Attitude and Performance in Mathematics

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Abstract: This quantitative research investigated the factor structure of the attitudes of 348 Grade 10 students towards mathematics and the dimensions that significantly predict Mathematics performance. The study utilized the author-permitted questionnaire ATMI and the secondary data obtained from the National Career Assessment Examination (NCAE). A data reduction technique under Principal Component Analysis was used to assess the dimensionality of the attitudes toward Mathematics. Results revealed that in the context of Matanao, Davao del Sur, Attitude Toward Mathematics is multidimensional with two dimensions explored and confirmed in the background, namely; Interest and Anxiety. Moreover, it was depicted that attitude towards mathematics significantly predicts performance in Mathematics. In terms of sex, it was found out that females performed better than males. Thus, the structured model suggested that their attitudes toward Mathematics significantly determine the students` Mathematics performance.

Keywords: *attitude towards mathematics, performance, factor structure*

Introduction

Mathematics is often considered a disliked subject in a learning context. Further, the affective domain is a vital area to contemplate in Mathematics education as it plays a part in determining students' learning and achievement of Mathematics. Hence, the performance and success of students depend upon students` attitudes, including beliefs and predispositions toward Mathematics.

In the international scenery, Tapia and Marsh II (2004) confirmed the four-factor structure of attitudes toward Mathematics, which consist of self-confidence, value, enjoyment, and motivation. Moreover, Mullis et al. (2012) revealed the key findings of the 2011 Trends in International Mathematics and Science Study (TIMSS, 2011) about the eighth grade`s Mathematics achievement in International Benchmark that Chinese Taipei, Singapore, and Korea, as well as Hong Kong, were among the top-performing countries in Mathematics reaching in the advanced international benchmarks.

In the Philippine scenery, the Philippines has the lowest average achievement in advanced Mathematics based on the 2008 TIMSS (Mullis et al., 2009). This advanced Mathematics comprises of algebra, geometry, and calculus. Furthermore, in the same report, the Philippines is in the lowest place concerning the advanced Mathematics cognitive domains, which comprised of knowing, applying, and reasoning. However, in the same report, the Philippines showed a positive effect towards advanced Mathematics with regard to its importance as per influence by the advice of others and by the teachers and instruction it has. The National Education Training and Research Center revealed the findings of the National Career Assessment Examination (NCAE) for the school year 2008-2009, where fourth-year students performed averagely low concerning its Mathematical ability with a percentage of 41.7%.

In the local scenery, Cascaro (2010) revealed that Digos City and Davao del Sur have mean percentage scores of 46.8% and 43.8%, respectively, for all components in the 2010 National Career Assessment Examination. These results summarized that all of the elements of the NCAE like Mathematical ability and others have a low percentage. However, the attitude of students toward Mathematics in Davao del Sur and Digos City is still not identified and even measured and assessed. Thus, Matanao National High School is one of the largest public secondary schools in the local setting where students` attitude toward Mathematics is not yet described and measured. With this, the researchers intended to inquire about the dimensions of attitude towards Mathematics and its causal analysis on the Mathematics performance of high school students.

The Study

This study aimed to determine the dimensions of students` attitudes toward Mathematics and its influence in the Mathematics performance of students of Matanao National High School. Specifically, this study sought to answer the following questions: (1) What is the factor structure of the attitudes of students towards Mathematics?, (2) What is the view of the high school students toward Mathematics in terms of sex, age, and class section? (3) What is the performance of the high school students in Mathematics based on the National Career Assessment Examination in terms of sex, age, and class section? (4) Is there any significant relationship between the Attitudes Toward Mathematics and Mathematics Performance of Grade 10 Students? And (5) Which dimension of attitudes towards Mathematics significantly influences the high school students` performance in Mathematics?

This study employed a quantitative research design. This design develops and utilizes inquiry approaches such as surveys and gathers data on predestined instruments that capitulate statistical information (Creswell, 2003). Specifically, this study used the survey method. Moreover, a confirmatory approach was used, which confirms the distinguished dimensionality of attitudes toward mathematics and mathematics performance and utilizing factor analysis in order to corroborate the existing and present factors that serve as dimensions on attitude toward Mathematics. Furthermore, it made use of descriptive design because it depicts the characteristics of the participants in a precise manner. It also employed correlation research design, which determines the association, connection, and relationship between attitudes toward mathematics and mathematics performance among Grade 10 high school students at Matanao National High School.

Furthermore, this study was conducted at Matanao National High School located at Poblacion, Matanao, Davao del Sur. The participants of this study were the Grade 10 students of MNHS who have taken the National Career Assessment Examination (NCAE). A total of 348 students were all selected from different classroom sections. The said students responded to the given survey questionnaire to determine the underlying dimensions of their attitude toward Mathematics. Thus, Table 1 portrays the distribution of the respondents varying from sex (male and female), age (years 14, 15, 16, 17, 18, 19, 20 and 23) and class sections (Rose, Daisy, Sampaguita, Anthurium, Tulip, Vanda, Daffodil, Adelfa, and Dahlia).

Moreover, this study employed both primary and secondary data from a questionnaire and the results of the National Career Assessment Examination, respectively. One of the instruments utilized in this study for data gathering purposes was the Attitude Toward Mathematics Inventory (ATMI) by Martha Tapia (1996), which comprises of 40 items viewed and recognized as observed variables and recorded on a 5-point scale. Another instrument was the National Career Assessment Examination Results of Matanao National High School, which serves as the secondary data. Moreover, the NCAE results of MNHS came from the school`s research center upon the approval of the school principal and school research coordinator. To assess the level of performance of the Grade 10 high school students at Matanao National High School, this scale was used also based on the size from the National Educational Research and Training Center (NERTC):

Findings

Table 2 shows the result of the dimension reduction of the items of the Students` Attitudes Toward Mathematics using the SPSS trial version. To distinguish the possibility of factorability of the Attitudes Towards Mathematics Inventory Scale, Kaiser-Meyer-Olkin (KMO) and Bartlett`s tests were employed. Thus, based on the factor analysis conducted, the KMO measure was assessed to be more than adequate having a sampling adequacy measure of 0.906, and the Cronbach`s alpha was assessed to determine the reliability of the data having a ratio of 0.924 which is considered to be high. Furthermore, Bartlett`s test of sphericity is 6335.917, and Bartlett`s coefficient is determined to be significant (0.000). The results of the KMO and Bartlett`s Test of Sphericity specified that the factor analysis could be performed on the data.

The orthogonal VARIMAX method was also performed to explain the maximum likelihood method of estimation. The criteria for assessing the practical significance of standardized factor loadings were applied (Hair et al., 1998, as cited by Balacy, 2015). For a sample size of exactly or more than 200 respondents, the factor loadings must be 0.4 or higher to consider the item significant. With this, items number 25 and 28 were eliminated because of gaining weak fillings. These encompass "*Mathematics is dull and boring*" and *"I would like to avoid using Mathematics in college."* These items were considered as the reverse items on the attitude scale utilized in this study.

Heavily loaded indicators are determined to become the basis for naming the factors that are present in the Attitude Towards Mathematics Scale utilized in this study. To sum up, eigenvalues, % variance explained, and reliability was considered in the data analysis in order to depict and to describe the appropriateness of the items as indicators of the factors. The results did not confirm the Attitudes Towards Mathematics by Martha Tapia (1996), .and has an eigenvalue of 11.203. Upon the inspection of the items, and on the results provided, there were 29 items

indicated. These consist of ATM_1, ATM_2, ATM_3, ATM_4, ATM_5, ATM_6, ATM_7, ATM_8, ATM_16, ATM_17, ATM_18, ATM_19, ATM_22, ATM_23, ATM_24, ATM_26, ATM_27, ATM_29, ATM_30, ATM_31, ATM_32, ATM_33, ATM_34, ATM_35, ATM_36, ATM_37, ATM_38, ATM_39 and ATM_40. Thus, this factor is called **Interest**, having a Cronbach alpha value of 0.937 as the internal consistency of the items. Thus, it implies a high level of reliability.

The first factor was on the high level of importance as it explained 28.006% of the total variance in the ATM. The second and the last factor explained 10.18% of the total variance in the ATM and have an eigenvalue of 4.075. Upon the inspection of the items, and on the results provided, there were nine items included. These consist of ATM_9, ATM_10, ATM_11, ATM_12, ATM_13, ATM_14, ATM_15, ATM_20 and ATM_21. Thus, this factor is called **Anxiety**, having 0.838 as the internal consistency of the items, which was assessed by Cronbach`s alpha. Hence, it implies a high level of reliability.

From the five distinguished factors by Tapia, M. (1996), only two factors were indicated, and they do not confirm the Attitudes Toward Mathematics by Martha Tapia (1996). The same output was also found out in the study of Ernest Afari (2012), where there are only three factors explored and do not confirm the predictors indicated in the attitude toward Mathematics inventory.

The hypothesized structure model is introduced in Chapter 2 of the study. Moreover, it was proposed that the hypothesized structure model described with four dimensions as stipulated by Tapia (1996). These include self-confidence, value, motivation, and enjoyment.

It was found out that the first factor verbally described as *Interest* punctuated that students have positive predispositions, beliefs, and attitudes toward Mathematics. These predispositions were profoundly characterized by the factor analysis performed on the data. Thus, students showed that they felt comfortable in answering questions in Math class, they liked Mathematics, they were comfortable expressing their ideas on how to look for solutions to a stressful problem in Math, they had usually enjoyed studying Mathematics in school, they considered Math as a fascinating subject, they believed that studying Math helps them with problem-solving in other areas, they planned to take as much Mathematics as they can during their education, they thought that studying advanced Mathematics is useful, they were happy in a Math class than in any other courses, they considered strong Math background could help them in their professional life, they believed that they are good at solving Math problems, they felt challenged in Mathematics, they had lots of self-confidence when it comes to Mathematics, they were confident that they could learn advanced Mathematics and they were willing to take more than the required amount of mathematics.

Furthermore, they preferred to do an assignment in Math than to write an essay, they wanted to develop their Mathematical skills, they liked to solve new problems in Mathematics, they thought that Mathematics helps develop the mind and teaches a person to think, they could think of many ways that they use Math outside of school, they were not afraid of Mathematics, they considered high school Math courses would be beneficial no matter what they decide to study, they served Mathematics as necessary in everyday life, they learned Mathematics quickly, they regarded Mathematics as the very worthwhile and essential subject, they had a great deal of satisfaction out of solving Mathematics problem, they considered Mathematics as one of the most important issues for people to study, they expected to do fairly well in any Math class they took, and they were able to solve Mathematics problems without too much difficulty.

The second factor verbally described as *Anxiety* underlined that there was also a high indication that students have negative predispositions, beliefs, and attitudes toward Mathematics. This dimension was weightily assessed through factor analysis. Thus, data revealed that there are students who felt uncomfortable in Mathematics. Moreover, the acclaimed that their mind goes blank and unable to think clearly when working with Mathematics, they felt that they were always under a terrible strain in a Math class, they felt nervous in studying Mathematics, they felt disliking Mathematics when they heard it, they regarded Mathematics as one of their dreaded subjects, they felt nervous to even think about having to do a Mathematics problem, they always felt confused in their Mathematics class. They felt a sense of insecurity when attempting Mathematics.

With this, the data profoundly revealed that Attitudes Toward Mathematics (ATM) is multidimensional as it showed and determined the two existing factors, namely; Anxiety and Interest. These factors were assessed by obtaining a high measure of sampling adequacy and reliability. Thus, these were considered as dimensions that influence students` Mathematics performance.

On the data screening, the test of normality was laid. Furthermore, the normality of the data was determined by assessing the Kurtosis Index, Skew Index, and Outliers. The data is said to be extremely skewed and extreme kurtosis if its absolute values are greater than 3 and 10, respectively.

Table 2. Factor Analysis of the Attitude Toward Mathematics Data

Item No.	ITEM	Factors	
		1	2
1	Mathematics is a very worthwhile and necessary subject.	.498	
2	I want to develop my Mathematical skills.	.597	
3	I get a great deal of satisfaction out of solving a Mathematics problem.	.456	
4	Mathematics helps develop the mind and teaches a person to think.	.561	
5	Mathematics is essential in everyday life.	.530	
6	Mathematics is one of the most important subjects for people to study.	.456	
7	High school Math courses would be beneficial no matter what I decide to study.	.538	
8	I can think of many ways that I use Math outside of school.	.539	
16	Mathematics does not scare me at all.	.539	
17	I have a lot of self-confidence when it comes to Mathematics.	.612	
18	I can solve Mathematics problems without too much difficulty.	.412	
19	I expect to do reasonably well in any Math class I take.	.450	
22	I learn Mathematics quickly.	.527	
23	I am confident that I could learn advanced Mathematics.	.609	
24	I have usually enjoyed studying Mathematics at school.	.686	
26	I like to solve new problems in Mathematics.	.578	
27	I would prefer to do an assignment in Math than to write an essay.	.598	
29	I like Mathematics.	.746	
30	I am happier in a Math class that in any other course.	.650	
31	Mathematics is an exciting subject.	.675	
32	I am willing to take more than the required amount of Mathematics.	.604	
33	I plan to take as much Mathematics as I can during my education.	.667	
34	The challenge of Math appeals to me.	.613	
35	I think studying advanced Mathematics is useful.	.650	
36	I believe studying Math helps me with problem-solving in other areas.	.670	
37	I am comfortable expressing my ideas on how to look for solutions to a stressful problem in Math.	.699	
38	I am comfortable answering questions in Math class.	.752	
39	A strong Math background could help me in my professional life.	.629	
40	I believe I am good at solving Math problems.	.616	
9	Mathematics is one of my dreaded subjects.		.605
10	My mind goes blank, and I am unable to think clearly when working with mathematics.		.643
11	Studying mathematics makes me feel nervous.		.625
12	Mathematics makes me feel uncomfortable.		.702
13	I am always under a terrible strain in a Math class.		.633
14	When I hear the word Mathematics, I have a feeling of dislike.		.612
15	It makes me nervous to even think about having to do a Mathematics problem.		.595
20	I am always confused in my Mathematics class.		.575
21	I feel a sense of insecurity when attempting Mathematics.		.424
	Eigenvalue	11.203	4.075
	% variance	28.006	10.18
	Reliability by Cronbach`s	0.937	0.838
	Cronbach $\alpha = 0.924$		

KMO = 0.906

Bartlett`s Test of Sphericity Chisquare = 6335.917, p=0.000

Table 3 depicts the summary statistics of the descriptive analysis, which revealed the level of normality of the data set on attitudes toward Mathematics inventory. Thus, based on the detailed review, the data set is said to be healthy, which divulges that the absolute values of Kurtosis Indices and Skew Indices are less than 10 and 3, respectively. Moreover, the analysis revealed that there is no indication of outliers on the data and is best described as mutually exclusive.

The mean of all items were verbally described as *Agree* and *Neutral*. Fourteen (14) items were included of having a response of *Agree*. Thus, this response includes the following items together with its corresponding mean score; ATM_5 (4.4454), ATM_4 (4.3793), ATM_2 (4.3420), ATM_6 (4.2328), ATM_7 (3.9425), ATM_35 (3.9338), ATM_36 (3.9138), ATM_39 (3.8506), ATM_8 (3.8190), ATM_1 (3.7241), ATM_31 (3.6954), ATM_34 (3.6782), ATM_25 (3.5833) and ATM_3 (3.5316).

On the other hand, twenty-six (26) items were included of having a response of *Neutral*. Thus, this response includes the following items together with their corresponding mean score; ATM_24 (3.4943), ATM_37 (3.4713), ATM_26 (3.4684), ATM_23 (3.3966), ATM_27 (3.966), ATM_28 (3.3879), ATM_33 (3.3305), ATM_29 (3.3218), ATM_38 (3.3103), ATM_40 (3.2816), ATM_32 (3.2701), ATM_17 (3.25), ATM_19 (3.2443), ATM_14 (3.2213), ATM_22 (3.1954), ATM_30 (3.1379), ATM_16 (3.1121), ATM_21 (3.1092), ATM_18 (3.092), ATM_20 (2.9971), ATM_13 (2.9943), ATM_15 (2.9943), ATM_10 (2.9885), ATM_12 (2.9828), ATM_9 (2.8621) and ATM_11 (2.6868).

Table 4 presents the level of attitude of high school students toward Mathematics. The overall mean score of 3.60 or high level indicates that students possessed a high level of interest toward Mathematics. However, students showed a moderate level of anxiety towards Mathematics, having an overall mean score of 2.98.

A high level of rating was found in the first factor. These encompass of the following items with their corresponding overall mean scores: ATM_5 (4.45), ATM_4 (4.38), ATM_2 (4.34), ATM_6 (4.23), ATM_7 (3.94), ATM_35 (3.93), ATM_36 (3.91), ATM_39 (3.85), ATM_8 (3.82), ATM_1 (3.72), ATM_31 (3.70), ATM_34 (3.68), ATM_25 (3.58) and ATM_3 (3.53).

The second factor revealed a moderate level of attitude toward Mathematics. These comprise of the following items with their corresponding mean scores: ATM_24 (3.49), ATM_37 (3.47), ATM_26 (3.47), ATM_23 (3.40), ATM_27 (3.97), ATM_28 (3.39), ATM_33 (3.33), ATM_29 (3.32), ATM_38 (3.31), ATM_40 (3.28), ATM_32 (3.27), ATM_17 (3.25), ATM_19 (3.24), ATM_14 (3.22), ATM_22 (3.20), ATM_30 (3.14), ATM_16 (3.11), ATM_21 (3.11), ATM_18 (3.09), ATM_20 (3.00), ATM_13 (2.99), ATM_15 (2.99), ATM_10 (2.99), ATM_12 (2.98), ATM_9 (2.86) and ATM_11 (2.69).

Table 4.1 presents the level of attitude toward Mathematics in terms of sex. An overall mean score of 3.59 or high level and 2.94 or a moderate level were depicted on the position of female students toward Mathematics both in interest and anxiety, respectively. These indicate that female high school students show a high level of positivity and a moderate level of negativity toward Mathematics. Similarly, the male students possessed the same level of attitude towards Mathematics, having 3.60 or high level and 3.06 or average level as its overall mean scores, respectively. This shows that males and females possessed the same level of interest in Mathematics. The same outcome was also revealed in the study conducted by Manoah et al. (2011), where both males and females have a moderate and neutral positive attitude toward Mathematics.

Table 4.2 presents the level of attitude toward Mathematics of the high school students in terms of age. On the first factor, Grade 10 high school students show a high level of interest in Mathematics and depict that they have a firm positive belief and predisposition on Mathematics. These encompass of 14-year old students having mean score 4.00, 15-year former students having a rating of 3.64, 19-year old students gaining a mean score of 3.63, 16-year early learning a mean rating of 3.54, 17-year old students getting a mean score of 3.38, 18- year old students getting a mean rate of 3.09. On the other hand, high school students aged 17 and 18 show a moderate level of interest in Mathematics, and it implies that they have relatively liked Mathematics. However, on the second factor, all of the students except those aged 20 and 23 show a moderate level of anxiety toward Mathematics. This implies that a negative attitude toward Mathematics of high school students is fair, neutral, and reasonable. This includes 14-year old students (3.33), 17-year former students (3.27),18-year old students (3.04), 15-year old students (2.96), 16-year old students (2.93), and 19-year old students (2.75). Table 4.3 illustrates the level of attitude toward Mathematics of Grade 10 High School students at Matanao National High School in terms of class sections. In the first dimension, seven class sections show a high level of interest in Mathematics.

Table 3. Descriptive Analysis on Attitude Toward Mathematics

ITEM NUMBER	MEAN	DESCRIPTIVE EQUIVALENT	SD	SKEWNESS	KURTOSIS
ATM_1	3.7241	Agree	1.09691	-.609	-.293
ATM_2	4.3420	Agree	0.94869	-1.607	2.261
ATM_3	3.5316	Agree	1.00811	-.265	-.436
ATM_4	4.3793	Agree	0.88525	-1.598	2.590
ATM_5	4.4454	Agree	0.86555	-1.802	3.264
ATM_6	4.2328	Agree	0.91756	-1.356	1.985
ATM_7	3.9425	Agree	1.01976	-.885	.500
ATM_8	3.8190	Agree	1.04591	-.726	.121
ATM_9	2.8621	Neutral	1.12782	.201	-.510
ATM_10	2.9885	Neutral	1.11572	.211	-.634
ATM_11	2.6868	Neutral	1.15992	.220	-.734
ATM_12	2.9828	Neutral	1.10265	.047	-.688
ATM_13	2.9943	Neutral	1.07632	-.058	-.550
ATM_14	3.2213	Neutral	1.13112	-.203	-.727
ATM_15	2.9943	Neutral	1.08166	.053	-.588
ATM_16	3.1121	Neutral	1.02609	-.178	-.288
ATM_17	3.2500	Neutral	1.01466	-.101	-.293
ATM_18	3.0920	Neutral	1.01439	.065	-.408
ATM_19	3.2443	Neutral	0.96665	-.159	-.164
ATM_20	2.9971	Neutral	0.94670	-.158	-.141
ATM_21	3.1092	Neutral	0.99834	-.046	-.417
ATM_22	3.1954	Neutral	1.03916	-.135	-.385
ATM_23	3.3966	Neutral	1.06999	-.261	-.522
ATM_24	3.4943	Neutral	1.09622	-.441	-.390
ATM_25	3.5833	Agree	1.19145	-.549	-.547
ATM_26	3.4684	Neutral	1.00238	-.267	-.404
ATM_27	3.3966	Neutral	1.06730	-.229	-.548
ATM_28	3.3879	Neutral	1.21308	-.447	-.662
ATM_29	3.3218	Neutral	1.14125	-.304	-.502
ATM_30	3.1379	Neutral	1.02895	.136	-.348
ATM_31	3.6954	Agree	1.12056	-.589	-.315
ATM_32	3.2701	Neutral	0.93385	-.157	.079
ATM_33	3.3305	Neutral	1.06962	-.277	-.442
ATM_34	3.6782	Agree	1.03811	-.646	-.035
ATM_35	3.9368	Agree	1.08249	-.916	.170
ATM_36	3.9138	Agree	1.08090	-.861	.189
ATM_37	3.4713	Neutral	1.06924	-.416	-.319
ATM_38	3.3103	Neutral	1.00787	-.109	-.335
ATM_39	3.8506	Agree	1.07128	-.647	-.336
ATM_40	3.2816	Neutral	1.04157	-.215	-.322

These include Tulip Section which is the STEM section gaining 4.00 as a mean rating, Vanda Section with a mean rating of 3.79, Sampaguita Section having a mean score of 3.63, Rose Section which is the Pilot Section weighing with a mean score of 3.62, Adelfa Section gaining an average rating of 3.55, Dahlia Section with a mean score of 3.54 and Daisy Section with a mean score of 3.52. However, two sections are showing a moderate level of interest in Mathematics. These involve the Daffodil Section and Anthurium Section having mean scores of 3.44 and 3.31, respectively.

Table 4. Level of Attitudes Toward Mathematics

	Mean	Std. Deviation	Descriptive Level
INTEREST	3.60	0.62	High
ANXIETY	2.98	0.72	Moderate

Table 4.1 Level of Attitude Toward Mathematics in terms of Sex

Sex	Interest			Anxiety		
	Mean	Standard Deviation	Descriptive Level	Mean	Standard Deviation	Descriptive Level
Female	3.59	0.64	High	2.94	0.74	Moderate
Male	3.60	0.59	High	3.06	0.68	Moderate
Total	3.60	0.62	High	2.98	0.72	Moderate

Table 4.2 Level of Attitude Toward Mathematics in terms of Age

Age	Interest			Anxiety		
	Mean	Standard Deviation	Descriptive Level	Mean	Standard Deviation	Descriptive Level
14	4.00	0.52	High	3.33	1.03	Moderate
15	3.64	0.62	High	2.96	0.71	Moderate
16	3.54	0.55	High	2.93	0.67	Moderate
17	3.38	0.73	Moderate	3.27	0.82	Moderate
18	3.09	0.58	Moderate	3.04	0.62	Moderate
19	3.63	0.87	High	2.75	0.45	Moderate
20	4.30	-	High	1.90	-	Low
23	4.10	-	High	3.80	-	High
Total	3.60	0.62	High	2.98	0.72	Moderate

Table 4.3 Level of Attitude Toward Mathematics in terms of Class Sections

Class Section	Interest			Anxiety		
	Mean	Standard Deviation	Descriptive Level	Mean	Standard Deviation	Descriptive Level
Rose	3.62	0.55	High	2.75	0.74	Moderate
Adelfa	3.56	0.68	High	3.02	0.72	Moderate
Sampaguita	3.63	0.49	High	3.12	0.52	Moderate
Tulip	4.00	0.45	High	3.43	0.77	Moderate
Daisy	3.52	0.50	High	2.95	0.63	Moderate
Anthurium	3.31	0.56	Moderate	2.81	0.59	Moderate
Vanda	3.80	0.61	High	2.88	0.72	Moderate
Dahlia	3.54	0.67	High	3.11	0.74	Moderate
Daffodil	3.44	0.77	Moderate	2.84	0.82	Moderate
Total	3.60	0.62	High	2.98	0.72	Moderate

Table 5 presents the level of Mathematics performance of Grade 10 students at Matanao National High School (MNHS) based on the national results on the National Career Assessment Examination (NCAE) for the school

year 2014-2015. Based on the descriptive analysis, the overall mean score of 43.85% or Low Average Level indicates that the high school students at MNHS performed average low in the Career Assessment Examination.

Table 5.1 presents the level of Mathematics performance of Grade 10 high school students in terms of sex. Thus, it was found out that female high school students performed better in the National Career Assessment Examination (2014-2015) with an average percentile rank of 46. 57 compared to male high school students with an average percentile rank of 39.80. This indicates that both female and male high school students performed averagely low on the national examination.

Table 5.2 illustrates the level of Mathematics performance of Grade 10 high school students in terms of age. Thus, it was revealed that students aged 14 years old performed best among other students with a mean performance rating of 48.00. They are followed by students aged 15 years of age having a mean percentile rank of 46.86, 18 years of age gaining a mean percentile rank of 42.00, 16 years of age having a mean percentile rank of 40.03, 17 years of age having a mean percentile rank of 37. 96. However, 19-year old high school students performed least in the examination among other students having a mean percentile rank of 18.75.

Table 5.3 demonstrates the level of Mathematics performance of Grade 10 high school students in terms of class sections. Thus, it was revealed in the analysis that among the nine chapters, the Tulip Section performed above average with a mean percentile rank of 79.72. It is because this section is the Science and Technology and Engineering Program section. The other eight parts performed a low average on the NCAE 2014-2015. These comprise of Rose Section (Pilot Section) having a mean percentile rank of 49.23, Sampaguita Section with a weighted mean percentile rank of 45.72, Dahlia Section with a mean percentile rank of 43.05, Adelfa Section gaining a mean percentile rank of 39.90, Anthurium Section performing with a mean percentile rank of 38.49, Vanda Section with a mean percentile rank of 37.29, Daffodil Section having a mean percentile rank of 34.72 and Daisy Section gaining a weighted percentile rank of 32.41.

Table 5. Level of Mathematics Performance

	Mean	Standard Deviation	Descriptive Level
Matanao NHS	43.85	23.72	Low Average

Table 5.1 Level of Mathematics Performance in terms of Sex

SEX	Mean	Standard Deviation	Descriptive Level
Female	46.57	24.32	Low Average
Male	39.80	22.27	Low Average
Total	43.85	23.72	Low Average

Table 5.2 Level of Mathematics Performance in terms of Age

AGE	Mean	Standard Deviation	Descriptive Level
14	48.00	36.11	Low Average
15	46.86	23.67	Low Average
16	40.03	23.00	Low Average
17	37.96	19.88	Low Average
18	42.00	22.25	Low Average
19	18.75	16.46	Low Average
20	36.00	-	Low Average
23	61.00	-	Average
Total	43.85	23.72	Low Average

Table 5.3 Level of Mathematics Performance in terms of Class Sections

Class Section	Mean	Standard Deviation	Descriptive Level
Rose	49.21	21.46	Low Average
Adelfa	39.90	22.42	Low Average
Sampaguita	45.72	21.62	Low Average
Tulip	79.72	18.89	Above Average
Daisy	32.41	17.16	Low Average
Anthurium	38.49	21.52	Low Average
Vanda	37.29	20.86	Low Average
Dahlia	43.05	19.63	Low Average

Daffodil	34.72	19.18	Low Average
Total	43.85	23.72	Low Average

Martha Tapia (1996) stipulated in her study that four distinguished dimensions significantly influence Mathematics performance. These include self-confidence, motivation, value, and enjoyment. Thus, by assessing the data through structural equation modeling by performing factor analysis, it was found out that two factors significantly influence Mathematics performance based on the review made into the data gathered.

Table 7 presents the model summary of the data as it performs structural equation modeling. Moreover, the data indicate that the model depicted has a structured equation of $y = \mathbf{0.947} + \mathbf{6.485}x_1 + \mathbf{6.129}x_2$ by performing multivariate regression analysis. It was also described that the data is significant. This analysis revealed that the attitude toward Mathematics is multidimensional, where it divulges two factors that significantly influence Mathematics performance. Thus, the decision is to accept the first null hypothesis.

Furthermore, it was also found out that there is a significant correlation between the attitude toward Mathematics and Mathematics performance. Thus, the decision is to reject the second null hypothesis. Table 7 explains the vital relationship between the independent and dependent variables. This result is best supported by the studies of Yilmaz et al. (2010), Mata et al. (2012), Michelli (2013), and other researchers as they concluded and found out that the attitude has significance to Mathematics performance.

Table 6. Significant Correlation

		Performance
Pearson Correlation	PERFORMANCE	1.000
	INTEREST	.220
	ANXIETY	.225
Sig. (1-tailed)	PERFORMANCE	.
	INTEREST	.000
	ANXIETY	.000

Table 7. The Structural Model Summary of Attitudes Toward Mathematics

Model Summary		
Parameters	Unstandardized Coefficient	Significance
Constant	0.947	0.907
Positive	6.845	0.001
Negative	6.129	0.001
SEM: $y = 0.947 + 6.485x_1 + 6.129x_2$		
$r^2 = 81.1\%$		

This study aimed to perform a data reduction technique called Confirmatory Factor Analysis on Attitudes Toward Mathematics to determine if the unique factor structure is present in the local setting. Moreover, it aimed to assess the level of attitude of students toward Mathematics and also the level of Mathematics performance of Grade 10 high school students at Matanao National High School based on the performance rate on National Career Assessment Examination (NCAE) taken last school year 2014-2015. Furthermore, it also aimed to recognize the dimensionality of attitudes toward Mathematics and its significant correlation to Mathematics performance. The data analysis was made possible for a sample of 348 grade 10 high school students in Matanao National High School. This study sought to analyze the causal relationship of attitude toward Mathematics to Mathematics performance in the form of the structural model.

Kaiser-Meyer-Olkin (KMO) and Bartlett`s Test of Sphericity were utilized to determine if the data on Attitudes Toward Mathematics is amenable to factor analysis. Moreover, Cronbach alpha was also used to determine the internal consistency or the reliability of the factor or all the elements indicated in the ATM scale.

It had been found out based on the measures revealed by the KMO and Bartlett`s Test of Sphericity that factor analysis can be performed on the ATM data. Thus, the ATM data has two components, and it satisfies the claim that Attitude Toward Mathematics is multidimensional.

This study sought to determine the level of students` attitude toward Mathematics and the level of students` Mathematics performance based on the results of the 2014-2015 National Career Assessment Examination (NCAE).

The process of determining these two determined levels was derived in obtaining the mean scores. Thus, these levels were revealed and statistically interpreted in terms of sex, age, and class section. Moreover, the scaling utilized in the interpretation was based on the scales of the Attitude Towards Mathematics Inventory scale (ATMI) for the primary data and the Performance Rate scale of the National Educational Research and Training Center (NERTC). With this, this study depicted that there are two data sets utilized. The significance of the predictors was also assessed.

The process of performing structural equation modeling was also derived in this study. This aimed to describe and to explain the relationship between the dimensions of the Attitude Toward Mathematics and the Mathematics performance.

Conclusions

Based on the findings of this study, the following statements are drawn; students` Attitudes Toward Mathematics (ATM) is multidimensional. Its factor structure revealed two factors, namely: Interest and Anxiety. However, it does not confirm Tapia`s predictor on her ATMI scale. Secondly, students` interest and anxiety towards Mathematics affect the Mathematics performance of students.

Moreover, the level of attitude of the high school students toward Mathematics is of a high level of interest and a moderate level of anxiety. The level of Mathematics performance of the Grade 10 students at Matanao National High School based on the National Career Assessment Examination is of low average. Then, there are two dimensions of attitude toward Mathematics that influence Mathematics performance – Interest and Anxiety. Lastly, there is a significant relationship between attitude toward Mathematics and Mathematics performance.

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