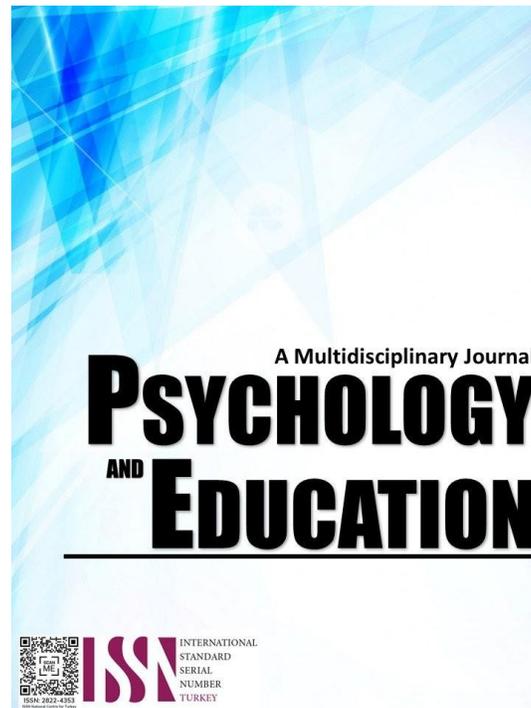


**A CORRELATIONAL STUDY OF ATTITUDES TOWARD MATHEMATICS,
STUDY HABITS, AND ACADEMIC PERFORMANCE
AMONG GRADE 10 STUDENTS**



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A Correlational Study of Attitudes Toward Mathematics, Study Habits, and Academic Performance among Grade 10 Students

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Abstract

This study investigated the relationship among attitudes toward mathematics, study habits, and academic performance of Grade 10 students at Handumanan National High School. Utilizing a descriptive-correlational research design, the study involved 288 students, with their academic performance measured by the average of their first and second quarter grades in Mathematics. The majority of respondents were from heterogeneous classes, with a smaller portion from homogeneous groups. Both groups demonstrated generally positive attitudes toward Mathematics. Although students perceived their exam preparation methods as effective, they reported difficulties with concentration and employed less effective study habits overall. Academic performance was rated as very satisfactory across both groups, with no significant difference based on class grouping. The results indicated no significant difference in attitudes toward Mathematics between homogeneous and heterogeneous groups; however, a significant difference was observed in their study habits. For the homogeneous group, a strong positive correlation was found between attitudes toward Mathematics and academic performance. In contrast, no significant relationship was found between attitudes and study habits or between study habits and academic performance within this group. Among the heterogeneous group, attitudes toward Mathematics were significantly correlated with academic performance, as were their study habits. However, no significant relationship was found between their attitudes and study habits. These findings suggest that both attitude and study habits independently influence academic performance in Mathematics, with variations depending on class grouping.

Keywords: *academic performance, academic performance in mathematics, homogenous, heterogenous, attitudes, study habits*

Introduction

The importance of learning Mathematics lies not only in the study of numbers, counting, and measuring, but also in its role as a means of communicating ideas and fostering a unique form of reasoning. According to the International Commission on Mathematical Instruction (2022), Mathematics is an essential part of human thought and logic, playing a crucial role in understanding the world and the people within it. It also serves as an effective method for developing mental discipline. Neelakantha Bhanu (2019), a mathematics enthusiast and e-learning consultant, emphasized that Mathematics strengthens logical reasoning and mental rigor.

Despite its significance, many students continue to exhibit negative attitudes toward the subject. Mathematics is often perceived as boring or difficult, especially due to the challenges of memorizing and understanding formulas. This contributes to the global issue of low-quality education in Mathematics.

For instance, in the United States, students scored relatively low in the 2015 Program for International Student Assessment (PISA), reflecting a significant decline in performance (as cited in Guinocor et al., 2020). Similarly, Indonesia ranked 64th out of 65 participating countries in the same assessment (Ajisuksmo & Saputri, 2017). In the Philippines, performance in the 2013 Trends in International Mathematics and Science Study (TIMSS) lagged far behind countries such as Singapore, South Korea, Hong Kong, Chinese Taipei, and Japan (Care et al., 2015). Likewise, in 2018, Filipino learners were among the lowest-performing groups in the PISA (Department of Education, 2019).

In light of this gap between current and expected performance, the researcher aims to assess the academic performance in Mathematics of Grade 10 students at Handumanan National High School in relation to their attitudes toward Mathematics and their study habits. The goal is to identify strengths and deficiencies in the teaching and learning process, thereby informing intervention programs that may improve Mathematics proficiency.

This study is anchored in several theoretical frameworks: Walberg's (1981) Theory of Educational Productivity, Ausubel's (1963) Motivation and Subsumption Theories, Gardner's (1983) Theory of Multiple Intelligences, and Bruner's (1966) Constructivist Theory.

Walberg's theory emphasizes that students' behavioral characteristics (such as attitudes and study habits) and their immediate environments (such as class grouping) influence educational outcomes. Key variables identified by Walberg include ability, prior achievement, motivation, age, classroom climate, quality of instruction, home environment, peer influence, and media exposure (Walberg, Fraser, & Welch, 1986). These factors collectively shape learning outcomes through both personal and environmental influences (DiPerna et al., 2002; Rugutt & Chemosit, 2005).

Ausubel's (1963) learning theory highlights the role of motivation in academic achievement. He asserts that self-motivated students, driven by curiosity, seek to understand and master knowledge to solve problems. Acknowledgement and recognition from significant

others such as parents and peers, further support this motivation (Adhikari, 2010).

Gardner's (1983) Theory of Multiple Intelligences proposes that students possess unique combinations of intelligences, including verbal-linguistic, logical-mathematical, spatial-visual, bodily-kinesthetic, musical, interpersonal, intrapersonal, naturalistic, and existential. Each intelligence reflects a distinct way of processing and expressing knowledge, supporting the idea that students learn best through their preferred styles and strengths (BusinessBalls, 2009).

Finally, Bruner's (1966) Constructivist Theory suggests that learning is an active process wherein students construct new ideas based on prior and current knowledge and experiences. This theory emphasizes the importance of cognitive processes in shaping how students acquire and apply knowledge (Matsumoto, 2017).

In applying these theories, this study explores how students' attitudes, study habits, learning environments, motivation sources, intellectual strengths, and cognitive processes influence their academic performance in Mathematics.

Research Questions

This study sought to determine the level of academic performance in Mathematics among Grade 10 students of Handumanan National High School in relation to selected variables during the School Year 2022-2023. Specifically, this study aimed to answer the following questions:

1. What is the profile of the respondents according to class grouping?
2. What is the level of attitude of the respondents towards Mathematics according to class grouping and when taken as a whole?
3. What is the extent of study habits of the respondents in terms of motivation, study methods, exam technique, and lack of distraction, according to class grouping and when taken as a whole?
4. What is the level of academic performance of the respondents according to class grouping, and when taken as a whole?
5. Is there a significant difference in the attitude of the respondents towards Mathematics when grouped and compared according to class grouping?
6. Is there a significant difference in the study habits of the respondents when grouped and compared according to class grouping?
7. Is there a significant difference in the academic performance of the respondents when grouped and compared according to class grouping?
8. Is there a significant relationship between attitude towards Mathematics and the academic performance of the respondents?
9. Is there a significant relationship between study habits and the academic performance of the respondents?
10. Is there a significant relationship between attitude towards Mathematics and study habits of the respondents?

Literature Review

Attitudes of Students in Mathematics

Attitudes refer to a person's tendency to respond to a particular object, idea, or individual, and these responses may vary depending on the situation (Haste, 2018). In the academic context, students with positive attitudes often place goals at the core of their education. They tend to have favorable perceptions of their learning experiences, their peers, and their teachers. Such students typically exhibit traits like discipline, diligence, and resourcefulness. They enjoy reading, allocate more time for studying, and spend less time on leisure activities. Having a positive perspective towards school, teachers, and academic subjects—such as Mathematics—is essential. This constructive mindset can motivate students to actively participate in lessons, thereby enhancing learning and supporting academic achievement (Maina, 2010; Kapur, 2018).

In California, U.S.A., Chen et al. (2018) found that a positive attitude toward Mathematics uniquely predicted achievement in the subject. Their study, which involved two groups of children, examined the relationship between positive attitudes and academic achievement by exploring the roles of effective-motivational and learning-memory systems. The results showed that positive attitudes were significantly correlated with heightened activity in the learning-memory system. Structural equation modeling revealed that this increased activity, along with the frequent use of efficient memory-based strategies, mediated the relationship between positive attitude and improved performance in Mathematics. This research was among the first to identify the neurocognitive mechanisms by which positive attitudes drive learning and academic success.

Similarly, in Korea, Hwang and Son (2021) identified a positive relationship between students' attitudes toward Mathematics and their academic achievement. Students with higher achievement in Mathematics reported greater interest in studying the subject and engaged more frequently in related activities. These learners, who had confidence in their mathematical abilities, also believed that mastering Mathematics would lead to better academic outcomes and future career opportunities. The researchers recommended that educators assess and support students' attitudes toward the subject to foster positive learning outcomes.

In Kenya, Githaiga et al. (2018) reported that students' attitudes significantly influenced their performance in Mathematics in public secondary schools in Kilifi sub-county. Specifically, learners with negative attitudes performed poorly in the subject.

In the Philippines, similar findings have been documented. Subia et al. (2018) in Cabanatuan City found a significant association

between students' attitudes and their performance in Mathematics. A higher level of positive attitude corresponded with better performance, while more negative attitudes resulted in lower achievement. Respondents also expressed that solving mathematical problems helped them become better thinkers and increased their chances of future success.

In Cebu, Capuno et al. (2019) reported that both attitudes and study habits positively affected students' performance in Mathematics. Consequently, they recommended the development of instructional plans specifically tailored to improve junior high school students' attitudes and study behaviors.

Likewise, in Bohol, Peteros et al. (2019) revealed that students' attitudes had a significant impact on their mathematical achievement. Their findings emphasized that a positive disposition toward Mathematics plays a critical role in academic success. The researchers encouraged teachers to nurture students' self-confidence by actively involving them in class discussions and activities aimed at deepening their understanding of the subject.

Study Habits

Study habits refer to the consistent practices and routines that individuals develop to support their learning process. These habits typically involve dedicating uninterrupted time for studying and reflect the individual's willingness and determination to learn (Rabia et al., 2017). As fundamental elements of academic success, study habits are influenced by various factors, including motivation, study methods, exam techniques, and the ability to avoid distractions (Entwistle et al., 1971; Thompson, 1976). Motivation includes the enjoyment and satisfaction derived from subject-related activities, which can inspire learners to engage more consistently. Study methods involve creating an optimal learning environment—organized, clean, and distraction-free—while exam techniques include strategies for managing test preparation effectively, such as thinking through answers in advance and using time wisely during assessments (Richardson, 2018; Entwistle et al., 1971).

The importance of effective study habits in academic performance is well supported by research. Rabia et al. (2017) emphasize that students lacking proper study habits often struggle to reach their full academic potential. A case in point is the study conducted by Ahmad (2018) in Saudi Arabia, where most male respondents showed poor study behavior—they studied only during exams, did not take notes, and lacked a consistent study schedule. These behaviors contributed to poor academic outcomes. Conversely, female students demonstrated more disciplined habits and stronger motivation, which translated into better performance. This gender gap highlights the importance of cultivating positive study practices early in a student's academic journey.

Further evidence comes from studies conducted in Pakistan and Iran. Bibi et al. (2020) found a positive correlation between students' study habits and academic achievement, affirming the notion that good study routines are integral to academic success. Similarly, Jafari et al. (2019) reported a significant association between study habits and academic performance among medical students in Kermanshah, Iran. These findings prompted the researchers to recommend pre-admission assessments of students' study habits and the provision of training programs aimed at enhancing these skills to support better academic outcomes.

In the local Philippine context, Relucio (2019) observed that poor study habits among students in Pangasinan were linked to unsatisfactory educational results. Common issues included failing to complete assignments and review class notes, particularly during school hours. Several external factors were identified as contributing to these habits, including unstable home environments, peer influence, the excessive use of social media, family-related financial difficulties, and general life stressors. To counter these challenges, study methods such as regular time management, consistent lecture note-taking, proactive planning, participation in tutorials, and perseverance even during low motivation are essential (Hayden, 2022; Entwistle et al., 1971). When students integrate strategic exam techniques and organized study methods into their routines, they become better equipped to navigate academic demands and improve their overall performance.

Academic Performance

Academic performance refers to the extent to which a student achieves educational objectives, often measured through continuous assessments or cumulative grade point averages (Talib & Sansgiry, 2012). Several factors influence academic performance, including students' attitudes, school resources, leadership, teacher competencies, classroom environment, parental involvement (Kudari, 2016), psychological and health conditions, motivational support, sensory impairments (Srinivas & Venkatkrishnan, 2016), guidance services (Maganga, 2016), time management, household dynamics, the teaching-learning process, and professional conduct (Kapur, 2018).

Motivation

Motivation is the psychological process that initiates, guides, and sustains goal-directed behavior. It drives individuals to achieve goals based on their study habits (Cherry, 2022). For example, motivated students often avoid procrastination, enjoy tackling new or challenging lessons, prioritize difficult tasks, begin work promptly after classes, persist despite challenges, see meaning in their tasks, strive for excellence, perform competitively, avoid failure, and complete assignments ahead of deadlines (Entwistle et al., 1971).

Distraction in Math

Generally, fear of the subject and a sense of failure are two major challenges students encounter in learning Mathematics. Fear can hinder comprehension, making it difficult for students to absorb concepts and ultimately causing a loss of interest in the subject. Other

distractions include spending excessive time on sports and social activities, worrying about exams or overdue assignments, and experiencing financial difficulties, among others (Entwistle et al., 1971).

In Aurora, Philippines, Laranang and Bondoc (2020) examined students' attitudes toward Mathematics. The results revealed that respondents had a moderate level of self-confidence and enjoyed studying the subject. They also held Mathematics in high regard, recognizing its importance in their daily lives. The subject was seen as a tool for promoting critical thinking. Moreover, students reported that they greatly enjoyed learning Mathematics and considered it useful for solving problems in other disciplines and in their future professions. However, while moderately motivated, they expressed some discomfort during Math classes.

The respondents' self-efficacy was also moderate. They acknowledged the importance of Mathematics for their future careers.

In Cebu, Philippines, Guinocor et al. (2020) found a significant association between students' study habits and academic performance in Mathematics. Although students displayed varied study orientations, the researchers recommended further research into other contributing factors, particularly learning strategies.

Methodology

Research Design

This study employed a descriptive-correlational research design to determine the academic performance in Mathematics of Grade 10 students at Handumanan National High School in relation to selected variables.

Descriptive-correlational research describes the variables and the relationships that naturally occur between and among them. It is used to examine whether changes in one or more variables are related to changes in another variable (Davis, 2019).

Aligned with the objective of this study, this design is suitable for investigating the present conditions and exploring the relationships and possible influences between variables (Dudovskiy, 2017).

Hence, this research design was deemed most appropriate, as it allowed the researchers to analyze the gathered data and establish relevant relationships, serving as a basis for sound analysis and interpretation.

Respondents

The participants of this study were the Grade 10 students of Handumanan National High School, Bacolod City, who were enrolled during the School Year 2022–2023.

Instrument

This study employed a two-part questionnaire. Part 1 is respondents' profile. Part 2 is the survey proper on attitudes toward Mathematics and study habits.

Martha Tapia's (1996) Attitudes Toward Mathematics Inventory was used to determine the attitudes of the respondents towards Mathematics. Statements in item numbers 9, 10, 11, 12, 13, 14, 15, 20, 21, and 28 are stated negatively thus scores for these items were reversed. Moreover, Entwistle et al.'s (1971) Study Habits Inventory was used in ascertaining the study habits of the students. The instrument has four areas, namely, motivation, study methods, exam technique, and lack of distraction. Motivation contains 14 items in which items 3, 6, 7, 8, 9, 11, 13, and 14 were stated negatively thus scores for these items were reversed. Study Methods also contains 14 items in which items 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, and 14 were stated negatively thus scores for these items were reversed. Exam Technique contains 9 in which items 1 to 6 were stated negatively thus scores for these items were reversed while Lack of Distraction contains 10 items in which items 2 to 10 were stated negatively thus scores for these items were reversed.

All areas were gauged using a 4-point Likert scale where 1 is the lowest and 4 is the highest. Respondents' responses were interpreted using Pimentel's (2019) nearest-integer response from normally distributed opinion model for Likert scale.

The DepEd Standardized Form 9 was used to secure the respondents' academic performance (i.e., mean average grade) in Mathematics for the first and second quarters. Academic performance was measured based on DepEd's grading system with reference to D.O. No. 8, series of 2015.

Procedure

Permission to conduct the study was obtained through formal written communication addressed to the School Principal of Handumanan National High School. Once approved, the researchers coordinated with the section counselors and administered the questionnaires via face-to-face interaction. Following health and safety protocols, the researchers met the target respondents in their designated classrooms for efficient administration. Before distributing the questionnaires, the researchers explained the purpose and intent of the study to the participants. Upon completion, all responses were recorded and prepared for computation, tabulation, and analysis.

Data Analysis

In the study, Question 1 utilized frequency and percentage scoring to determine the demographic profile of the respondents. Questions

2, 3, and 4 employed the mean to assess the respondents' attitudes toward Mathematics, their study habits, and their academic performance. To determine whether significant differences existed based on class grouping, Questions 5, 6, and 7 applied the Z-test in analyzing the levels of attitudes toward Mathematics, the extent of study habits, and academic performance. Lastly, Questions 8, 9, and 10 used the Pearson Product-Moment Correlation Coefficient (Pearson r) to examine whether significant relationships existed among academic performance, attitudes toward Mathematics, and study habits.

Results and Discussion

This section underscores the presentation, analysis, and interpretation of the data gathered in this research study. The results are presented in tables to emphasize the significance of each problem.

Profile of Respondents

Table 1 shows the profile of the respondents by class grouping.

Table 1. *Distribution of the Respondents According to Class Grouping*

<i>Class Grouping</i>	<i>n</i>
Homogenous	27
Heterogenous	254
Total	281

The majority of the respondents came from the heterogenous group with 253 students while there were only 28 respondents from the homogenous group. The homogenous group were the first 90 students with the highest general point average while the heterogenous group were the students with mixed general point averages.

Attitudes of Respondents toward Mathematics According to Class Grouping and Taken as a Whole

Table 2 shows the level of attitudes of the respondents toward Mathematics according to class grouping and when taken as a whole.

Table 2. *Level of Attitudes of Respondents toward Mathematics According to Class Grouping and Taken as a Whole*

<i>Class Grouping</i>	<i>Mean</i>	<i>Interpretation</i>
Homogenous	2.86	Positive
Heterogenous	2.86	Positive
As a whole	2.86	Positive

The level of attitudes toward Mathematics of the respondents that is homogenous and heterogenous combined obtained an overall mean score of 2.86, interpreted as positive.

The result implied that respondents' attitude towards Mathematics was positive. With positive attitudes, the respondents had developed the necessary Mathematical skills and abilities necessary to perform subject-related activities such as specific and problem-solving situations (Haste, 2018). The respondents, therefore, possessed the necessary traits of discipline, diligence, and resourcefulness. Having positive attitudes, the respondents religiously devoted themselves to learning and acquired the necessary educational outcomes (Kapur, 2018).

In conformity to this result, Chen et al., (2018) found out that positive attitudes toward Mathematics uniquely predicted students' achievement on the subject. Moreover, the researchers found that positive attitude increased respondents' engagement with learning-memory system.

Similarly, Hwang and Son (2021) discovered a positive connection between students' attitudes toward mathematics and mathematics achievement. Students with higher mathematics achievement have actively engaged in mathematics-related activities. This liking with Mathematics was predicated on the premise that learning mathematics would result in a better result such as getting good scores and landing more job opportunities. With this, the researchers recommended that educators need to examine students' behavioral characteristics toward the discipline and provide the necessary support for excellent outcomes.

Extent of Study Habits of the Respondents According to Class Grouping and When Taken as a Whole

Table 3 shows the extent of study habits of respondents according to class grouping and when taken as a whole.

The respondents' study habits were to a low extent that is homogenous and heterogenous groups alike though they were generally motivated at mean score of 2.63 and 2.52, respectively and found their exam technique effective with mean score of 2.53 and 2.63; however, they were distracted given the mean score of 2.39 and 2.31 and found their study methods less effective with mean score of 2.18 and 2.36 respectively.

Being motivated, the respondents enjoyed the different Mathematics-related activities and their corresponding challenges. With this, they do not give up easily even when things are too difficult for them. Likewise, they would always see relevance in most of their

written and performance tasks. They strived to be good at something even in trivial matters and preferred to do things ahead of time.

Table 3. *Extent of Study Habits of Respondents According to Class Grouping and When Taken as a Whole*

<i>Study Habits</i>	<i>Class Groupings</i>	<i>Mean</i>	<i>Interpretation</i>
Motivation	Homogenous	2.63	Motivated
	Heterogenous	2.52	Motivated
Study Methods	Homogenous	2.18	Less Effective
	Heterogenous	2.36	Less Effective
Exam Technique	Homogenous	2.53	Effective
	Heterogenous	2.63	Effective
Lack of Distraction	Homogenous	2.39	Distracted
	Heterogenous	2.31	Distracted
As a whole	2.44	Low Extent	

This finding is in consonance to the statement of Hawthorne (2021) that motivated students are achievers and have more potential to succeed. This is because motivation is crucial component to learning. It does not only generate desirable behaviors in students but also promotes a better sense of well-being and welfare. Understanding, therefore, how to motivate students in education is integral in providing the latter with the best possible starting point in life.

Level of Academic Performance of Respondents According to Class Grouping and When Taken as a Whole

The table below presents the level of academic performance of the respondents according to class grouping and when taken as a whole.

Table 4. *Level of Academic Performance of Respondents According to Class Grouping and When Taken as a Whole*

<i>Class Grouping</i>	<i>Mean</i>	<i>Interpretation</i>
Homogenous	87.80	Very Satisfactory
Heterogenous	88.10	Very Satisfactory
As a whole	88.00	Very Satisfactory

The level of academic performance of respondents according to class grouping was very satisfactory with a mean of 87.80 for homogenous, 88.10 for heterogeneous and 88.00 when taken as a whole.

The results in this regard indicated that respondents (homogenous and heterogenous groups combined) had exceeded expectations insofar as their academic performance in Mathematics was concerned. They were able to achieve the targets over and above the established standards of the subject.

According to Kudari (2016), some of the identified factors that influenced higher level of academic performance were learners' attitudes or behavior, resources and facilities in school, leadership, teachers' pedagogical competencies, learning environment, and parental involvement (Kudari, 2016), psychological wellness, health-related conditions, degree of motivations for learning, and physiological incapacities (Srinivas and Venkatkrishnan, 2016), guidance services (Maganga, 2016), skills development, management of time, home conditions, teaching-learning process, and teacher professionalism (Kapur, 2018).

Basically, it is incumbent upon respondents to take responsibility over their learning in the pursuit of their basic education. As such, mastering Mathematical skills and concepts needs commitment to learn and succeed. This includes determination and setting of achievable goals and objectives. It requires strong belief in their capabilities to surpass the subject. It needs perseverance and development of skills in taking challenges brought by learning the discipline. Moreover, respondents need to connect their previous and present experiences in the process of learning. It requires a willingness to work with others and with oneself. It needs dedication to existing better practices. It requires to acknowledge feedback as basis for potential improvement. With these, students can better understand mathematical language and achieve better learning outcomes King's Printer for Ontario, 2022).

Consequently, OECD (2022) averted that as performers in Mathematics, the respondents recognized the role that the discipline plays in the real world to make sound and concrete dispositions needed by concerned and productive citizens.

Difference on the Attitude of Respondents toward Mathematics when Grouped and Compared According to Class Grouping

Table 5 shows the comparative statistics between the attitudes of respondents toward Mathematics when grouped and compared according to class grouping.

Using z-test, the result showed that the computed (z) value of zero (0) is below the p-value of 1.96 thus, the null hypothesis is accepted. This means that no significant difference existed in the levels of attitudes of the respondents toward Mathematics when grouped and compared according to class grouping, that is, between homogenous and heterogenous groups.

This result suggested that the two groups of respondents did not necessarily differ in their attitudes toward Mathematics; they shared

similar levels of interests and motivations toward the subject whether they came from the first 90 students with the highest general point (homogenous) or the group of students with mixed general point averages (heterogenous).

Table 5. *Difference on the Attitudes of Respondents toward Mathematics when Grouped and Compared According to Class Grouping*

<i>Class Grouping</i>	<i>n</i>	<i>Mean of Attitudes Toward Mathematics</i>
Homogenous	27	2.86
Heterogenous	254	2.86

Computed (z) value: 0

P-value: 1.96

Decision: Accept Ho

Interpretation: Not Significant @ 0.05 Level of Significance

Based on this result, it could be safely deduced that, regardless of class grouping, the respondents shared a common level of attitude towards Mathematics, and it did matter to their performance in the said subject.

According to Walberg's theory, students' behavioral characteristics such as their attitudes and study habits influence educational outcomes. Moreover, Walberg identified some key variables which had great impact on learners' educational outcomes or academic performance such as their capabilities, prior experiences and achievement, degree of motivation, age maturity, quantity and quality of instructions and methods, surrounding climate, home conditions, friends and cliches, and extent of exposure to social media (Walberg, Fraser, & Welch, 1986).

Difference on the Study Habits of Respondents when Grouped and Compared to Glass Grouping

Table 6 shows the comparative statistics between the extents of study habits of the respondents when grouped and compared according to class grouping.

Table 6. *Difference Between the Extents of Study Habits of the Respondents when Grouped and Compared According to Glass Grouping*

<i>Class Grouping</i>	<i>N</i>	<i>Mean</i>
Homogenous	27	2.43
Heterogenous	254	2.33

Computed (z) value: 2.04

P-value: 1.96

Decision: Reject Ho

Interpretation: Significant at 0.05

The z-test result showed that the computed value of 2.04 is above the p-value of 1.96 thus, the null hypothesis is rejected. This means that there was a significant difference between the extents of study habits of the respondents when grouped and compared according to class grouping that is between homogenous and heterogenous groups.

The result implied that respondents – they being coming from different groups with distinct characteristics likewise differed in their respective study habits. Hence, they differed in motivation, study methods, exam techniques, and lack of distraction.

Results on this regard suggested that respondents had varied or multiple intelligences that demonstrated their respective aptitude, capabilities, and abilities in Mathematics.

Thus, these results conformed to Howard Gardner's (1983) Theory of Multiple Intelligences and the latter relate to students' distinct aptitudes and set of capabilities and ways that they prefer to use in the process of learning. Gardner's multiple intelligences theory, as mentioned in the preceding discussions, can be used for curriculum development, planning instruction, selection of course activities, and related assessment strategies. The instruction is designed to help students develop their intellectual capabilities. It also helps increase their level of confidence in addressing areas that they have difficulties. Students' multiple learning preferences can be addressed when instruction includes appropriate teaching and learning methods in addressing students' varied needs. Gardner himself asserts that educators should use multiple ways and innovations to design instructional materials with achievable goals. Moreover, in addressing the multiple intelligences and potential of students, learning facilitators can customize teaching and learning tools (businessballs.com, 2009).

Difference on the Academic Performance of Respondents when Grouped and Compared According to Glass Grouping

Table 7 shows the comparative statistics between the academic performance of the respondents when grouped and compared according to class grouping.

The z-test result showed that the computed value of -0.43 is below the p-value of -1.96 in absolute value therefore, the null hypothesis is accepted. This means that no significant difference existed between the levels of academic performance of the respondents when grouped and compared according to class grouping that is homogenous vs heterogenous groups.

The result suggested that respondents – although they came from different groups, did not necessarily differ in their respective knowledge and learning outcomes in Mathematics. This knowledge gained and learning outcomes in Mathematics as mentioned in the



study completed by Abaidoo (2018), are basically assessed through performance marks per educational standards to be attained over certain period.

Table 7. Difference Between the Academic Performance of Respondents when Grouped and Compared According to Glass Grouping

Class Grouping	N	Mean of Academic Performance
Homogenous	27	87.80
Heterogenous	254	88.10

Computed (z) value: -0.43
 P-value: -1.96
 Decision: Accept Ho
 Interpretation: Not Significant at 0.05

Furthermore, as mentioned earlier, academic performance is basically influenced by some of the identified factors such as, but not limited to, students’ behavioral characteristics, school facilities and resources, teachers’ competencies, and learning space and conditions (Kudari, 2016).

Relationship between Attitudes toward Mathematics and Academic Performance of Respondents

Table 8 shows the relational statistics between the attitudes of the respondents toward Mathematics and their academic performance.

Table 8. Relationship between Attitudes toward Mathematics and Academic Performance of Respondents

Class Grouping	n	Mean of Attitudes Towards Mathematics	Mean of Academic Performance	Pearson r	
Homogenous	27	2.86	87.80	.55	T Computed Value: 3.26 α = 5%, df: 25 Tabular Value: 2.060 Decision: Reject Ho Interpretation: Significant
Heterogenous	254	2.86	88.10	.40	T Computed Value: 6.86 α = 5%, df: 252, Tabular Value: 1.969 Decision: Reject Ho Interpretation: Significant

For the homogenous group, the result showed that at 0.05 level of significance and a degree of freedom of 25, the t computed value of 3.26 is greater than the tabular value of 2.060 thus, the null hypothesis is rejected. This means that a significant relationship existed between the attitudes toward Mathematics of the respondents and their academic performance.

In similar way, for the heterogenous group, the result showed that at 0.05 level of significance and a degree of freedom of 252, the computed value of 6.86 is greater than the tabular value 1.969 therefore, the null hypothesis is rejected. This means that a significant relationship existed between the attitudes toward Mathematics and academic performance of the respondents.

The results implied that respondents’ attitudes toward the subject played a vital role as it was positively linked to their academic performance.

In agreement to these results, Chen et al. (2018) found respondents’ attitude toward Mathematics uniquely predicted the latter’s learning and achievement. Similarly, Hwang and Son (2021) found respondents, who had confidence in mathematical prowess, believed that learning Mathematics would result in a better outcome such as school success and more opportunities in landing jobs soon. On the other hand, Githaiga et. al. (2018) reported that students who held poor outlook towards the subject generated a not good performance in the subject.

In addition, Subia et al. (2018) found, in their study, that respondents’ attitudes had greatly increased their achievement in Mathematics. In other words, the higher the respondents’ positive attitude, then the higher their performance; whereas the higher their negative attitude toward the subject, then the lower their performance. Nevertheless, the respondents believed that working with Mathematical problems enabled them to make sound judgments and have more chances of being successful in their endeavors and life in general.

Relationship Between Study Habits and Academic Performance of Respondents

Table 10 shows the relational statistics between study habits of the respondents and their academic performance.

the tabular value of 2.060 thus, the null hypothesis is accepted. This means that no significant relationship existed between the study habits of the respondents and their academic performance.

The results suggested a negative link between respondents’ study habits and their achievement in Mathematics. In other words, this group of respondents were naturally gifted as they could still excel in Mathematics classes notwithstanding the status of their study habits. However, it did not negate the fact that study habits are still one of the best drivers of learning processes and academic

performances. In fact, according to Rabia et. al. (2017), without study habit, an individual's learning may be stunted thereby making him or her life self-limited. Research, moreover, showed that study habits are an important factor in the process of generating good or bad learning outcomes.

Table 10. *Relationship Between Study Habits and Academic Performance of Respondents*

<i>Class Grouping</i>	<i>n</i>	<i>Mean of Study Habits</i>	<i>Mean of Academic Performance</i>	<i>Pearson r</i>	
Homogenous	27	2.43	87.80	.02	T Computed Value: 0.118 $\alpha = 5\%$, df: 25 Tabular Value: 2.060 Decision: Accept Ho Interpretation: Not Significant
Heterogenous	254	2.33	88.10	.20	T Computed Value: 3.242 $\alpha = 5\%$, df: 252 Tabular Value: 1.969 Decision: Reject Ho Interpretation: Significant

On the contrary, with the heterogenous group, at 0.05 level of significance and degree of freedom of 252, result showed that the computed value of 3.242 is greater than the tabular value of 1.969 thus, the null hypothesis is rejected. This means that a significant relationship existed between the study habits and academic performance of the respondents.

Results in this regard implied a positive link between study habits and educational outcomes. In support of this, Walberg, Fraser, and Welch (1986) reported study habits as the key factor which had great influence to educational outcomes. Moreover, study habits come along with motivation, ability, exam technique, prior achievement, age, quantity and quality of instruction, classroom climate, home environment, peer group, and exposure to mass media outside of school. Likewise, with good study habits, respondents had engaged and sustained their goal-oriented behaviors to ensure better academic performance in Mathematics (Cherry, 2022).

Relationship Between Attitudes toward Mathematics and Study Habits of Respondents

Table 11 shows the relational statistics between attitudes of the respondents toward Mathematics and their study habits.

Table 11. *Relationship Between Attitudes toward Mathematics and Study Habits of Respondents*

<i>Class Grouping</i>	<i>n</i>	<i>Mean of Attitudes Toward Mathematics</i>	<i>Mean of Study Habits</i>	<i>Pearson r</i>	
Homogenous	27	2.86	2.43	-.04	T Computed Value: -0.197 $\alpha = 5\%$, df: 25 Tabular Value: -2.060 Decision: Accept Ho Interpretation: Not Significant
Heterogenous	254	2.86	2.33	.06	T Computed Value: 0.972 $\alpha = 5\%$, df: 252 Tabular Value: 1.969 Decision: Accept Ho Interpretation: Not Significant

In the case of homogenous group, results showed that at 0.05 level of significance and degree of freedom of 25, the computed value of -0.197 is below the tabular value of -2.060 thus results showed no significant relationship existed between the respondents' attitudes toward Mathematics and study habits.

Results implied that respondents' attitudes toward Mathematics did not necessarily influence their study habits. However, their attitudes towards the subject were but natural.

With natural and positive attitudes toward the subject, the respondents exhibited goal-oriented behavior and possessed the necessary traits of discipline, diligence, and resourcefulness. They devote more time to studying their lessons and to finding the best possible ways to understand the topics well. Consequently, having positive attitudes toward the subject enabled the respondents to religiously devote themselves to learning processes and achieved the needed learning outcomes (Maina, 2010; Kapur, 2018).

In similar fashion, under the heterogenous group, at 0.05 level of significance, the computed value of 0.972 is below the tabular value of 1.969, thus the null hypothesis is accepted. The results showed no significant relationship existed between their attitudes toward Mathematics and their study habits.

Further, results indicated that the two variables had no correlation, however, they had great impact on the students' educational outcome.

Undeniably, their attitudes toward the subject necessarily fueled their motivation, exam technique, focus, study habits, and academic

achievement in general. These results confirmed Chen et al. (2018) study which found out that respondents' attitude necessarily increased their engagement with the learning system. In the like manner, Capuno et al. (2019) found significant association between students' attitudes and study habits which in turn impacted performance outcomes in mathematics. Thus, researchers strongly recommended the utilization of development plan in the teaching the discipline to the learners.

Conclusions

In light of the findings, the researchers drew several conclusions. Firstly, there were more respondents from the heterogeneous group than from the homogeneous group. The respondents demonstrated favorable dispositions toward Mathematics, suggesting that they developed essential skills and abilities that contributed to higher achievement in the subject. Study habits were identified as a vital factor in learning achievement; regardless of their extent or level, effective study habits were central to student success. The respondents generally performed well and achieved the set standards of the subject. Class grouping influenced respondents' attitudes toward Mathematics and impacted their academic performance to varying degrees. However, the study found that study habits differed significantly between the two groups, whereas academic performance did not vary much based on class grouping—indicating that students across both groups possessed comparable levels of knowledge, which fueled their learning outcomes. A positive correlation was found between students' attitudes and their academic performance, confirming the importance of attitudes in educational success. Moreover, it was observed that students from the homogeneous group were inherently gifted, while those from the heterogeneous group had to rely more on effective study habits to excel. Finally, respondents' attitudes were seen as integral to the formation of their study habits.

Based on these findings and conclusions, the researchers offered several recommendations. First, it is advised that class groupings be maintained to assess whether teaching strategies or innovations are necessary. Mathematics teachers are encouraged to develop innovative teaching strategies that sustain students' positive attitudes toward the subject, such as relating Mathematics to real-life situations and integrating games into lessons. A collaborative effort between teachers and parents is recommended to help students cultivate effective study habits that can enhance academic performance. Support and encouragement from both teachers and parents are also crucial in helping students achieve academic excellence. Math teachers from different class groupings should communicate and share effective teaching strategies to maintain positive attitudes among students. Furthermore, teachers and parents should provide mechanisms to help students manage their time and responsibilities, and students are advised to create personal study schedules, adopt effective study methods, and improve exam techniques. Advanced lessons or innovative learning environments should be provided to students in the homogeneous group to further enhance their academic performance. Teachers should continue implementing school programs that foster positive attitudes toward Mathematics and initiate more projects aligned with this goal. A growth mindset should be instilled in students through motivation and encouragement, helping them understand that improvement in Mathematics is achievable. Lastly, Mathematics instruction should incorporate a developmental plan that considers both attitudes and study habits to enhance students' learning experiences.

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