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Math Interest and Performance of Grade 11 students in General Mathematics

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***Abstract*— This study assessed the interest in mathematics and the performance of Grade 11 students in General Mathematics. It also sought to determine the relationship between the respondents' interest in mathematics and performance in General Mathematics.**

It utilized the descriptive quantitative method of research with the use of secondary data from the school records and a standardized questionnaire. There were 525 respondents in the study. The respondents were grade 11 students from two identified public and private high school from Cebu City, Cebu, Philippines. Six statistical treatments were used in this study: simple percentage, weighted mean, Pearson's r, one-way ANOVA, and t-test for independent samples.

It was revealed that most of the respondents were 16 to 17 years old and were female. It also revealed that most of the parents were high school graduates, and the families had a combined monthly income of Php10,000 below. The academic performance of the respondents was very satisfactory. It was found out that there is negligible positive correlation, yet significant relationship, between the respondents' interest in mathematics and performance in General Mathematics. Moreover, there is a significant difference among the academic performance of the respondents when grouped according to their academic strand but none when they are grouped according to the type of school they are enrolled in. It was concluded that the level of interest in mathematics is significantly related to the performance in General Mathematics especially among those with higher level of academic performance. The researchers recommend that the proposed action plan can be used and monitored.

Keywords—teaching mathematics; teaching strategies; students' interest; mathematics performance; general mathematics; descriptive-quantitative; senior high school; academic track; Philippines

I. INTRODUCTION

Mathematics is integral in our lives. We use it in our day-to-day activities even without realizing it sometimes. We use mathematics in travelling, making purchases, budgeting expenses, and cooking to name a few. It is a tool that develops mental discipline, logic and reasoning, and critical and analytical thinking. It helps us make our lives organized and helps us better understand the things going on around us. As a discipline, it is considered diverse and universal and it finds useful applications in all fields of study whether it be engineering, medicine, agriculture, business, politics, sports, and many others.

Expertise in mathematics is a key to a country's technological advancement and economic progress. For this reason, mathematics education and student achievement in the subject is given focus and attention in the Philippines. The basic education curriculum in the country includes mathematics as a core subject across levels from K-3 to senior high school. These mathematics courses at the basic education level cover the basics necessary to prepare them for life after graduating from the senior high school level – for college or employment.

While the significance it plays in our daily lives and the importance of mathematics as an integral part of the curriculum cannot be stressed enough, problems related to the performance of students in mathematics are still evident not just in the Philippines but also in other countries. In the 2018 Programme for International Student Assessment, several countries showed declining performances in mathematics. Quebec produced a loss of 4 points from 2003 to

2018, Canada declined by 15 points, Alberta declined by 38 points, British Columbia declined by 34 points and the greatest loss was experienced by Manitoba which declined by 46 points. The Philippines participated in the program for the first time as part of the Department of Education's reform plan on quality basic education. However, the country ranked second to the last among 79 participating countries. The disappointing results of the international assessment confirm that there is indeed a problem in the performance of students in discipline, especially the Philippines.

This study intended to investigate the level of interest of the Grade 11 students at Don Vincente Rama Memorial National High School and Asian College of Technology towards learning mathematics and their level of academic performance in General Mathematics. This study aimed to provide an objective assessment of the variables included in the study for the purpose of determining action plans.

This study is anchored on Krapp's Theory of Interest and Walberg's Theory of Educational Productivity.

The interest Theory by Krapp interprets interest as a person-object-relationship. A person will develop an interest for an "object" for either a shorter or longer period. This object of interest "can refer to concrete things, a topic, a subject matter, an abstract idea, or any other content of the cognitively represented life-space" (Krapp, 1999). In this study, the "object" being referred to is General Mathematics. The interest of students in General Mathematics is "a unique motivational variable" which can be expressed through giving full attention and engagement to the learning activities.

On the other hand, the Theory of Educational Productivity by Walberg sought to explain student academic performance. It states that "to increase educational productivity and efficiency, educational process goals as well as achievement goals must be considered". These educational process goals include the perception of students on the "social environment, creativity, self-concept, participation in extra-curricular activities, and interest in subject matter" (Walberg, 1978). Based on this construct, if students are interested in General Mathematics, then they will perform better academically.

The legal basis for this study is the Department of Education Order No. 034 s. 2022 which allows schools to implement any of the following: (a) 5 days of in-person classes, (b) blended learning modality with 3 days in-person classes and 1 day of distance learning, (c) full distance learning.

In in-person classes, both the teachers and students are physically present. There is active engagement and feedback on activities are immediate. In distance learning, the teachers and the students are geographically remote from each other during instruction. There are three types of distance learning – modular, online classes and television/radio-based.

Modular Distance Learning uses printed or digital self-learning modules whichever is applicable. The teachers monitor the progress of the students through telephone, text messaging or instant messaging. In Online Distance Learning, on the other hand, the teacher facilitates students' active participation through different technologies accessed via the internet while they are geographically remote from each other. A stable internet connection is required for this type. The students download learning materials from the internet, attend virtual classes and submit assignments online. The teachers utilize a Learning Management System like the DepEd Commons.

Moreover, the television/radio-based instruction utilizes self-learning modules which they converted into video lesson for television-based and radio script for radio-based. Blended Learning combines in-person and distance learning. This modality limits face-to-face learning to ensure social distancing.

Based on the DepEd memo, in-person classes are done from Mondays to Wednesdays while distance learning from Thursdays to Fridays.

Some literature believed that interest has a vital role in the academic performance of students in mathematics. However, there are also some that say otherwise. Therefore, this study used Interest Theory and Educational Productivity Theory to understand more the interest-academic performance relationship in mathematics of the students in the Philippine context.

II. METHODOLOGY

A. Design

This study utilized descriptive-quantitative design. Descriptive-quantitative design involves test, survey, interview, and observation to describe status or characteristics by phenomenon or situation (Eggen & Kauchak, 2010). Quantitative descriptive data was used to describe, explain, predict, or control the phenomena that was studied in this research regarding statistic or numerical data (Gay, Mills, Airasian,2012, p.7). Descriptive-quantitative was utilized since this research was used to investigate the level of interest of the respondents to mathematics and their academic performance. A survey was conducted using convenience sampling technique to collect data. Convenience sampling is a technique in which readily available respondents are selected. This sampling technique was used since it is a practical choice in conducting the study wherein the availability of the respondents, research budget and time constraint are considered. The respondents' level of interest, academic performance in mathematics, and relationship between the two were then analyzed.

B. Environment

The setting of the study centered on the respondents from two institutions. First is the Asian College of Technology – International Educational Foundation, formerly known as Asian Computer Institute, is a private college in the Philippines located in Cebu City and Talisay City which was established in

1988. The school started as Asian College of Technology in Colon, Cebu City - a college which offered computer science courses with the aim of becoming the primary provider of computer literacy in Cebu City. In 1992, the school was incorporated as Asian College of Technology, Inc which led to the expansion of its educational programs and the establishment of its Bulacao Campus in Talisay City. At present, the school offers preschool, elementary, and high school in addition to the post-secondary and collegiate courses it initially offered. From its pioneering computer science curriculum offering, ACT is now offering diverse college courses which includes four courses under the College of Arts, Sciences and Pedagogy, 4 courses under the College of Business Management, four courses under the College of Computer Studies, three courses under the College of Nursing and Allied Programs, and complete Basic Education Programs. It's Senior High School program offers the academic and technical-vocational-livelihood (TVL) track. The academic tracks include the following strands: general academic strand (GAS), humanities and social sciences (HUMSS) strand, science, technology, engineering, and mathematics (STEM) strand, and accountancy, business and management (ABM) strand.

The second institution where the study was conducted is the Don Vicente Rama Memorial National High School, the first national high school and one of the biggest public high schools in the south of Cebu City. It was opened on June 7, 1993, given the name Cebu City Don Carlos A. Gothong Memorial National High School – Basak Extension through DECS Order No. 5 series of 1989. It became independent on October 9, 1993, and acquired its new name in 1994, the Basak National High School. Through a resolution in 2004, the name was converted into Don Vicente Rama Memorial National High School. It is situated in two barangays of the south of Cebu – barangay Basak San Nicolas and barangay Basak Pardo. At present, the school offers a complete program of the high school level for basic education from Grade 7 to Grade 12.

The two identified schools are located at the heart of Cebu City. The Asian College of Technology is one of the many private schools with a good number of senior high school students. On the other hand, Don Vicente Rama Memorial National High School is among the top 3 public high schools in Cebu City in terms of population.

C. Respondents

The respondents considered in the study were the Grade 11 students of the two identified public and private high schools. The respondents of the study were the 525 Grade 11 students from Asian College of Technology and Don Vicente Rama Memorial National High School. Out of the 525 total population, 277 come from ACT and 248 come from DVRMNHS.

The respondents from each school were categorized according to the strand they were taking. Of the 277 respondents from ACT, 101 were taking up STEM, 106 were taking up ABM and 70 were taking up GAS. Of the 248 respondents from Don Vicente Rama Memorial National High School, 106 were taking up STEM, 78 were taking up ABM and 64 were taking up GAS.

With General Mathematics as a core subject taken by all senior high school students under the academic track, the study utilized convenience sampling technique which involved the Grade 11 students taking up the strands STEM, ABM and GAS. This data is presented in Table 1, the distribution of the respondents of the study.

TABLE 1. DISTRIBUTION OF THE RESPONDENTS

Name of Schools	N	n1	n2	n3	%
Asian College of Technology	277	101	106	70	52.76
Don Vicente Rama Memorial National High School	248	106	78	64	47.24
Total	525	207	184	134	100.00

D. Instrument

This study utilized a descriptive-survey questionnaire which consists of questions that met the needs of the problem in the study. The questionnaire was composed of the following parts:

Part I. Profile of the Respondents. The students' name, age, gender, parents' highest educational attainment, combined family monthly income, type of school enrolled, and academic strand enrolled were gathered.

Part II. Math Interest. The Math Interest Inventory (II) by Stevens and Olivarez, 2005 was adapted. This has 27 questions and uses a 5-point scale: Strongly Disagree (1), Disagree (2), Undecided (3), Agree (4), and Strongly Agree (5). Eleven out of the 27 items are negatively stated. These were reverse scored before analysis of data was done.

On the other hand, the academic performance of the students in General Mathematics were based on the grades shown in their repost cards for the first quarter of school year 2022-2023.

E. Scoring Procedure

The rating scale with the corresponding weights and values was used by the researchers. The heaviest weight was assigned to the most favorable response. Ranges were assigned to each of the weights in the rating scale.

To gather a vivid interpretation, the researchers used the scoring procedure found in Table 2 for the math interest of the respondents.

The researchers used the scoring procedure in Table 3 to evaluate the performance of the respondents in General mathematics.

TABLE 2. MATH INTEREST SCORING PROCEDURE

Scale	Numerical Rating	Descriptive Rating	Verbal Interpretation
5	4.21-5.00	Very High	The respondents strongly agree on the statements describing their interest in learning mathematics.
4	3.41-4.20	High	The respondents agree on the statements describing their interest in learning mathematics.
3	2.61-3.40	Mode rate	The respondents are undecided on the statements describing their interest in learning mathematics.
2	1.81-2.60	Low	The respondents disagree on the statements describing their interest in learning mathematics.
1	1.00-1.80	Very Low	The respondents strongly disagree on the statements describing their interest in learning mathematics.

TABLE 3. GENERAL MATHEMATICS PERFORMANCE SCORING PROCEDURE

Scoring Range	Descriptive Rating	Verbal Interpretation
90-100	Outstanding	The Grade 11 student's performance represents an extraordinary level of achievement and commitment in math subject.
85-89	Very Satisfactorily	The Grade 11 student's performance in math exceeded expectations of the teacher.
80-84	Satisfactorily	The Grade 11 student's performance in math met expectations of the teacher.
75-79	Fairly Satisfactorily	The Grade 11 student's performance in math failed to meet expectations of the teacher.
Below 75	Poor	The Grade 11 student's performance in math was consistently below expectations of the teacher.

III. PRESENTATON, ANALYSIS AND INTERPRETATION OF DATA

A. Results of the data gathered from Asian College of technology

1) Level of Interest

Table 4 shows that the respondents agree on the positively worded statements specifically item numbers 4, 7, 10, 16 and 26. These items express the respondents' interest in mathematics, and that they want to learn all about mathematics. They want to know how to do mathematics problems because knowing a lot about it is helpful. Furthermore, the respondents strongly agree with statement number 22 which is also a positively worded statement. This shows that the respondents want to learn more about mathematics.

Moreover, the respondents also agree with the negatively worded statements namely item numbers 2, 5, 14, 18, and 20. This shows that they get mad easily and are wasting their time when working on mathematics. They tend to be bored and stop working to do something else. They also prefer easy mathematics. On the other hand, they disagree with item number 27. This conveys that they do not struggle with mathematics.

It is evident that the respondents are undecided on 15 out of 27 statements describing their interest in learning mathematics. Overall, the aggregated weighted mean of 3.40 which implies that Asian College of Technology respondents are moderately interested in mathematics.

According to Mazana et al. (2019), attitude towards mathematics can be influenced by how students enjoy the class and teacher's classroom management.

To ensure that students won't get bored or mad and think that they are just wasting their time when working on mathematics, the teachers need to improve their teaching techniques and strategies. This can be addressed by sending them to trainings and seminars. Also, integrating ICT or internet and communication technologies in conducting lessons could help in making the class more interesting.

Students prefer math that is easy maybe because they are not confident with their skills. Are their skills enough to continue with the tasks given to them? According to Aguilar (2021), if students' confidence and self-perception is not met, it is likely that they will develop long-lasting negative attitudes towards mathematics. The high school students in this research by Aguilar acknowledge their negative perception towards mathematics since elementary or middle school. To boost their confidence and nurture their mathematical talents, peer tutorial sessions can be done through an organization like a math club. Studious and achiever students can be tapped to help their fellow students who are struggling with the subject.

TABLE 4. LEVEL OF INTEREST OF THE RESPONDENTS TOWARDS LEARNING MATHEMATICS

S/N	Indicators	WM	Verbal Description
1	I like to answer questions in Math class.	3.38	Moderate
2	I am wasting my time on math.	4.09	High
3	I work more math problems than what I have to.	2.92	Moderate
4	I like math.	3.52	High
5	I am bored when working on math.	3.70	High
6	I spend more hours working on math.	3.11	Moderate
7	I am interested in math.	3.70	High
8	I would rather be working on something else besides math.	3.08	Moderate
9	I work on math in my spare time.	2.77	Moderate
10	Knowing a lot about math is helpful.	4.20	High
11	I give up easily when working on math.	3.30	Moderate
12	I want to talk about math with my friends.	3.31	Moderate
13	I feel good when it comes to working on math.	3.24	Moderate
14	When working on math, I want to stop and start working on something else.	3.97	High
15	I spend more time than most of my classmates working on math.	2.91	Moderate
16	I want to know all about how to do math problems.	4.12	High
17	I am always thinking of other things when working on math.	3.01	Moderate
18	I prefer easy math over math that is hard.	3.70	High
19	I feel excited when a new math topic is announced.	3.25	Moderate
20	I get mad easily when working on math.	3.53	High
21	I am too involved in math.	3.06	Moderate
22	I want to learn more about math.	4.22	Very High
23	I have difficulty paying attention when working on math.	2.89	Moderate
24	I choose to work on math.	3.25	Moderate
25	I spend as little as possible when working on math.	2.83	Moderate
26	I want to know all about math.	4.13	High
27	I struggle with math.	2.54	Low
	Aggregate Weighted Mean	**3.40**	**Moderate**

Legend: 4.21-5.00-Very High; 3.41-4.20-High; 2.61-3.40-Moderate; 1.81-2.60-Low; 1.00-1.80-Very Low

2) Level of Academic Performance

Table 5 shows that 91 out of 277 respondents from Asian College of Technology which comprised 32.85% percent, have very satisfactory performance in General Mathematics. Eight-eight or 31.77 percent have outstanding performance while 59 or 21.30 percent have satisfactory performance.

Furthermore, 21 or 7.58 percent did not meet expectations and 18 or 6.50 percent have fairly satisfactory performance. Overall, the respondents from Asian College of Technology have very satisfactory performance in General Mathematics with a mean of 86.19 and standard deviation of 6.22.

To further improve the academic performance of the students in General Mathematics, the administrators and teachers must look into the curriculum. Lesson plans must be improved to provide appropriate activities and achieve the desired competencies. According to Chand et al. (2021), an ineffective mathematics curriculum was the reason behind the students' poor performance in the subject. Use of technologies, improving the quality of teachers, and introducing field work in the curriculum were some of the recommendations made from their study.

3) Relationship Between Interest and Academic Performance

Table 6 reflects the test on significant relationship between the math interest and academic performance in General Mathematics of the respondents. Using the Pearson product moment correlation test, the result shows a correlation coefficient r-value of 0.318 and p-value 0.000 which is less than the 0.05 significance level. This suggests that there is a significant relationship between the mathematics interest and academic performance in General Mathematics, therefore rejecting the null hypothesis.

The Pearson r-value of 0.318 gives a weak positive correlation. This implies that that the interest of the Asian College of Technology respondents in mathematics will predict their academic performance in General Mathematics although not strongly. According to Salifu and Bakari (2022), student's interest and perception significantly predicted students' achievement in mathematics. Also, Tembe et al. (2020) showed that there was a significant relationship between mathematics interest and students' achievement in mathematics.

TABLE 5. LEVEL OF ACADEMIC PERFORMANCE OF THE RESPONDENTS IN GENERAL MATHEMATICS

Level	Numerical Range	f	%
Outstanding	90-100	88	31.77
Very Satisfactory	85-89	91	32.85
Satisfactory	80-84	59	21.30
Fairly Satisfactory	75-79	18	6.50
Did not Meet the Expectations	Below 75	21	7.58
Total		**277**	**100.00**
Mean		86.19	
St. Dev.		6.22	

TABLE 6. TEST OF SIGNIFICANT RELATIONSHIP BETWEEN THE RESPONDENTS' MATH INTEREST AND THEIR ACADEMIC PERFORMANCE IN GENERAL MATHEMATICS

Variables	r-value	Strength of Correlation	p - value	Decision	Result
Math Interest and Academic Performance in General Mathematics	0.318*	Weak Positive	0.000	Reject Ho	Significant

*significant at p<0.05 (two-tailed)

The test of significant difference among the academic performance of the respondents from Asian College of Technology when grouped according to their academic strand, can be seen in Table 7. This uses one-way ANOVA at 0.05 level of significance. The computed mean square value between academic strands is 667.893 while the computed mean square value within the academic strands is 34.126. These resulted in a computed F-value of 19.570 and a p-value equal to 0.000 which is less than the 0.05 significance level.

The results suggest that the null hypothesis is rejected which means there is a significant difference among the academic performance in General Mathematics of the respondents in Asian College of Technology when grouped according to their academic strand. This implies that students enrolled in one strand perform significantly better in General Mathematics than the students enrolled in the other two strands.

To further analyze the data, the average General Mathematics grade per strand was computed. Students enrolled in GAS significantly had lower academic performance compared to those enrolled in ABM and STEM. This is supported by studies conducted in the Philippines. The first one is by Cerbito (2020) which showed that their STEM students had the highest academic performance means score among all academic strands. Moreover, a study by Nazareno et al. (2021) found that students in the STEM strand have outstanding performance in all core subjects which include mathematics. Similarly, those in ABM strand displayed outstanding to very satisfactory performance while those in GAS showed satisfactory to fairly satisfactory performance.

According to Dumapias and Tabuzo (2018), STEM students tend to perform better in mathematics than students from other strands because they are more interested in mathematics. They observed that there is a moderately high relationship between the confidence and interest of the respondents in math and their interest in pursuing the STEM strand.

TABLE 7. TEST OF SIGNIFICANT DIFFERENCE AMONG THE ACADEMIC PERFORMANCE OF THE RESPONDENTS WHEN GROUPED ACCORDING TO THEIR ACADEMIC STRAND

Source of variation	Sum of squares	df	Mean square	*F*-value	*p*-value	Result
Between groups	1335.787	2	667.893	19.570*	0.000	Significant
Within groups	9351.073	274	34.128			
Total	10686.859	276				

*Significant at $p < 0.05$

B. Results of the data gathered from Don Vicente Rama Memorial National High School

1) Level of Interest

Table 8 shows that the respondents agree on the positively worded statements specifically item numbers 7, 10, and 26. These items express the respondents' interest in mathematics, and that they want to learn all about mathematics. Furthermore, the respondents strongly agree with statement numbers 16 and 22 which are also positively worded statements. These show that the respondents want to learn more about mathematics because knowing a lot is helpful for them.

Moreover, the respondents also agree with the negatively worded statements namely item numbers 2, 14, and 18. These show that they are wasting their time when working on mathematics. They tend to stop working and do something else. They also prefer easy mathematics. On the other hand, they disagree with item number 27. This conveys that they do not struggle with mathematics.

It is evident that the respondents are undecided on 16 out of 27 statements describing their interest in learning mathematics. Overall, the aggregated weighted mean of 3.27 implies that Don Vicente Rama Memorial National High School respondents are moderately interested in mathematics just like the students from ACT. Also, the same areas of concern are observed.

To ensure that students won't get bored or mad and think that they are just wasting their time when working on mathematics, the teachers need to be equipped with skills on the improvement of instruction. This can be done by conducting training on different teaching strategies applicable to different areas in mathematics.

To increase the students' interest and passion in mathematics, math competitions can be conducted. This will encourage them to value intellectual pursuits and nurture their mathematical talents.

2) Level of Academic Performance

Table 9 shows that 82 out of 248 respondents from Don Vicente Rama Memorial National High School, which comprised 33.06% percent, have very satisfactory performance in General Mathematics. Eighty or 32.26 percent have satisfactory performance while 60 or 24.19 percent have outstanding performance. Furthermore, 25 or 10.08 percent have fairly satisfactory performance while one or 0.40 percent did not meet expectations. Overall, the academic performance of the respondents from DVRMNHS in General Mathematics is very satisfactory, with a mean of 85.69 and standard deviation of 5.25.

To further improve the academic performance of the students in General Mathematics, cooperative learning can be done. This will enable knowledge sharing among students in a comfortable setting. Cooperative learning, according to Karali et al., is effective in increasing the academic achievement of the students in mathematics.

3) Relationship Between Interest and Academic Performance

As shown in Table 10, using the Pearson product moment correlation test, the p-value is 0.001 which is less than the 0.05 significance level. This suggests that there is a significant relationship between the mathematics interest and academic performance in General Mathematics of the Don Vicente Rama Memorial National High School respondents, therefore rejecting the null hypothesis.

However, correlation coefficient r-value is 0.219 which suggests that the correlation is negligible positive. This implies that the interest of the respondents will not significantly predict their academic performance in General Mathematics. The result is contrary to that of Asian College of Technology. One study supporting this finding is by Wong and Wong (2019). Correlational analyses showed that interest was not significantly correlated to mathematics performance among the students.

The test of significant difference among the academic performance of the respondents from Don Vicente Rama Memorial National High School when grouped according to their academic strand can be seen in Table 11.

TABLE 8. LEVEL OF INTEREST OF THE RESPONDENTS TOWARDS LEARNING MATHEMATICS

S/N	Indicators	WM	Verbal Description
1	I like to answer questions in Math class.	3.23	Moderate
2	I am wasting my time on math.	3.86	High
3	I work more math problems than what I have to.	2.86	Moderate
4	I like math.	3.33	Moderate
5	I am bored when working on math.	3.40	Moderate
6	I spend more hours working on math.	2.96	Moderate
7	I am interested in math.	3.51	High
8	I would rather be working on something else besides math.	2.74	Moderate
9	I work on math in my spare time.	2.77	Moderate
10	Knowing a lot about math is helpful.	4.18	High
11	I give up easily when working on math.	3.11	Moderate
12	I want to talk about math with my friends.	3.17	Moderate
13	I feel good when it comes to working on math.	3.10	Moderate
14	When working on math, I want to stop and start working on something else.	4.00	High
15	I spend more time than most of my classmates working on math.	2.72	Moderate
16	I want to know all about how to do math problems.	4.21	Very High
17	I am always thinking of other things when working on math.	2.83	Moderate
18	I prefer easy math over math that is hard.	3.77	High
19	I feel excited when a new math topic is announced.	3.16	Moderate
20	I get mad easily when working on math.	3.31	Moderate
21	I am too involved in math.	2.95	Moderate
22	I want to learn more about math.	4.21	Very High
23	I have difficulty paying attention when working on math.	2.64	Moderate
24	I choose to work on math.	2.95	Moderate
25	I spend as little as possible when working on math.	3.00	Moderate
26	I want to know all about math.	4.11	High
27	I struggle with math.	2.13	Low
	Aggregate Weighted Mean	**3.27**	**Moderate**

Legend: 4.21-5.00-Very Hig; 3.41-4.20-High; 2.61-3.40-Moderate; 1.81-2.60-Low; 1.00-1.80-Very Low

TABLE 9. LEVEL OF ACADEMIC PERFORMANCE OF THE RESPONDENTS IN GENERAL MATHEMATICS

Level	Numerical Range	f	%
Outstanding	90-100	60	24.19
Very Satisfactory	85-89	82	33.06
Satisfactory	80-84	80	32.26
Fairly Satisfactory	75-79	25	10.08
Did not Meet the Expectations	Below 75	1	0.40
Total		**248**	**100.00**
Mean		85.69	
St. Dev.		5.25	

TABLE 10. TEST OF SIGNIFICANT RELATIONSHIP BETWEEN THE RESPONDENTS' MATH INTEREST AND THEIR ACADEMIC PERFORMANCE IN GENERAL MATHEMATICS

Variables	r-value	Strength of Correlation	p - value	Decision	Result
Math Interest and Academic Performance in General Mathematics	0.219*	Negligible Positive	0.001	Reject Ho	Significant

*significant at p<0.05 (two-tailed)

TABLE 11. TEST OF SIGNIFICANT DIFFERENCE AMONG THE ACADEMIC PERFORMANCE OF THE RESPONDENTS WHEN GROUPED ACCORDING TO THEIR ACADEMIC STRAND

Source of variation	Sum of squares	df	Mean square	F-value	p-value	Result
Between groups	1082.694	2	541.347	23.631*	0.000	Significant
Within groups	5612.661	245	22.909			
Total	6695.355	247				

*Significant at $p < 0.05$

The test uses one-way ANOVA at 0.05 level of significance. The computed mean square value between academic strands is 541.347 while the computed mean square value within the academic strands is 22.909. This resulted in a computed F-value of 23.631 and a p-value equal to 0.000 which is less than the 0.05 significance level.

The results suggest that the null hypothesis is rejected which means there is a significant difference among the academic performance in General Mathematics of the respondents in Don Vicente Rama Memorial National High School when grouped according to their academic strand. This implies that the academic strand the respondent is enrolled in causes statistically significant differences in their General Mathematics grades. The result is the same as that of Asian College of Technology.

To further analyze the data, the average General Mathematics grade per strand was computed. Students enrolled in ABM significantly had lower grades compared to those enrolled in GAS and STEM. One possible factor is the grading scales and practices of the teachers. Only one teacher handles all GAS and STEM classes while another teacher handles all ABM classes. According to Olmos (2018), grades often fluctuate between teachers as they implement all methods into their grades, in different ways.

C. Results of the data gathered from the Two Identified Schools

1) Level of Interest

As shown in Table 12, the respondents agree on the negatively worded statements specifically item numbers 2, 14, 18, and 20. The weighted means describe that they get mad easily and are wasting their time when working on mathematics. They tend to be bored and stop working to do something else. Furthermore, they prefer easy mathematics over hard math.

However, the weighted mean of item number 27 suggests that respondents do not agree, meaning they are not struggling with mathematics. This can be explained by them agreeing to the positively worded statements specifically item numbers 4, 7, 10, 16 and 26. This suggests that they like mathematics, want to know all about it and that their knowledge of math is important. Furthermore, Item number 22 gave a very high verbal description which means that respondents strongly agree with the statement. They want to know all about math.

However, it is evident in 15 out of the 27 indicators with moderate rating ranging from 2.77 to 3.31 and the aggregated weighted mean value of 3.34 that they have moderate interest in learning mathematics. Although they show interest in math but there are things that hold them back which affect their attitude towards it. It can be noted that the two schools have the same set of areas that need intervention as evidenced by their responses to each indicator. Therefore, the implications and related literature are just the same and can be read from the ACT and DVRMNHS tables.

2) Level of Academic Performance

Table 13 shows that 173 out of the 525 respondents or 32.95 percent had very satisfactory academic performance in General Mathematics. They got grades between 85 and 89. One hundred forty-eight respondents or 28.19 percent had outstanding performance, with grades ranging from 90 to 100

while 139 respondents or 26.48 percent got grades from 80 to 84 which indicates satisfactory performance. Furthermore, 43 or 8.19 percent had fairly satisfactory performance and 22 or 4.19 percent did not meet the expectations because their grades are below 75.

In general, the academic performance of the respondents is very satisfactory as shown in the mean value of 85.97 with a standard deviation of 5.76.

Since the academic performance of the students from the two schools is generally the same, similar interventions can be made. These interventions can be seen below the ACT and DVRMNHS tables for level of academic performance.

3) Relationship Between Interest and Academic Performance

As shown on table 14, the correlation coefficient r-value is 0.281 and p-value 0.000, which is less than the 0.05 significance level. This suggests that over-all, at 0.05 level of significance, there is a significant relationship between the mathematics interest and academic performance in General Mathematics of the Asian College of Technology and Don Vicente Rama Memorial National High School respondents. The null hypothesis, therefore, is rejected.

However, the r-value 0.281 is very small. It indicates a negligible positive correlation. The relationship is perceived to be significant based on the p-value although there is close to zero correlation because the sample size is large enough to make a small effect significant. Since this study has large sample size and convenience sampling is used, we focus our interpretation on the R-value and not on the p-value. The closer the value of r to zero, the greater the variation (Laerd Statistics, 2020). Therefore, this implies that math interest and academic performance in General Mathematics are not correlated. This means that the level of interest in math cannot predict the respondent's academic performance in General Mathematics.

TABLE 12. LEVEL OF INTEREST OF THE RESPONDENTS TOWARDS LEARNING MATHEMATICS

S/N	Indicators	WM	Verbal Description
1	I like to answer questions in Math class.	3.31	Moderate
2	I am wasting my time on math.	3.98	High
3	I work more math problems than what I have to.	2.89	Moderate
4	I like math.	3.43	High
5	I am bored when working on math.	3.56	High
6	I spend more hours working on math.	3.04	Moderate
7	I am interested in math.	3.61	High
8	I would rather be working on something else besides math.	2.92	Moderate
9	I work on math in my spare time.	2.77	Moderate
10	Knowing a lot about math is helpful.	4.19	High
11	I give up easily when working on math.	3.21	Moderate
12	I want to talk about math with my friends.	3.25	Moderate
13	I feel good when it comes to working on math.	3.17	Moderate
14	When working on math, I want to stop and start working on something else.	3.99	High
15	I spend more time than most of my classmates working on math.	2.82	Moderate
16	I want to know all about how to do math problems.	4.16	High
17	I am always thinking of other things when working on math.	2.92	Moderate
18	I prefer easy math over math that is hard.	3.74	High
19	I feel excited when a new math topic is announced.	3.20	Moderate
20	I get mad easily when working on math.	3.43	High
21	I am too involved in math.	3.01	Moderate
22	I want to learn more about math.	4.21	Very High
23	I have difficulty paying attention when working on math.	2.77	Moderate
24	I choose to work on math.	3.11	Moderate
25	I spend as little as possible when working on math.	2.91	Moderate
26	I want to know all about math.	4.12	High
27	I struggle with math.	2.34	Low
	Aggregate Weighted Mean	**3.34**	**Moderate**

Legend: 4.21-5.00-Very High; 3.41-4.20-High; 2.61-3.40-Moderate; 1.81-2.60-Low; 1.00-1.80-Very Low

TABLE 13. LEVEL OF ACADEMIC PERFORMANCE OF THE RESPONDENTS IN GENERAL MATHEMATICS

Level	Numerical Range	f	%
Outstanding	90-100	148	28.19
Very Satisfactory	85-89	173	32.95
Satisfactory	80-84	139	26.48
Fairly Satisfactory	75-79	43	8.19
Did not Meet the Expectations	Below 75	22	4.19
Total		**525**	**100.00**
Mean		85.97	
St. Dev.		5.76	

TABLE 14. TEST OF SIGNIFICANT RELATIONSHIP BETWEEN THE RESPONDENTS' MATH INTEREST AND THEIR ACADEMIC PERFORMANCE IN GENERAL MATHEMATICS

Variables	r-value	Strength of Correlation	p - value	Decision	Result
Math Interest and Academic Performance in General Mathematics	0.281*	Negligible Positive	0.000	Reject Ho	Significant

*significant at p<0.05 (two-tailed)

It is noted from tables 12 and 13, that the level of interest in mathematics of the respondents is moderate yet their academic performance in General Mathematics is very satisfactory. These findings are supported by Wong and Wong (2019). According to their study, correlational analyses showed that interest was not significantly correlated to mathematics performance among the students. The students, despite having lower level of interest towards mathematics, could still perform better in mathematics test because they were driven to learn for extrinsic reasons like avoiding negative consequences from not performing well and that their learning activities in the classroom were more structured. This is further supported by the study conducted by Herrera (2019) which showed that there are many variables related to the academic performance in General Mathematics like class size, peer factor, age, and academic strand.

The findings above were based on the weighted mean of the indicators of the math interest level of the respondents. Since the relationship of math interest and academic performance is perceived to be statistically significant although there is negligible positive correlation, the researchers further studied the gathered data. Instead of using the weighted mean of the indicators, the corresponding verbal description was used. These were tested for correlation using chi-squared test. For very high level of math interest, most of the respondents had outstanding academic performance in General Mathematics. For moderate to high level of math interest, many respondents had very satisfactory performance. Furthermore, for very low to low math interest, there are only few observations, so the relationship was not strongly established. Therefore, math interest level can predict academic performance only for better performing students.

Table 15 shows the test of significant difference among the academic performance of the respondents from the two identified schools when grouped according to their academic strand.

Using one-way ANOVA at 0.05 level of significance, the computed mean square value between academic strands is 575.190 while the computed mean square value within the academic strands is 31.150. The ratio of the between groups and within groups mean squares resulted in a computed F-value of 18.465 and a p-value equal to 0.000 which is less than the 0.05 significance level.

TABLE 15. TEST OF SIGNIFICANT DIFFERENCE AMONG THE ACADEMIC PERFORMANCE OF THE RESPONDENTS WHEN GROUPED ACCORDING TO THEIR ACADEMIC STRAND

Source of variation	Sum of squares	df	Mean square	*F*-value	*p*-value	Result
Between groups	1150.380	2	575.190	18.465*	0.000	Significant
Within groups	16260.191	522	31.150			
Total	17410.571	524				

*Significant at $p < 0.05$

The results suggest that the null hypothesis is rejected which means there is a significant difference among the academic performance in General Mathematics of the respondents in the two identified schools when grouped according to their academic strand. This implies that the academic strand the respondent is enrolled in causes statistically significant differences in their General Mathematics grades. So those enrolled in STEM have significantly different grades than those enrolled in ABM and GAS.

Moreover, Table 16 shows the test of significant difference among the academic performance of the respondents when grouped according to the type of school they are enrolled in.

Using t-test for independent samples with 0.05 level of significance, the computed mean of the performance of the respondents enrolled in a public school is 85.73 with a standard deviation of 5.21 while the computed mean for those enrolled in a private school is 86.19 with a standard deviation 0f 6.22. The mean difference is –0.47. The difference was tested using t-test with a computed t-value of –0.933 and a p-value equal to 0.351 which is greater than the significance level.

The result suggest that the null hypothesis must not be rejected which means that there is no significant difference between the academic performance of the respondents when they are grouped according to the type of school, they are enrolled in. The comparison between the performance of students for private and public schools is common. The opinion that private schools are better than public schools is also common. In a study by Owaduge (2015), results revealed that private schools perform better than public schools in terms of students. In another study by Kishan, et al. (2021), it was stated that private school education quality is much better than public school education. However, Pianta and Ansari (2018) suggest that while private school students may perform better than public school students, the difference between their performances is eliminated completely when family income and parents' level of educational attainment is controlled. It can be noted that while there are two types of schools considered in this study, the family income and the educational attainment of the parents of the respondents in both types of schools are in the same range.

TABLE 16. TEST OF SIGNIFICANT DIFFERENCE AMONG THE ACADEMIC PERFORMANCE OF THE RESPONDENTS WHEN GROUPED ACCORDING TO THE TYPE OF SCHOOL ENROLLED

Source of Difference	Mean	Standard Deviation	Mean Difference	Computed t- value	p-value	Decision	Result
Public	85.73	5.21	-0.47	-0.933	0.351	Do not reject Ho	Not Significant
Private	86.19	6.22					

*significant at p<0.05

IV. CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it can be concluded that the level of interest in mathematics is significantly related to performance in General Mathematics, especially among those with higher levels of academic performance. It can also be concluded that the STEM and ABM students have better performance in General Mathematics than GAS students. Student performance, in general, is affected by many factors which includes student' learning skills, parental background, peer influence, competence of teacher, and learning environment (Briones, et al., 2021). More importantly, students, whether interested in a subject or not, will strive to perform well if they are driven by external reasons like avoiding negative consequences or because of a goal that they want to achieve.

Based on the findings and conclusions of the study, the following are recommended:

1. For further studies,

1.1 conduct a replicate study on the level of interest and performance in General Mathematics in other research environments like in schools where family income and the educational attainment of the

parents of the respondents are not in the same range,

1.2 improve the sampling size as the sample size in this study may have been too large. In large sample sizes, there is a tendency for small differences to be exaggerated into significant differences, even if they are not clinically significant, which may mislead the researchers and result to wrong conclusions, and

1.3 use other factors which may affect the students' performance in General Mathematics such as teacher competency, instructional strategies and techniques, curriculum and even environment and school facilities.

2. To increase the level of math interest and improve the academic performance in General Mathematics of grade 11 students, the following are proposed:

2.1 conduct of math competitions and the formation of math clubs to help motivate and increase the interest of those students who are not much interested in mathematics.

2.2 implementation of peer learning programs to foster an environment of camaraderie among students and will also enable knowledge sharing in a more comfortable setting so their mathematical skills will improve.

2.3 regular faculty meetings, curriculum development seminars and colleague mentoring to enable the teachers to be more equipped in teaching the subject.

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