2. There is no significant difference in the perception of the student-respondents towards mathematic self-efficacy when grouped according to profile.
3. There is no significant relationship between mathematics anxiety and the academic performance of the student-respondents.
4. There is no significant relationship between mathematics self-efficacy and the academic performance of the student-respondents.

5. There is no significant difference between mathematics anxiety and mathematics self-efficacy of the student-respondents.

4. Methodology

The research design employed was descriptive in nature. Descriptive research aims to correctly and thoroughly characterize a population, situation, or phenomenon. A descriptive study design might use a wide range of research methodologies to explore one or more variables [6].

The study targeted Grade 11 senior high school students as the respondents conducted in Botolan District, Division of Zambales during Academic Year 2020-2021. Five hundred fifteen (515) were officially enrolled Grade 11 students of Botolan District. From the total population of five hundred fifteen (515), there are two hundred twenty-five (225) respondents. The sample size was computed using Sloven's formula with a 0.5 margin of error and applied stratified random sampling to select the respondents.

The researcher's primary tool in gathering data and information from the respondents was a survey questionnaire. The five-part instrument focused on gathering the data and knowledge of the student-respondents. The first part deals with the profile of the student-respondents as to age, sex, strand, and school. The second part deals with the academic performance of the student-respondents reflected on their final grade in General Mathematics. The third part determines the level of mathematics anxiety regarding Appraisal, Arousal, Face Expression, and Action Tendencies based on Rameli's [7] study entitled "Malaysian School Students' Math Anxiety: Application of Rasch Measurement Model.". It is a 24-item questionnaire based on the Parkinson's Four Emotion Factor Theory. It is designed to measure the level of mathematics anxiety with a 0.96 Rasch reliability coefficient value marked as excellent. The fourth part gathers the perception of mathematics self-efficacy regarding mastery experience, vicarious learning, social persuasion, and physiological states, which is based on the Sources of Mathematics Self-Efficacy (SMSE) Scale [8]. It was validated and examined by Kandemir and Perkmen [9] in their study "Examining Validity of Sources of Mathematics Self-Efficacy Scale in Turkey" with an overall Cronbach alpha value of 0.84 and composite reliability value of 0.84 marked as accepted. The last part will be an open-ended question about the sources of anxiety in learning mathematics.

After validating the instrument, the researcher sought approval from the School Heads and Principals signed by the Schools Division Superintendent. Since a face-to-face survey is limited due to the present pandemic crisis, the researcher utilized google form, a social media platform in gathering data and information. Link and the barcode of the Google Form were sent through messenger to the advisers of Grade 11 in different public senior high schools with the aid of the School Principal. The researcher assured that the study's objectives and purpose were indicated in the google form following the data privacy. The researchers allotted about two (2) weeks for the distribution and retrieval to assure a hundred percent of respondents. The researchers employed the Statistical Package for Social Sciences v.26 (SPSS) software in analyzing the gathered data. The statistical tools used are frequency, percentage, weighted mean, F-test, T-test, and Pearson r.

To better understand the study, utilized the IV-DV model of framework or known as the Independent-Dependent Variable frame. Figure 1 below is the conceptual paradigm of the study showing the relationship of the variables used in the study.

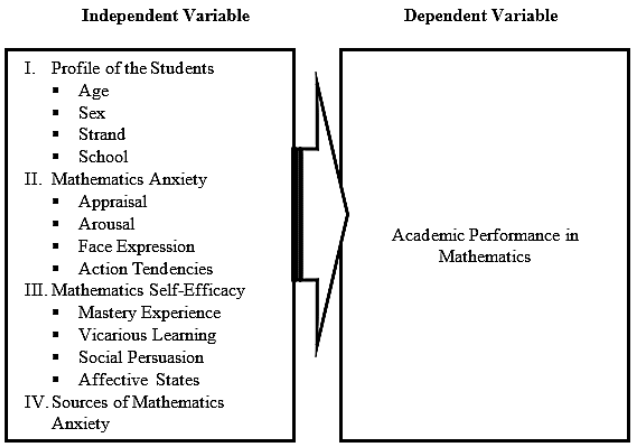

Figure 1. Paradigm of the Study

The Independent Variable frame, known as the cause variable, deals with the profile of the student-respondents as the first part. The second part deals with how the respondents describe mathematics anxiety. The third part deals with the perception of the respondents towards mathematics self-efficacy. For the Dependent Variable frame or known as the effect variable, the academic performance of the student-respondents in Mathematics was gathered.

5. Results and Discussion

1. Profile of the Respondents

Table 1. Frequency and Percentage Distribution of the Student's Profile

Age	Frequency	Percent
20 years old	41	18.22
19 years old	39	17.33
18 years old	74	32.89
17 years old	71	31.56
Total	**225**	**100.00**
Mean = 18.22 years old		

Sex	Frequency	Percent
Male	89	39.56
Female	136	60.44
Total	**225**	**100.00**
Strand	**Frequency**	**Percent**
Science, Technology, Engineering, and Mathematics (STEM)	43	19.11
Humanities and Social Sciences (HUMSS)	103	45.78
Accounting and Business Management (ABM)	24	10.67
Technical, Vocational and Livelihood (TVL)	21	9.33
General Academic Strand (GAS)	34	15.11
Total	**225**	**100.00**
Name of Senior High School	**Frequency**	**Percent**
Botolan National High School	93	41.33
Panan National High School	29	12.89
Bancal Integrated School	18	8.00
New Taugtog National High School	38	16.90
Loob-Bunga High School	18	8.00
Beneg National High School	10	4.44
San Juan Integrated School	19	8.44
Total	**225**	**100.00**

Age. The mean age of the student-respondents was 18.22 years old. The student of the present study belongs to the age range from 18 – 25 years old, which according to Prajapati, Patel, and Raninga [10], is considered young adults. In the study of Lopez and Malay [11], it also appears that most of their respondents are senior high school students aged 18 – 19 years old. Young adulthood is a period of development and change, but the magnitude of change may appear less dramatic than during childhood and adolescence [12].

Sex. Of the two hundred twenty-five (225) student-respondents, 136 or 60.4% are female respondents, and 89 or 36.6% are male respondents. The findings are also confirmed by Jabor, Machtmes, Kungu, Buntat, and Nordin [13], which reveals that the majority of the respondents are female. In Buctot, Kim, and Kim's [14] study, more than half of their respondents are female junior and senior high school students.

Strand. With a large population of students, the majority of the respondents were from the HUMSS strand. It has been reported that 49% of the students want to enroll in the academic track and technical vocational and livelihood track [15].

School. As for the school, most of the students (93 or 41.33%) are respondents from Botolan National High School since they have the highest number of enrolled senior high school followed by New Taugtog National High School with 38 or 16.90% of student-respondents. Maglipot [16] reported that the Department of Education Region III has one of the highest enrolees for Academic Year 2020-2021.

2. Academic Performance

Table. 2 Academic Performance of the Student-Respondents in General Mathematics

Academic Performance		Frequency	Percentage
Advanced	90 & Above	45	20.00
Proficient	85 - 89	101	44.89
Approaching Proficient	80 - 84	69	30.67
Developing	75 - 79	10	4.44
Beginning	74 & Below	0	0
	Total	**225**	**100.0**
Mean Grade	**86.62 (Proficient)**		

The mean grade of the student-respondents in General Mathematics is 86.62. The students show proficient levels in General Mathematics based on the k-12 Curriculum Guidelines. The result shows that students possess good skills in solving and answering questions and facts in Mathematics. The findings are similar to the study of Tus [18], which revealed that the majority of the respondents (54.62%) got a satisfactory grade with a range of 85 – 89. A similar conclusion also showed that 46.32% of the students' academic achievement was satisfactory [17].

3. Mathematics Anxiety

Appraisal. For Appraisal, students feel anxious once they see that the examination questions are different from what they regularly answer (WM=3.01, ranked 1). They also worry when they do not have enough skills to learn mathematics lessons involving complex formulas. The finding signifies that students become apprehensive during exams when they lack sufficient abilities to learn mathematics lessons and are not familiar with examination questions. The increased tension and worry about the exam were identified as the causes of negative contribution to the students' performance [18]. Some students feel anxious when taking a test. This makes them stressed. Students were worried by the term test itself [19]. Students reported to have experienced problems related to understanding or comprehending mathematics questions and explaining the solution or answer [20]. The level of Mathematics Anxiety in terms of Appraisal was a high positive level.

Arousal. In terms of Arousal, the students agreed that their heart beats fast when their teacher asks how to solve mathematics problems and that they feel their head aching when facing a tricky question in mathematics(WM = 2.80,

ranked 1). The lack of confidence of a student to answer or solve mathematics problems when called upon by the teacher, as well as the shaking of voices and sweating of palms when asked by the teacher to explain a mathematical concept, are some of the reasons why students feel worried or anxious, according to Estonanto [21], although these are senior high school students. Reyes [22] stated that doing calculations in front of the class makes them anxious and that they have stage fright when discussing the results of the mathematics lesson. There is a high positive level of Mathematics anxiety as to Arousal.

Table 3. Mathematics Anxiety

Appraisal	WM	QR	Rank
1. I feel worried when learning mathematics concepts that involve many symbols.	2.66	Agree	4
2. I worry when my math teacher asks questions that involve solving.	2.61	Agree	5
3. I feel anxious once I see the examination question is different from what is regularly asked.	3.01	Agree	1
4. I feel worried when I lack skills in learning mathematics lesson that involves complex formula.	3.00	Agree	2
5. I feel anxious once I see the assessment question asked is different from what is regularly asked.	2.94	Agree	3
Overall Weighted Mean	**2.84**	**Agree**	
Arousal	**WM**	**QR**	**Rank**
1. My head feels hurt when answering tough math questions.	2.65	Agree	2
2. My heart beat fast when the teacher asked me how to solve math problems.	2.80	Agree	1
3. I feel nervous when answering math problems.	2.63	Agree	3
4. My hands are trembling when answering or solving math problems.	2.29	Disagree	5
5. I would daydream if I could not answer math examination questions.	2.49	Disagree	4
Overall Weighted Mean	**2.57**	**Agree**	
Face Expression	**WM**	**QR**	**Rank**
1. I will frown my forehead when I cannot answer Mathematics questions asked by the teacher.	2.76	Agree	1
2. My face feels hot when answering math questions.	2.35	Disagree	4
3. My face is easily sweating when there is a math exam.	2.33	Disagree	5
4. I snapped my lip because I worried that I could not understand the math lesson taught by the teacher.	2.58	Agree	2
5. I usually cover my face whenever I do not know how to solve problems, especially during exams.	2.47	Disagree	3
Overall Weighted Mean	**2.50**	**Agree**	
Action Tendencies	**WM**	**QR**	**Rank**
1. I keep silent during math class because I am afraid to be asked by my teacher.	2.67	Agree	1
2. I will play with a pen (other objects) when I cannot answer Mathematics questions during exams.	2.64	Agree	2
3. I will look at my other classmates or friends when I cannot answer Mathematics questions given by the teacher.	2.46	Disagree	3.5
4. I avoid eye contact and move to a hidden position during math class.	2.46	Disagree	3.5
5. I skip my mathematics class.	1.44	Strongly Disagree	5
Overall Weighted Mean	**2.33**	**Disagree**	

Face Expression. The students agreed that they would frown their forehead when they could not answer mathematics questions asked by the teacher (WM = 2.76, ranked 1). They also snap their lips because they worry that they cannot understand the mathematics lesson taught by the teacher. Students who felt terrible when solving mathematics questions indicated more significant concern and, in particular, perceived stress than those who felt positively about mathematics examinations [23]. Classroom activities requiring exercises on boards, oral recitation, feeling uncomfortable, and the presence of teachers might all contribute to their nervousness [22]. The level of Mathematics anxiety in terms of Face Expression is highly positive.

Action Tendencies. As for Action Tendencies, students agree that they keep silent during math class because they are afraid to ask their teacher (WM = 2.67, ranked 1). They also agree that they tend to play with their pen or other objects when they cannot answer mathematics questions during examination. Students avoid recitations during math class because they feel uneasy performing mathematics calculations [24]. When students get worried about answering difficult questions, they avoid mathematics in their modules at the earliest [24]. There is a high positive level of Mathematics anxiety in terms of Action Tendencies.

4. Mathematics Self-Efficacy

Mastery Experience. Students strongly agreed that if they study hard, they do well in mathematics (WM=3.35, ranked 1). The result is also confirmed by Norbu and Dukpa [25]. This signifies that students' performance in mathematics depends on their exerted effort. Students gain self-confidence and feel good when they understand and learn mathematics lessons [22]. Those who were confident in their mathematical ability in learning mathematics performed better in the tasks than those who were not as confident in their ability [26]. Estonanto and Dio [27] mentioned that to perform better in mathematics requires skills in analytics and mathematical comprehension. The students possess a high positive level of Mathematics self-efficacy.

Vicarious Learning. Students agree that seeing adults and kids do well in mathematics pushes them to do better (WM = 3.23, ranked 1). Norbu and Dukpa [25] also revealed that students could be motivated to perform well in math when they see other people do well. This signifies that a good role model motivates them to strive in mathematics class. Mukuka, Mutarutinya, and Balimuttajjo [28] also found that students exposed to cooperative learning possess a strong relationship between self-efficacy belief and mathematical reasoning ability. In terms of vicarious learning, students have a high positive level of mathematics self-efficacy.

Social Persuasion. Students agreed that their teacher appreciates them if they solve mathematics problems correctly (WM= 3.10, ranked 1). Students received appreciative words because of their ability to solve in Mathematics, thus developing more self-efficacy in Mathematics [25]. The teacher's words of encouragement help the student do a lot better [29]. The language of encouragement used in the classroom can affect students' feelings of belonging and connectivity [29]. A teacher's support can have an impact on how pupils perceive themselves. Furthermore, encouraging comments impact the quality of classroom education, causing students to delve deeper and create connections. Students have a high positive

level of Mathematics self-efficacy in terms of Social Persuasion.

Table 4. Mathematics Self-Efficacy

Mastery Experience	WM	QR	Rank
1. I make excellent grades on math tests.	2.59	Agree	5
2. I do well on math assignments.	2.85	Agree	3
3. I do well on even most mathematics assignments.	2.72	Agree	4
4. I got good grades in math on my last report card.	2.94	Agree	2
5. If I study hard, I do well in mathematics.	3.35	Strongly Agree	1
Overall Weighted Mean	**2.89**	**Agree**	
Vicarious Learning	**WM**	**QR**	**Rank**
1. Seeing adults and kids do well in math pushes me to do better.	3.23	Agree	1
2. When I see how my teacher or other students solve a problem, I can picture myself solving the problem in the same way.	3.16	Agree	3
3. I imagine myself working through challenging math problems successfully.	3.17	Agree	2
4. I compete with myself in math.	2.96	Agree	5
5. Seeing my classmates and other students do better than me in math pushes me to do better.	3.08	Agree	4
Overall Weighted Mean	**3.12**	**Agree**	
Social Persuasion	**WM**	**QR**	**Rank**
1. Adults in my family have told me how good I am at math.	2.59	Agree	3
2. My teacher appreciates me if I solve math problems correctly.	3.10	Agree	1
3. My friends like to work with me in group works during math class.	2.77	Agree	2
4. Other students told me how good I am at math.	2.43	Disagree	5
5. I have been praised for my math ability.	2.54	Agree	4
Overall Weighted Mean	**2.69**	**Agree**	
Affective State	**WM**	**QR**	**Rank**
1. I start to feel energized as soon as I begin my Mathematics work.	2.70	Agree	3
2. Just being in Mathematics class makes me feel calm and relaxed.	2.80	Agree	1
3. My mind gets a lot of ideas, and I am able to clearly think when doing Mathematics work.	2.73	Agree	2
4. I get to relax when I think about learning Mathematics.	2.55	Agree	5
5. My whole body gets to relax when I have to do Mathematics.	2.60	Agree	4
Overall Weighted Mean	**2.68**	**Agree**	

Affective State. Students agreed that being in Mathematics class makes them feel calm and relaxed (WM = 2.80, ranked 1). They also agreed that they get many ideas and can think when doing Mathematics work clearly. This signifies that the student is in a conducive learning environment. The finding was congruent to the study of Norbu and Dukpa [26]. They stated that a conducive, friendly, secured, and stress-free learning environment encourages students to participate and learn better, thus gaining more self-efficacy. In a conducive learning environment, learning experiences via problems may help students solve mathematical problems well, either individually or collectively. This may be an asset to solve mathematical problems in their learning activities [30]. The level of mathematics self-efficacy in terms of Physiological State was a high positive level.

5. Analysis of Variance on the Difference in the Level of Mathematics Anxiety When Grouped According to Student's Profile

Table 5. Summary on the Level of Mathematics Anxiety when grouped according to Student's Profile

Sources of Variation	Appraisal		Arousal		Face Expression		Action Tendencies	
	F	Sig.	F	Sig.	F	Sig.	F	Sig.
Age	1.133	0.336	1.699	0.168	2.339	**0.074***	0.911	0.437
Sex	0.139	0.710	0.523	0.470	5.632	**0.018***	1.059	0.305
Strand	1.131	0.343	2.441	**0.048***	5.214	**0.000***	1.107	0.354
School	0.475	0.826	1.581	0.154	0.892	0.502	2.291	**0.036***

****Significant***

Appraisal. The significant values for Age (0.336), Sex (0.710), Strand (0.343), and School (0.826) were higher than the 0.05 alpha level of significance. Therefore, the null hypothesis is accepted. There is no significant difference in the perceived Mathematics Anxiety in terms of Appraisal when grouped according to age, sex, strand, and school. Student-respondents believed that they have the same understanding of Mathematics Anxiety with regards to Appraisal.

Arousal. The significant value for Age (0.168), Sex (0.470), and School (0.154) were higher than the 0.05 alpha level of significance. Therefore, the null hypothesis is accepted. There is no significant difference in the perceived level of Mathematics anxiety in terms of Arousal when grouped according to age, sex, and school. Student-respondents' beliefs and understanding of Mathematics Anxiety in terms of Arousal are the same. The significant value for Strand (0.048) was lower than the 0.05 alpha level of significant value. Therefore, the null hypothesis was rejected. Student-respondents differ significantly in their perceived level of Mathematics Anxiety regarding Arousal when attributed to respondents' strand. Students choose a career path requiring only a lesser mathematics subject [31]. Rameli [7] reported that students from Asia, such as Korea, Japan, and Thailand, regarded Mathematics Anxiety to be considerably greater than students from Europe or the West.

Face Expression. The significant values for Age (0.074) and School (0.502) were higher than the 0.05 alpha level of significance. Therefore, the null hypothesis is accepted. There is no significant difference in perceived Mathematics anxiety regarding face expression when grouped according to age and school. Student-respondents' beliefs and understanding of Mathematics Anxiety in terms of Face Expression are the same. The significant values for Sex (0.018) and Strand (0.000) were lower than the 0.05 alpha level of significance. Therefore, the null hypothesis is rejected. Student-respondents differ significantly in their perceived level of Mathematics Anxiety in terms of Face Expression when attributed to respondents' age and strand, which contradicts the claims of Iglesia et al. [20], [32], and [33]; however, it must be emphasized that significance noted is statistically significant which corroborates with the findings of Asikhia [34]; and [35]. The difference in the perceived level of mathematics anxiety could explain how the students perceived mathematics as either male or female

domains [34]. Alico, Maraorao, and Maraorao [36]; and Erdem [37] also mentioned that among gender, female students have a higher level of mathematics anxiety. Lacia, Ben, and Elizar [35] found that the mathematics anxiety levels between males and females significantly differ. On the other hand, students with a high level of mathematics anxiety tend to choose tracks requiring lesser mathematics courses. This is why most students choose HUMSS as their career path [31].

Action Tendencies. The significant values for Age (0.437), Sex (0.305), and Strand (0.354) were higher than the 0.05 alpha level of significance. Therefore, the null hypothesis is accepted. There is no significant difference in the perceived level of Mathematics Anxiety in terms of Action Tendencies when attributed to age, sex, and strand. Students' beliefs and understanding of Mathematics Anxiety in terms of Action Tendencies are the same. The significant value for School (0.036) is lower than the 0.05 alpha level of significance. Therefore, the null hypothesis is rejected. Student-respondents differ significantly in their perceived level of Mathematics anxiety regarding Acton tendencies when attributed to school. The findings support the claims of Lacia, Ben, and Elizar [35]; and Winarso and Haqq [38]. Students from Asia, such as Korea, Japan, and Thailand, regarded Mathematics Anxiety to be considerably greater than students from Europe or the West [3]. Students from elementary schools developed a higher significant level of mathematics anxiety than students from secondary schools [38]. In contrast, Winarso and Haqq's [38] study indicates that senior high students possess a high level of mathematics anxiety compared to the lower level of education.

6. Analysis of Variance on the Difference in the Level of Mathematics Self-Efficacy When Grouped According to Student's Profile

Table 6. Analysis of Variance on the Difference in the Level of Mathematics Self-Efficacy When Grouped According to Student's Profile

Sources of Variation	Mastery Experience		Vicarious Learning		Social Persuasion		Affective State	
	F	Sig.	F	Sig.	F	Sig.	F	Sig.
Age	4.145	**0.007***	3.215	**0.024***	1.660	0.177	4.497	**0.004***
Sex	0.011	0.916	5.400	**0.021***	0.941	0.333	4.441	**0.036***
Strand	0.566	0.687	0.566	0.687	1.595	0.177	1.083	0.366
School	1.360	0.232	1.252	0.281	0.766	0.597	2.154	**0.049***

Significant

Mastery Experience. The significant values for Sex (0.916), Strand (0.687), and School (0.232) were higher than the 0.05 alpha level of significance. Therefore, the null hypothesis is accepted. There is no significant difference in the perceived level of mathematics self-efficacy in mastery experience when attributed to sex, strand, and school. Students' beliefs and understanding of mathematics self-efficacy in mastery learning are the same. The significant value for Age (0.007) is lower than the 0.05 alpha significance level. Therefore, the null hypothesis is rejected. Student-respondents differ significantly in their level of mathematics self-efficacy regarding mastery experience when attributed to age. It is possible to conclude that age might be a predictor of students' mathematics self-efficacy. There is a lack of studies regarding age and mathematics self-efficacy. However, some studies suggest that younger students perform better in mathematics than older students [13]; [39].

Vicarious Learning. The significant values for Strand (0.687) and School (0.281) were higher than the 0.05 alpha level of significance. Therefore, the null hypothesis is accepted. There is no significant difference in the level of mathematics self-efficacy in terms of vicarious learning when attributed according to strand and school. Students' belief and understanding of mathematics self-efficacy in vicarious learning is the same when attributed to strand and school. The significant values for Age (0.024) and Sex (0.021) were lower than the 0.05 alpha level of significance. Therefore, the null hypothesis is rejected. Student-respondents differ significantly on their perceived level of mathematics self-efficacy regarding vicarious learning when attributed to age and sex. The result contradicts the findings of Ducay and Alave [40], Cuevas and Berou [41], and Probst [42], where there was no significant difference between mathematics self-efficacy of male and female students. On the other hand, the significant difference in mathematics self-efficacy regarding vicarious learning and age cannot be verified by other findings since there is a lack of research. However, some studies suggest that younger students have a higher mathematics performance than older students [13]; [39].

Social Persuasion. The significant values for Age (0.177), Sex (0.333), Strand (0.177), and School (0.597) were higher than the 0.05 alpha level of significance. Therefore, the null hypothesis is accepted. There is no significant difference in perceived Mathematics Self-Efficacy in terms of Social Persuasion when grouped according to age, sex, strand, and school. Students believed that they have the same understanding of Mathematics Self-Efficacy with regards to social persuasion.

Affective State. The significant values for Strand (0.366) were higher than the 0.05 alpha significance level. Therefore, the null hypothesis is accepted. There is no significant difference in mathematics self-efficacy regarding Affective states when grouped according to strand. Students' belief and understanding of Mathematics self-efficacy in terms of physiological state are the same when attributed to strand. The significant values for Age (0.004), Sex (0.036), and School (0.049) were lower than the 0.05 alpha level of significance. Therefore, the null hypothesis is rejected. There is a significant difference in the perceived level of Mathematics self-efficacy regarding physiological state when attributed to age, sex, and school. Students' beliefs and

understanding differ significantly in age, sex, and school. The result contradicts the findings of Ducay and Alave [40], where there was no significant difference between the self-efficacy of males and females.

On the other hand, the finding was similar to the study of Ozdemir, Karasan, & Sahal [43], where students' attitudes towards mathematics differ significantly according to the school where they enroll. Moreover, the significant difference in mathematics self-efficacy regarding vicarious learning and age cannot be verified by other findings since there is a lack of research. Nevertheless, some studies suggest that younger students have a higher mathematics performance than older students [13]; [39].

7. Pearson Correlation on the Relationship Between the Level of Mathematics Anxiety and Academic Performance

Table 7. Relationship Between Mathematics Anxiety and Academic Performance of the Students

Academic Performance		Grade	Decision	Interpretation
Mathematics Anxiety	Pearson Correlation	-0.198	Ho is rejected Significant	**Negligible Relationship**
	Sig. (2-tailed)	0.003		
	N	225		

Table 7 shows that the significant value (0.003) is lower than the 0.05 alpha significance level. Therefore, the null hypothesis is rejected. There is a significant negligible relationship between perceived Mathematics Anxiety and academic performance in General Mathematics of the students. The inverse connection indicates that as students' anxiety levels in General Mathematics rise, so does their performance. Based on this finding, it is possible to conclude that the mathematics anxiety level of senior high school students is substantially connected to their performance level in General Mathematics. As a result, their degree of math anxiety is negatively related to their academic performance in General Mathematics. The result is also verified by Hiller et al. [44] and Ducay and Alave [40] that mathematics anxiety affects students' academic performance. There is a link between mathematics anxiety and student performance in Pre-calculus [22]. Furthermore, findings were also revealed where students' self-confidence significantly impacts students' understanding of specific mathematical concepts [28].

8. Pearson Correlation on the Relationship Between the Level of Mathematics Self-Efficacy and Academic Performance

Table 8. Relationship Between Mathematics Self-Efficacy and Academic Performance of the Students

Academic Performance		Grade	Decision	Interpretation
Mathematics Self-Efficacy	Pearson Correlation	0.161	Ho is rejected Significant	**Negligible Relationship**
	Sig. (2-tailed)	0.016		
	N	225		

The significant value (0.016) in Table 8 was lower than the 0.05 alpha significance level. Therefore, the null hypothesis is rejected. There is a significant negligible relationship between perceived Mathematics self-efficacy and academic performance of students in General Mathematics. The positive relationship signifies that the increase in Mathematics self-efficacy of the students will improve the students' performance in Mathematics. The result was also verified by Hiller et al. [44], Ducay and Alave [40], and Mariera, Murugami, and Muthee [45], where mathematics self-efficacy is a predictor of academic performance. Students that have a firm conviction in their abilities and capabilities will eventually do well [29]. The ability to achieve well in mathematics, do well in completing the task and adapt to the learning environment possess a high level of self-efficacy [46].

9. T-test on the Difference in the Perception Between Mathematics Anxiety and Mathematics Self-Efficacy by the Student-Respondents

Table 9. Differences Between the Level of Mathematics Anxiety and Mathematics Self-Efficacy

Variable	n	M	SD	t	Sig.	Interpretation
Mathematics Anxiety	225	2.56	0.539	-6.253	0.000	**Ho is rejected Significant**
Mathematics Self-Efficacy	225	2.84	0.404			

The significant value (0.000) on the difference between perceived mathematics anxiety and mathematics self-efficacy was lower than 0.05 alpha level of significance. Therefore, the null hypothesis is rejected. There is a significant difference in the student respondents perceived mathematics anxiety and mathematics self-efficacy. Mathematics self-efficacy significantly influences mathematics anxiety [47]. As a result, one potential lesson from the current study's findings is that increasing students' mathematical self-efficacy may also be beneficial in lowering mathematics fear. It is possible that lowering students' mathematics anxiety may be beneficial in increasing their mathematics self-efficacy. Students who were more anxious about mathematics tended to have lesser cognitive reflection and, as a result, more inflexible persistence [48]. Findings also revealed a strong interaction between perceived mathematics anxiety and mathematics self-efficacy [44]; [41].

10. Sources of Mathematics Anxiety

Student-respondents were asked what they felt about learning Mathematics. Responses were categorized into subthemes: positive emotion and negative emotion. Positive and negative emotions are linked with the achievement of the students in Mathematics [49]. Mathematics anxiety is based on physical and emotional feelings, while mathematics self-efficacy is about the student's effort and the teachers' coping

techniques [23]. Based on the result of the study, for positive emotion, sixteen (16) students said they feel happy about learning Mathematics; fifteen (15) said learning Mathematics is good; fourteen (14) students mentioned that Mathematics made them feel challenged; and lastly, seven (7) said they feel better.

The dominant remarks of the student-respondents are the feeling of happiness whenever they acquire new knowledge and skills in solving. Getting a correct answer also motivates them to pursue learning Mathematics which was evident in their responses:

"Learning Mathematics makes me feel happy, especially if I got the correct answers."

"I feel great when I can cope with Mathematics subjects, and the most exciting thing/part is when I can solve the problems."

"Exciting and interesting because we all know that Mathematics is a very challenging subject because we are always finding a solution to every problem."

The result suggests that positive experiences and reinforcements aid the students to become good in Mathematics. Students are motivated to learn and better connect with their teachers when given sufficient attention and commendations [50]. Students appraised and given encouraging words also support their academic growth [29]. It is also conclusive that students with positive self-concept in mathematics possessed higher mathematical skills [51].

Table 10 presents the students' responses when asked how they feel about learning Mathematics.

Table 10. Students' Responses about Learning Mathematics

Subthemes	Feelings Towards Learning Mathematics	Number of Responses
Positive Emotion	Feeling Happy	16
	Feeling Better	7
	Feeling Good	15
	Mathematics is Challenging	14
Negative Emotion	Nervousness	26
	Pressured	3
	Math is complicated	18
	Feeling Anxious and Worried	9
	Total	**108**

For the negative emotion, twenty-six (26) mentioned that they feel nervous when learning Mathematics; eighteen (18) responded that Mathematics is complicated; nine (9) said that they feel anxious and worried; and lastly, three (3) respondents said they are pressured in learning Mathematics. The dominant remarks of the student-respondents are the feeling of nervousness, especially during solving problems and checking whether the answer is correct or not. They mentioned that Mathematics is challenging to learn without the aid of a teacher, which is evident in their responses:

"Nervous with an answer in mind but do not want to say because it might be wrong."

"It is hard to self-study in Mathematics."

"...it is difficult without the aids from the professional to guide me of solving the mathematical problems…."

Based on the findings, students acknowledged that Mathematics is a complex subject, making them feel nervous, especially during exams, activities, and even recitations. Students feel nervous, worried, and anxious once they hear mathematical terms that seem very hard [27]. This could be possible when students do not master the concept and lack conceptual, computational, and manipulative skills in solving mathematical problems. It is also possible that teaching styles cause major anxiety [27].

Table 11 presents the students' responses about their experience in learning Mathematics that made them feel anxious.

Table 11. Student's Responses on their Anxious Experiences in Learning Mathematics

Feelings Towards Learning Mathematics	Number of Responses
Stage fright	23
Teacher Related Factor	6
Lack in Skills or Knowledge	29
Mathematics Examination	8
Solving Mathematics Problem	29
Total	**95**

Student-respondents were asked about their experiences that made them feel anxious in learning Mathematics. Based on the result, twenty-nine (29) said they were not able to solve mathematics problems, and they lacked in skill or knowledge to solve; twenty-three (23) said answering in front of the class made them feel anxious; eight (8) said they got worried during examination day; and lastly, six (6) mentioned experiences related to teachers' behavior, attitude and teaching style. The dominant remarks of the student-respondents are solving Math problems that involve many variables and different formulas. They get worried when they do not have enough mathematical skills to understand and solve math problems which are evident in their responses:

"My experiences in learning Mathematics that makes me feel anxious is when I try to solve, but it didn't work well, to analyze and understand it."

"I feel anxious in times of examination day."

"...when my teacher called me to answer Math problems, but I don't know what (is) the answer."

"...when the teacher didn't explain it well."

Based on the findings, students acknowledged that lacking mathematical skills to solve Math problems is the main reason for their anxiety. Students' lack of effort, being reluctant to seek help from others, inattention in the classroom, and lack of motivation are some reasons why students lack the skills to solve Math problems. Students detest Math as a subject because it is not easy to understand. There is poor instruction, and it demands more time to comprehend [1]. Strictness in any means may also affect the students' performance [52]. Students also noticed their

teacher is either unprepared or does not have mastery of the topic [52]; [27]. It could also be possible when students know the basic skills, yet they do not understand the proper application of the concept itself. That is why students are afraid to answer in front of the class [22].

5. Conclusion and Future Scope

Based on the findings, the researchers concluded that:

1. The female students who belong to young adults are enrolled as Grade 11 in a public Senior High School in the Botolan district.
2. The students demonstrate a proficient level in General Mathematics.
3. The perceived level of Mathematics Anxiety by the students is highly positive.
4. The perceived level of Mathematics Self-Efficacy by the students is highly positive.
5. When grouped according to age, the students' perceptions on the Appraisal, Arousal, Face Expression, and Action Tendencies aspects of Mathematics Anxiety do not differ significantly. When grouped according to sex, perceptions differ significantly on the Face Expression, while perceptions on the Appraisal, Arousal, and Action Tendencies are the same. In terms of the strand, perceptions differ significantly on the Arousal and Face Expression, while perceptions on the Appraisal and Action Tendencies are the same. In terms of school, the significant difference only matters on the Action Tendencies, while perceptions on Appraisal, Arousal, and Face Expression are the same.
6. When attributed to age, perceptions on the Mastery Experience, Vicarious Learning, and Physiological State aspect of Mathematics self-efficacy differ significantly, while perceptions on Social Persuasion are the same. When grouped according to sex, perceptions on Vicarious Learning and Affective State differ significantly while perceptions on Mastery Experience and Social Persuasion are the same. In terms of the strand, perceptions on all the aspects of Mathematics self-efficacy are the same. In terms of school, perceptions only differ significantly on Affective State.
7. There is a significant yet negative relationship between the perceived level of Mathematics anxiety and students' academic performance in General Mathematics.
8. There is a significant positive relationship between the perceived level of Mathematics self-efficacy and students' academic performance in General Mathematics.
9. Students feel nervous when learning mathematics, especially during examinations and recitations. They acknowledged their lack of skills and knowledge in solving Mathematics problems.

In the light of the preceding conclusions of the study, the following recommendations were advanced:

1. Students should develop their mathematical skills by understanding the how and why mathematics to give a stronger basis for future learning. They should mentally work out their arithmetic skills to strengthen their working memory, build confidence, establish motivation, and encourage themselves to raise questions and make space for curiosity.
2. Student organizations may collaborate with students who excel in Mathematics who will serve as role models and note-taking buddies to give support and aid other students to motivate them to learn by showing real-world situations that involve Mathematics use outside of the classroom, explaining how Mathematics works, and allow them to be comfortable in trying different approach to solve problems and give them processing time to understand the concept. They should help create a positive learning environment, be an agent for positive reinforcements and approaches, and share a positive attitude about Mathematics to actively encourage other students to participate in class.
3. To help students overcome their stage fright in Mathematics, a student organization, with the help of Mathematics teachers and advisers, may plan to conduct Mathematics activities, games, or team-building events emphasizing the conceptual understanding and providing other avenues to solve problems that increase students' drive to engage in Mathematics.
4. Teachers may also incorporate more engaging activities or games in Mathematics during class to allow the students to communicate and show them how to create good work. To empower students to have a sense of ownership in learning Mathematical concepts to develop independence and self-learning, teachers may focus on developing students' thinking logically and reasonably and allow them to share feedback and ideas.
5. A follow-up study may be conducted regarding age and mathematics self-efficacy to validate the result of the findings. Future researchers may also conduct this study in broader scope for validation purposes.

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