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UNIVERSITY STUDENTS' ATTITUDES AND MATHEMATICS PERFORMANCE: A CORRELATIONAL ANALYSIS

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ABSTRACT: This study identified the profile, mathematics performance and the attitude of the respondents. Furthermore, it determined the difference on the mathematics performance of the respondents when grouped according to profile and correlated the relationship between the attitude of the respondents in mathematics and their academic performance. The study used the descriptive design. The survey-questionnaire and the Mathematics Attitude Scale Inventory were used to gather data and the data were analyzed using the frequency counts, mean, percentage, multiple Regression, T-test and ANOVA. The study found out that majority of the respondents are early adults, females and General Academic Strand (GAS) graduates. The respondents' fathers are high school graduates; while, their mothers are college graduates with family income that range from 2,100-5,000. The mathematics performance of the respondents is "good". The respondents have positive attitude and disposition towards Mathematics. And the attitude of the respondents is significantly related to their performance in Mathematics. This means if the respondents have positive attitude and disposition towards Mathematics, the better is their Mathematics Performance or the higher is their grade.

Keywords: *Academic achievement, Attitude towards Mathematics, Disposition in Math, Mathematics Performance and Profile*

I. INTRODUCTION

Mathematics performance greatly rely on the person's belief, disposition and attitude towards it. It is expected then, that university students by all means should have a positive attitude toward mathematics to have a better academic achievement and must do all their best to finish any academic task related to Mathematics.

Significantly, parents and teachers should collaboratively work in developing positive attitude of the schooling children towards mathematics. It is understood that a positive attitude towards mathematics reflects a positive emotional disposition in relation to the subject and, in a similar way, a negative attitude towards mathematics relates to a negative emotional disposition. These emotional dispositions have an impact on an individual's behavior, as one is likely to achieve better in a subject that one enjoys, has confidence in or finds useful. For this reason, positive attitudes towards mathematics are desirable since they may influence one's willingness to learn and also the benefits one can derive from mathematics instruction. This is supported by the studies of Nicolaidou and

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Philippou (2003) who revealed that there is a significant correlation between attitudes and Mathematics performance. They stated further those students having positive attitudes achieved better in Mathematics.

Similarly, Mathematics educators should help their students not only to develop a deep, conceptual understanding of mathematical concepts and processes, but also to extend effort in developing a positive attitude towards mathematics. Through having a positive attitude, a student is intrinsically motivated to learn exigent mathematical problems and expectedly be determined to progress with or without the supervision of the instructor. The students with diverse backgrounds must be guided as well so that the teacher's and the learners' goal will be mutually achieved

Dramanu and Balarabe (2013) as cited by Peteros, stated that self-concept is multifaceted, hierarchical, organized and structured, descriptive and evaluative, stable, and yet increasingly situation specific. Moreover, academic self-concept is an evaluation of the perception of students based on their experience and interpretation of the events that they experience in school which leads to the formation of specific attitudes, feelings, and perceptions about one's intellectual and academic abilities based on the academic scenario.

In the study of Guay et al. (2010), which aimed to investigate the self-concept of the students, they found that students who have high academic self-concept have higher grades because they are more motivated to perform well in school. However, students who have low self-concept avoid school tasks because they consider these as threats, which led them to have poor performance.

Timmerman et al. (2017) examined the relationship between the Math self-concept and Math achievement of the 108 twelve to 14-year-old students from a secondary school in the Netherlands. They found that there is a significant positive correlation between Math self-concept and achievement of the students in all four domains of Math, such as measurement, relations, numbers, and scale. Furthermore, the regression analysis showed that Math self-concept was significantly accounted for in the variance of Math scores of the students.

Similarly, Kamoru and Ramon (2017) investigated the relationship between self-concept and Math achievement of 200 senior secondary school students from Ibadan Metropolis using random sampling. Students were asked to answer the 20-item Math Self Concept Questionnaire and took a 30-item multiple choice Math Achievement Test. Results uncovered that there was no noteworthy distinction in gender for Math self-concept. Furthermore, there was a significant positive correlation between the self-concept and the Math achievement of the students. Thus, they suggested that teachers should develop a positive self-concept of the students towards Mathematics and provide a pleasant teaching experience in order to enhance higher self-concept and better performance of the students in Mathematics.

Dramanu and Balarabe (2013) examined the relationship between self -concept and the academic performance of Junior High School students in Ghana. Students were asked to complete the self-concept questionnaire and answer the Math achievement test. Results uncovered that there was a critical connection between results revealed that there was a significant relationship between self-concept and academic performance of the students. Further, a significant difference between the self-concept of the urban and rural high school students has also observed wherein urban high school students had higher scores.

Lee and Kung (2018) explored the relationship between Math self-concept and Math achievement of the Junior High School Taiwanese students using structural equation modeling. They found that there was a considerable gender contrast concerning the student's Math self-

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concept and Math achievement. Boys showed a higher self-concept than girls, but girls had higher Math achievement than boys.

Correspondingly, Ajogbeje (2010) investigated the relationship between self-concept and academic achievement of the 450 secondary students in Ekiti State using multiple regression analysis. Results uncovered that there was a critical connection between self-concept and Mathematics performance of the students.

Subia et. al (2018) conducted a study titled "Attitude and Performance in Mathematics I of Bachelor of Elementary Education Students: A Correlational Analysis". They found out that their respondents whose overall performance in Mathematics 1 is below average 82.10 which implied that their respondents are weak in Math 1. His findings also revealed that entering freshmen students were weak in almost all areas of Mathematics and were not ready for College Mathematics. Furthermore, they also found out that first year college's level of proficiency in Mathematics is poor, and that majority of the students performed poor in their achievement in Mathematics.

At Cagayan State University, Philippines some students have not fully mastered the basics of Mathematics most especially those who were enrolled in non-board courses. Perceptibly, majority of them have less interest in solving word problems. Most preferred simple drills which do not require Higher Order Thinking skills (HOTS). Noticeably, during the first two weeks of the second semester last 2020, some students honestly revealed that they do not like Mathematics that much because of its complexities and exigent nature. Most students also narrated that they have poor foundation in Math; while, several students bravely related that their Math teachers during their elementary and high school days favored more those students who are mathematically advanced than those who are mathematically challenged. Consequently, it made them passive learners, and have negative attitude towards the subject. Similarly, there were students who have the same perceptions and experiences as other students had. They also found difficulty in solving Math problems. During their informal interview with them, one of the reasons why they are not confident in solving Math is because they had not fully mastered the basics of Mathematics and their foundation in Math is not fully strengthened. Some problem-solving skills were not fully taught to them when they were in the elementary and high school. Consequently, some of them have negative perception and attitude towards Mathematics.

The study is anchored on Integration Theory and Attitude change of Anderson. This theory of information integration is applied to attitude. For analysis, a simple attitudinal model of judgment is used, qualitative comparisons are made to relate whether attitude has a bearing to one's achievement in Math.

Congruity of attitude and Mathematics performance are shown to be consequences of the theory of information integration. Finally, it is noted that integration theory has had reasonable success in the areas of learning as well as attitude change. In this study, attitude is considered as one of the factors affecting the academic performance of the respondents in mathematics. It is the researcher's belief that students with positive disposition and attitude can lead to better Mathematics performance. This is further moored to the idea that motivation drives the students to perform well in the class.

In this study, the research questions such as "What is the profile of the respondents in terms of age, sex, Senior High School track, father's highest educational attainment, mother's highest educational attainment and monthly income of parents?"; "What is the mathematics performance of the respondents?"; "What is the attitude of the respondents towards

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Mathematics?"; "Is there a significant relationship between the attitude of the respondents in mathematics and their academic performance?" were answered.

Objectives of the Study

This study determined the attitudes of the respondents and their mathematics performance and it identified the relationship between the attitude of the respondents in mathematics and their academic performance.

II.METHODOLOGY

Research Design

The study used the descriptive design to describe the profile of the respondents, attitude of the respondents and Mathematics performance of the respondents.

Participants

The respondents of the study were the second-year students of College of Teacher Education, College of Business Entrepreneurship and Accountancy, College of Allied Health Sciences and College of Hospitality Management, who were officially enrolled for the first semester, School Year 2019-2020. Stratified Random Sampling procedure for equal proportional allocation of respondents was employed. The total second year population is 1,596 but only 75% of the total population was taken as the respondents. After determining the needed number of respondents per college. The researcher used the fishbowl technique in identifying the actual number of respondents.

Data Collection tools

Survey questionnaire was used to gather the needed data and the mathematics performance of the respondents was based on the respondents' grades in Mathematics in the Modern World which were taken from the University Registrar's Office.

Data Analysis

Frequency counts, mean and percentage were used to treat the profile variables of the respondents. The weighted mean was used to describe the mathematics performance of the respondents. And to treat the relationship between the attitude of the respondents in mathematics and their academic performance, Pearson R correlation was used.

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III. RESULTS AND DISCUSSION

A. Respondents' Profile

Table 2 shows the personal profile of the 1,196 respondents according to age, sex, Senior High School track, highest educational attainment of parents and monthly income.

In terms of age, it is revealed in the table that 1085 respondents or 90.7% falls on the age bracket of 19-21 while 0.01% falls on the age bracket of 28-40 years old. This infers that majority of the respondents are early adults.

Considering their personal profile as to sex, the table shows that 899 respondents or 75.2% are females; while, 297 or 24.8% are males. Hence the respondents are female dominated.

As regards the Senior High School track, 1028 or 85.95% are Academic track (GAS) graduates; while, 168 respondents or 14.04 percent are Technical-Vocational-Livelihood track graduates. So far, there were no Sports and Arts Design Tracks graduates enrolled at CSU Andrews. This can be attributed to the kind of courses offered at the said campus where the said tracks are related.

For the monthly income of the respondents' families, it is shown in the table that 409 or 34.2% falls on the income bracket of 2,100-5,000; while 348 or 29.1% falls on the income bracket of 10,000 and above; conversely, 284 or 23.7% falls on the income bracket of 5,100-9,999 and the rest of 155 or 13.0% have below 2,000 monthly income. This means that majority of the respondents belong to families who are not earning that much. Their monthly income is just enough to finance family basic needs.

With regard to the highest educational attainment (HEA) of their father, it is revealed that 284 or 23.7% are high school graduates; while, 277 or 23.2% are college graduates. Conversely, 194 or 16.2% are college undergraduates. On the other hand, 161 or 13.5 are elementary undergraduates; 124 or 10.4% are high school undergraduates; 122 or 10.2% are elementary graduates; 24 or 2.0% are master's degree holders and 10 or 0.8 % are doctorate degree holders.

On the other hand, with regards to highest educational attainment of the respondent' mother, 332 or 27.8% are college graduates; 271 or 22.7 percent are high school graduates; 193 or 16.1% are college undergraduates; 131 or 11.0% are elementary graduates; 123 or 10.3% are High School Undergraduates; while 96 or 8.0 % are elementary undergraduates; on the other hand, 39 or 3.3% are master's degree holders and the rest of 0.9% or 39 are doctorate degree holders. This finding shows that majority of the mothers of the respondents have undergone to higher level of education.

Table 1. Frequency and percentage distribution of the profile of the respondents

Variables		**Frequency (n= 1196)**	**Percentage**
Age	16- 18 years old	95	7.9
	19- 21 years old	1085	90.7
	22- 24 years old	12	1.0
	25- 27 years old	3	0.3
	28- 30 years old	1	0.1
Sex	Male	297	24.8
	Female	899	75.2

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Senior High School Track	Academic Track	1028	85.95
	TVL	168	14.05
	Sports	0	0
	Arts and Design	0	0
Monthly income of parents	Below 2,000	155	13.0
	2,100-5,000	409	34.2
	5,100- 9,999	284	23.7
	10,000 and above	348	29.1

Highest Educational Attainment	**Mother**		**Father**	
	Frequency (n=1196)	**Percentage**	**Frequency (n=1196)**	**Percentage**
Elem Undergrad	96	8.0	161	13.5
Elem Grad	131	11.0	122	10.2
HS Undergrad	123	10.3	124	10.4
HS Grad	271	22.7	284	23.7
College Undergrad	193	16.1	194	16.2
College Grad	332	27.8	277	23.2
Master's Degree	39	3.3	24	2.0
Doctorate Degree	11	0.9	10	0.8

Attitude of the respondents towards Mathematics

Table 2 shows the 16 positive statements 14 negative statements about Mathematics. The positive statements on items 1, 2, 3, 6, 11, 14, 19 and 24 have weighted means which would fall on the attitude bracket of 3.4 - 4.19 with a descriptive value of "agree". Specifically, these statements are "In school, I thoroughly enjoy Mathematics classes", "When I work with Mathematics problems, I find that my thinking and reasoning are sharpened.", "I am interested to acquire further knowledge in Mathematics." "I think I have more chances of becoming successful if I am good in Mathematics.", "Mathematics makes me more inquisitive about things which are not clear to me." and "I find Mathematics useful for problems of everyday life.

This finding means that the respondents, who believed to have a good foundation and who enjoyed Math, have positive attitude. They perceived positively that improvement on thinking and reasoning skills and becoming more successful in life were the benefits of being good in Mathematics.

This is in consonance to the findings of Subia, Salangsang and Medrano (2018). They found out that their respondents have positive attitude and perceptions particularly on the first three positive statements. Their study revealed that through mathematics reasoning skills of the college students are enhanced.

However, the positive statements in items 13, 17, and 27 which are "My favorite subject is Mathematics.", "I feel happier in my Mathematics class than in any other class" and "In Mathematics, I am not satisfied with just a passing grade; I want really something high." have

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weighted means that fall within the bracket of 2.6-3.39 which have a descriptive value of "**uncertain".**

This finding means that the respondents are not so sure or not totally convinced that Mathematics is their favorite subject compared to other General Education Curriculum subjects. The respondents also perceived that they are not quite sure if they are happier in Mathematics class compared to other class. For them, passing a subject is already a consolation. This can be attributed to the degree of difficulty of the subject compared to other basic subjects.

The revealed data conform to the finding of Subia, et.al (2018) particularly on item 13. They found out that their respondents considered Mathematics as their least favorite subject; however, they inferred that although their respondents do not like Mathematics, they are aware that an individual who is involved in Math will be most likely to develop critical thinking skills and will be more likely to succeed in life.

It can be gleaned also in the same table that the 4th, 5th, 7th, 8th, 9th, 19th, 22nd, 28th and 30th negative statements, "I feel uncomfortable with numbers and symbols." , "I am too nervous to think in my Mathematics class.", "I am unable to think clearly when working with Mathematics.", "Mathematics makes me feel as though I am lost in a jungle of numbers and I cannot find my way out." , "Mathematics problems scare me." , "I easily give up when I cannot solve a Mathematics problem.", "I think I will stand a better chance to succeed in my college course if it does not require Mathematics." and "My poorest mark is usually in Mathematics." have weighted means that fall within the bracket of 2.6-3.39 which have a descriptive value of "**uncertain"**

This means that the respondents are not fully confident and comfortable with numbers and symbols. They are not really sure in if they have a better chance to succeed in their college course if it does not require Mathematics. Further, they are unsure on their answers when tasked to solve Math problems.

This agrees to the claim of Bianco (2017) that learning Math can be difficult but some people believe Math is significant since it is everywhere and it is used in everyday life. Math is there to keep people to be well-ordered and to be organized essentially. In fact, Delos Angeles (2020) noted that learning style play a dynamic role in the lives of learners.

On the other hand, the negative statements found in items 12, 26 and 29 have weighted means that fall within the bracket of 2.6-3.39 which have a descriptive value of "**uncertain".** These negative statements are "I would willingly exchange my Mathematics subject for an easier subject in school.", "I consider Mathematics as my most difficult subject.", "I always need someone to help me with Mathematics because it confuses me."

This finding implies that the respondents are not so sure of their perceptions and attitudes if they would exchange Mathematics subject for an easier subject in school; if Mathematics is their most difficult subject, and if they need someone to help them with Mathematics because it confuses me." This reality partly proves that freshmen students have math anxiety.

This finding jointly favors the findings of Subia, et al (2017) that the BEED respondents in their study have math anxieties in terms of solving problems. He stated that highly anxious math students will avoid situations in which they have to perform mathematical calculations. A Math anxious student become so uncomfortable when confronted on mathematical tasks that he/she can experience physical symptoms including increased heart rate, nervous stomach and breathing difficulties that prevent them from concentration and learning. These feelings have

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been traced to be caused by variety of sources, including negative experiences in the classroom, poor self-image, lack of appreciation for the application of Mathematics to "real life" and shyness that prevents them from asking questions.

However, it is very alarming that the negative statements "Of all my teachers, it is my Mathematics teacher that I like the least." and "I would be happy if Mathematics were to be taken out of the curriculum." have weighted means that fall within the bracket of 3.4 -4.19 which have a descriptive value of "**agree".** This means that the respondents liked their Math teachers the least, and if given the chance they preferred that Mathematics will not be offered in the university and will be taken out of the curriculum.

Despite of these perceptions, the overall weighted mean is 3.22 which means the respondents have a positive attitude towards Mathematics. It implies that no matter how hard or difficult the activities or drills in Mathematics in a Modern World, the respondents have still positive disposition and perception toward Math.

This negates the findings and claim of Kogce, et.al (2018). According to them, when children first go to school, they usually have positive attitudes towards Mathematics. However, as they progress, their attitudes become less positive and frequently become negative at high school. They also found out that there was a significant difference between younger and older students' attitudes towards mathematics with 8th graders having lower attitudes than 6th graders.

Table 2. Attitude of the respondents towards Mathematics.

Statements	Mean	Descriptive Value
1.In school I thoroughly enjoy Mathematics classes.	3.45	**agree**
2.When I work with Mathematics problems, I find that my thinking and reasoning are sharpened.	3.75	**agree**
3. I am interested to acquire further knowledge in Mathematics.	3.85	**agree**
4. I feel uncomfortable with numbers and symbols.	3.13	**uncertain**
5.I am too nervous to think in my Mathematics class.	3.02	**uncertain**
6.I think I have more chances of becoming successful if I am good in Mathematics.	3.65	**agree**
7.I am unable to think clearly when working with Mathematics.	3.21	**certain**
8.Mathematics makes me feel as though I am lost in a jungle of numbers and I cannot find my way out	3.02	**uncertain**
9.Mathematics problems scare me.	3.06	**uncertain**
10. I enjoy going beyond the assigned work in Mathematics and I try solving more than what is expected of me.	3.22	**uncertain**
11. Mathematics makes me more inquisitive about things which are not clear to me.	3.44	**agree**
12. I would willingly exchange my Mathematics subject for an easier subject in school.	2.97	**uncertain**
13. My favorite subject is Mathematics.	2.75	**uncertain**
14. Of all my teachers, it is my Mathematics teacher that I like the least.	3.51	**agree**
15. My parents love and enjoy Mathematics.	3.14	**uncertain**

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16. If I had my way, I would avoid taking Mathematics subjects in College.	3.26	**uncertain**
17. I feel happier in my Mathematics class than in any other class.	2.85	**uncertain**
18. I think my mind works well when doing Mathematics problems.	3.21	**uncertain**
19. I would be happy if Mathematics were to be taken out of the curriculum.	3.54	**agree**
20. I feel I have a good foundation in Mathematics.	3.17	**uncertain**
21.The people I enjoy going with are those who are good in Mathematics.	3.12	**uncertain**
22. I easily give up when I cannot solve a Mathematics problem.	3.20	**uncertain**
23. Mathematics is a subject which I have always enjoyed studying.	3.05	**uncertain**
24. I find Mathematics useful for problems of everyday life.	3.79	**agree**
25. Mathematics gives me such satisfaction.	3.30	**uncertain**
26. I consider Mathematics as my most difficult subject.	2.74	**uncertain**
27. In Mathematics, I am not satisfied with just a passing grade; I want really something high.	2.83	**uncertain**
28. I think I will stand a better chance to succeed in my college course if it does not require Mathematics.	3.28	**uncertain**
29. I always need someone to help me with Mathematics because it confuses me.	2.56	**uncertain**
30. My poorest mark is usually in Mathematics.	3.39	**uncertain**
Over-all weighted mean	3.22	**Positive**

Mathematics Performance of the Respondents

Table 3 shows that 560 or 46.82% of the respondents were at the grade range of 87- 92 with a descriptive value of "Good". While, 421 or 35.21% were at the grade range of 81- 86 with "Satisfactory" as the descriptive value. Whereas, 147 or 12.29% were at the grade range of 93- 98 with a descriptive value of "Very Good". There were also 64 respondents or 5.35% of the population whose grades fall on the grade range of 75-80 which means passing, 4 respondents or 0.33% have grades that fall on the grade range of 99-100% which has a descriptive value of "Excellent".

The computed mean value is 87.26 with descriptive value of "good". This finding intends to convey that the respondents are not weak in Math. They are not that highly intellectual, but they are not poor in numeracy and abstract comprehension.

This finding negates the findings of Subia, et. al (2018) in their study "Attitude and Performance in Mathematics I of Bachelor of Elementary Education Students: A Correlational Analysis". They found out that their respondents whose overall performance in Mathematics 1 is below average 82.10 which showed that their respondents are weak in Math 1. His findings also revealed that entering freshmen students were weak in almost all areas of Mathematics and

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were not ready for College Mathematics. Furthermore, they also found out that first year college's level of proficiency in Mathematics is poor, and that majority of the students performed poor in their achievement in Mathematics.

Table 3. Mathematics Performance of the Respondents

Intervals	Frequency (n= 1196)	Percentage
99- 100	4	0.33
93-98	147	12.29
87- 92	560	46.82
81-86	421	35.21
75-80	64	5.35
Mean= 87.26;	s. d. = 4.35	

Correlation between the Attitude and the Performance in Mathematics in the Modern World of the Respondents

Table 4 presents the significant relationships that exist between the attitudes of the respondents and their performance in Mathematics in the Modern World.

The attitude of the respondents is significantly related to their performance in Mathematics. The P-value is lesser than 0.01 level of significance. Thus, the null hypothesis is rejected. This means that there is significant relationship between the attitude and the performance in mathematics of the respondents. If the respondents have positive attitude and disposition towards Mathematics, the better is their Mathematics Performance or the higher is their grade. Likewise, if the respondents exhibit negative attitude in Mathematics, the lower is his/her performance in Mathematics. This implies that students with positive attitude in Mathematics performed better than those students with negative attitude.

This is related to the findings of Zan, et al. (2008). They claimed that a positive attitude towards mathematics reflects a positive emotional disposition in relation to the subject and, in a similar way, a negative attitude towards mathematics relates to a negative emotional disposition. One is likely to achieve better in a subject that he/she enjoys, has confidence in or finds it useful. For this reason, positive attitudes towards mathematics are desirable since they may influence one's willingness to learn.

In like manner the finding of the study is parallel to the findings of several studies that had been conducted to find out the relationship between attitude towards mathematics and academic achievement of the students. Most of these studies showed that there is a positive correlation between students' attitude towards mathematics and academic achievement of students (Mohd et al, 2011; Bramlett & Herron, 2009) and also achievement in problem solving (Nicolaidou & Philippou, 2003). Their studies have also shown that students' attitude towards problem solving has a positive relation with students‟ mathematics achievement (Mohd et al, 2011).

Table 4. Relationship between the Attitude and the Performance in Mathematics in the Modern World of the Respondents

Variables	r-Coefficient	P-vaue
Academic Performance	0.306*	0.000
Math Attitude		

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*Significant at α= 0.01

IV. CONCLUSIONS AND RECOMMENDATIONS

In the light of above-mentioned findings, the study concluded that the mathematics performance of the respondents is "good" which means that the respondents are not poor and are not that highly intellectual in analytical comprehension and they have positive attitude which is significantly related to their performance in Mathematics. This means if the respondents have positive attitude and disposition towards Mathematics, the better is their Mathematics Performance or the higher is their grade. Significantly, this implies that they value the importance of Math not only in their academic endeavor but also in the different facets of life. This further implies that the significance of the subject is appreciated by the respondent's despite of its complexities. This is then interrelated to the Integration Theory and Attitude change of Norman H. Anderson where attitude and Mathematics performance are shown to be consequences of the theory of information integration. It is noted that integration theory has had reasonable success in the areas of learning as well as attitude change.

It is recommended that the Mathematics instructor should motivate and help the university students to have a sustained positive attitude towards Math. The syllabi, instructional materials and teaching strategies to be used should be enriched and be enhanced to help the students achieve their learning objectives and for them to have a better Mathematics performance.

Moreover, curriculum planners should develop a Math curriculum that is experiential and learner-based as embodied in CMO 46, s. 2012 to help the students sustain their positive disposition towards mathematics.

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