Exploring the Interplay Among Study Habits, Attitude Towards Mathematics and Parental Involvement: A Path Analysis of their Impacts on Students’ Performance in Mathematics

.

ABSTRACT

|  |
| --- |
|  This study aimed to examine the relationship between study habits, attitude toward Mathematics, and parental involvement in students' Mathematics performance. It also sought to identify a path model that best predicts students' Mathematics performance. The research involved 224 Grade 8 students from secondary schools in Malungon 2 District, Division of Sarangani, selected through stratified random sampling. Data were collected using surveys and students’ second-quarter grades in Mathematics. The study utilized a questionnaire consisting of thirty statements, with responses ranging from strongly agree to strongly disagree.Results indicated that students exhibited high levels of study habits, positive attitude toward Mathematics, and high levels of parental involvement. Their Mathematics performance was classified as Proficient. Correlation analysis revealed that, among the three variables, only parental involvement had a significant relationship with students’ academic performance in Mathematics.Furthermore, the path model showed that study habits, attitude toward Mathematics, and parental involvement each had a direct influence on students' academic performance. Based on these findings, it is recommended to continue using diverse teaching strategies and differentiated learning activities to further enhance students’ study habits and attitudes. School administrators are also encouraged to implement programs that strengthen parental involvement, such as parent-child tutorials at home, regular parent-teacher conferences, and active participation in school events like recognition days. Original Research Article |

*Keywords: Study habits; attitude towards Math; parental involvement; Mathematics performance.*

1. INTRODUCTION

Society expects schools to develop children into productive and responsible citizens, equipping them with the competencies and skills needed for lifelong learning and employment. Mathematics plays a crucial role in this, as proficiency in the subject is essential for success in modern society.

Key factors influencing students' academic performance include study habits, parental involvement [1], and attitude toward Mathematics [2]. Research indicates that strong study habits significantly enhance mathematics performance [3]. Additionally, a positive attitude toward Mathematics is vital in the learning process, as it affects students' motivation and engagement. Parental involvement also plays a crucial role, with students receiving strong parental support demonstrating higher proficiency and a more positive outlook on Mathematics [2].

Negative perceptions of Mathematics stem from various learning barriers, highlighting the need to examine factors affecting student performance [4]. Similarly, in the Philippines, the 2022 Programme for International Student Assessment (PISA) revealed poor mathematics performance, with Filipino students scoring 355 points—117 points below the OECD average. Only 16% achieved at least basic proficiency (Level 2).

In Malungon 2 District secondary schools, the 2022-2023 Mathematics mean percentage score (MPS) was 80.56, indicating a lack of mastery despite intervention efforts. This persistent underperformance demands urgent attention. Identifying the factors influencing mathematics achievement is crucial to preventing further educational decline.

However, limited studies have explored the combined influence of study habits, attitude toward Mathematics, and parental involvement on student performance. This gap prompted the researcher to conduct a path analysis on these factors, aiming to provide insights that can guide enrichment activities to enhance mathematics achievement among Grade 8 students.

2. OBJECTIVES

This study aimed to examine the relationships among study habits, attitude toward Mathematics, and parental involvement in the Mathematics performance of Grade 8 students in Malungon 2 District during the 2023-2024 school year.

Specifically, it sought to:

1. Determine the level of study habits among Grade 8 students;
2. Evaluate the level of students' attitude towards Mathematics among the Grade 8 students;
3. Determine the level of parental involvement among the Grade 8 students;
4. Assess the Mathematics performance of Grade 8 students;
5. Determine the significant relationship between study habits and Mathematics performance;
6. Determine the significant relationship between attitude toward Mathematics and Mathematics performance;
7. Determine the significant relationship between parental involvement and Mathematics performance;
8. Identify the best path model that predicts students' Mathematics performance based on study habits, attitude toward Mathematics, and parental involvement.

3. MATERIALS AND METHODS

Research Design

This study employed a non-experimental quantitative research design, utilizing the descriptive-correlational technique to collect relevant data, ideas, facts, and information. The descriptive aspect was used to analyze and present data on students' study habits, attitude toward Mathematics, and parental involvement. Meanwhile, the correlational aspect examined the relationships among these variables and the Mathematics performance of Grade 8 students. Additionally, the study aimed to identify the best path model for predicting students' Mathematics performance based on their study habits, attitude toward Mathematics, and parental involvement.

**Research Instrument**

The researcher utilized an adapted questionnaire to collect the necessary data for this study. It was adapted from the study of Flores [5] on Correlates of Mathematics Performance of Students in Public Secondary Schools. The questionnaire's reliability was tested using Cronbach's alpha, yielding a reliability index of 0.993, which indicates high internal consistency and reliability. The questionnaire consisted of three sections. The first section contained 10 items assessing students' study habits, including how they study, when and where they study, and whether they prefer to study alone or with others. The second section also included 10 items, focusing on students' attitudes toward Mathematics, specifically their perspectives and perceptions of learning the subject. Lastly, the third section contained 10 items evaluating parental involvement, which referred to parents' participation in their child's academic activities, particularly in Mathematics learning. Respondents rated each item based on the extent to which it applied to them.

Students’ Mathematics performance was assessed based on their second-quarter grades in Algebra during the school year 2023–2024. These grades were obtained from their respective class advisers, with the permission and informed consent of the respondents.

**Respondents of the Study**

 The researcher used stratified random sampling to select the 224 respondents from all public secondary and integrated schools in Malungon 2 District, Division of Sarangani. Grade 8 students were chosen as the focus of this research because they experienced learning disruptions, such as the pandemic, during their critical transition from elementary to secondary education. Therefore, analyzing their study habits, attitude toward Mathematics, and parental involvement is essential in assessing their readiness to engage with a more complex curriculum in the following year.

|  |
| --- |
| **Table 1. Distribution of Respondents** |
|  **SCHOOLS** | **POPULATION** | **SAMPLE SIZE** | **Percentage (%)** |
| 1 | 135 | 59 | 26.34 |
| 2 | 108 | 48 | 21.43 |
| 3 | 78 | 34 | 15.18 |
| 4 | 74 | 33 | 14.73 |
| 5 | 35 | 15 | 6.7 |
|  6 | 31 | 14 | 6.25 |
|  7 | 28 | 12 | 5.36 |
|  8 | 21 | 9 | 4.02 |
|  **TOTAL** | 510 | 224 | 100.00 |

**Data Gathering**

In gathering data for this study, the following steps served as guide for the researcher:

1. Permission letter was obtained from the relevant offices. An endorsement letter and approval from the Office of the SPAMAST Graduate School were secured and presented to the Schools Division Superintendent of the Division of Sarangani for authorization. A study permit was then submitted to the Public Schools District Supervisor and the school heads of the eight (8) secondary schools in Malungon 2 District.

2. A face-to-face orientation was conducted with the students to explain the study’s purpose and procedures. Consent was obtained for the use of their first- and second-quarter grades as part of the data collection. The researcher then personally administered the survey questionnaires.

3. The collected data were analyzed using the mean, Pearson Product Moment Correlation and Path Analysis. Afterward, the results were carefully examined and interpreted through a structured data analysis procedure.

**4. RESULTS AND DISCUSSION**

**Level of Students’ Study Habits**

The level of students' study habits is presented in Table 2, which shows an overall mean of 3.66, indicating a high level of study habits among students. Students frequently allocate time for tasks, engage with learning materials, set achievable objectives, prioritize tasks based on deadlines and importance, and review information at regular intervals. Moreover, the overall standard deviation (SD = 0.32) suggests that, on the whole, students demonstrated consistent study habits in Mathematics.

As shown in the table, item number 4, ''Look for a comfortable place to study,'' has the highest rating with a mean of 4.35, which is described as very high. This means that students always demonstrate a positive attitude towards mathematics when studying in a comfortable place. Students always choose a comfortable, quiet area, with minimal interruptions and a relaxing space to focus and complete the work. Winstead [6] argued that the quality of the study space has a huge impact on the effectiveness of the study session. He added that the learning environment dramatically affects the students' learning outcomes. One of the keys to effective studying is finding a good location with few distractions. [7].

Furthermore, item number 3, ''Studying regularly with classmates,'' has the lowest mean of 3.25, described as Moderate. This suggests that the students sometimes demonstrate a positive attitude when studying with classmates. Students do not prefer to study with peers, although it has been assumed that students and adolescents want to be with their peers and actively engage with them [8]. Results revealed that different types of peers affect students in different ways. The study by Singasing [9] found that peers can influence study habits in becoming responsible or irresponsible students. Additionally, he argued that engaging with peer relations involved distractions in studying and other bad influences, including having fun during class hours. Studying with peers also has negative effects, such as peer pressure, which encourages them to do negative things [10].

|  |
| --- |
| **Table 2. Level of Students’ Study Habits** |
| **PARTICULARS** | **MEAN** | **SD** | **DESCRIPTION** |
| 1. Make a timetable in studying lessons in Mathematics. | 3.53 | 0.78 | High |
| 2. Get assignments done in time. | 3.95 | 0.96 | High |
| 3. Studying regularly with classmates. | 3.25 | 0.92 | Moderate |
| 4. Look for a comfortable place to study. | 4.35 | 0.92 | Very High |
| 5. Use free time to study. | 3.53 | 0.91 | High |
| 6. Spent more time solving difficult problems.  | 3.65 | 1.02 | High |
| 7. Start reviewing for major exams, three days, or a week before the exam. | 3.54 | 1.02 | High |
| 8. Prefer to have a group study. | 3.70 | 1.07 | High |
| 9. Memorize the notes rather than try to understand, summarize, and conceptualize them. | 3.37 | 1.03 | Moderate |
| 10.Review and analyze the difficult lessons in Mathematics. | 3.75 | 0.85 | High |
| **Overall** | **3.66** | **0.32** | **High** |

 **4.2 Students’ Attitudes Towards Mathematics**

Table 3 presents the students’ attitude toward Mathematics which shows a general mean of 3.88, indicating a high level of attitude toward the subject. This suggests that students often exhibit enthusiasm, curiosity, and engagement in learning opportunities. They are motivated and challenged to identify the appropriate formulas for solving problems, work diligently, and listen attentively during lessons. Additionally, they strive to improve their computation skills, confidently explain the properties of real numbers, and use the checking method to verify the accuracy of their solutions. Notably, the overall standard deviation of 0.30 indicates a high level of consistency in students’ responses, suggesting that learners generally share a positive and uniform attitude toward the subject.

As shown in the table, item number 4, ''work hard and listen very well when the teacher discusses the lesson,'' received the highest rating of 4.55, described as Very High. This suggests that students are determined to learn the subject by always demonstrating enthusiasm, curiosity, and engagement in every learning opportunity and it emphasizes the important role of the teacher in the developing students’ attitude towards Mathematics. Among the various student-related factors, attitude is considered by many researchers to be a key determinant of academic performance in Mathematics [11].

On the other hand, Item 5, “Volunteer in answering the teacher’s question in class,” received the lowest rating of 3.40, described as Moderate. This indicates that students only occasionally demonstrate enthusiasm, curiosity, and engagement during class discussions and often lack the confidence to volunteer answers in Mathematics. The fear of embarrassment or making mistakes in front of their peers contributes to students’ anxiety toward the subject, particularly when required to solve or recite problems in class [12]. According to Bandura (1977), as cited by Çiftçi and Yıldız [13], self-confidence plays a crucial role in shaping an individual’s emotions, thoughts, behaviors, and motivation toward a given task. Studies have shown that many students lack confidence in solving mathematical problems [14]. Additionally, she emphasized that low competitiveness among students may contribute to reduced motivation and a perception of laziness. Students’ varying experiences with mathematics also significantly influence their attitudes toward the subject [15].

|  |
| --- |
| **Table 3. Level of Students’ Attitude towards Mathematics** |
| **PARTICULARS** | **MEAN** | **SD** | **DESCRIPTION** |
| 1. Like to attend in the class because of new concepts. | 4.16 | 0.98 | High |
|  2. Find word problem solving easy. | 3.81 | 0.92 | High |
| 3. Stimulated and challenged to determine the appropriate formula to be used in solving problems. | 3.70 | 0.89 | High |
| 4. Work hard and listen very well when the teacher discusses the lesson. | 4.55 | 0.69 | Very High |
|  5. Volunteer in answering the teachers’ question in the class. | 3.40 | 0.87 | Moderate |
|  6. Never leave the problem without answer even if it is difficult. | 3.68 | 0.82 | High |
|  7. Easily identify which is a parallel line and a perpendicular line. | 3.95 | 0.85 | High |
|  8. Work hard to improve computation skills. | 4.17 | 0.86 | High |
| 9. Confident in explaining the properties of real numbers. | 3.50 | 0.93 | High |
| 10. Use checking method to verify if the solution in the given problem is correct. | 3.83 | 0.99 | High |
| **Overall** | **3.88** | **0.30** | **High** |

**Parental Involvement**

The level of students’ parental involvement is presented in Table 4. It obtained a general mean of 3.77. This denotes that the students have a high level of parental involvement. In this connection, parental participation is occurring and exhibited. Results revealed that parent’s manifest appreciation and involvement in school projects and other activities, performance, achievements, and other undertakings in Mathematics of the students. Parents ensured that they provided their children with nutritious meals and a conducive learning environment at home. They spent time with them while doing their assignments and helped them develop good study habits. Additionally, the low overall standard deviation (SD = 0.37) suggests that, in general, parental involvement was consistently high among the respondents, supporting the validity of the overall descriptive rating.

As shown in Table 4, item number 9, ''supportive in the student's project and activities,'' has the highest rating with 4.14, described as High. Parents often care about their children's mathematics learning [16]. According to Huang et al. [17], parents' cognitive and behavioral involvement had significant positive effects on their children's mathematics results. He added that parents who are more involved in their children's school performance may also place greater importance on their children's mathematics achievement. Otani [18] states that parental involvement influences educational outcomes through three mechanisms: modelling school related behaviors and attitudes, reinforcing specific aspects of school learning, and instruction.

Furthermore, Item 10, *“Encourages the learner to join different math competitions in school,”* received the lowest rating of 3.00, described as Moderate. This suggests that parents do not consistently encourage their children to participate in mathematics competitions. Some parents expressed mixed feelings about their children's involvement in such activities. However, it is important to note that no parent wants to deny their child the opportunity to succeed [19]. This finding aligns with the study of Arcillas et al. [20], which observed that parents often do not provide sufficient support for their children’s participation in academic competitions, such as quiz bees. Moreover, some parents do not actively help boost their child’s confidence when it comes to joining academic contests.

|  |
| --- |
| **Table 4. Level of Parental Involvement** |
| **PARTICULARS** | **MEAN** | **SD** | **DESCRIPTION** |
| 1. Manifest appreciation and involvement in school projects and other activities. | 3.94 | 0.92 | High |
| 2. Show concern and appreciation of performance, achievements, and other undertakings especially in Mathematics. | 3.94 | 0.97 | High |
| 3. Provide nutritious meals and a conducive learning environment at home. | 4.12 | 0.83 | High |
| 4. Spent time with the learner while doing their assignments. | 3.43 | 0.96 | High |
| 5. Keep track of the learners' progress in school. | 3.74 | 0.97 | High |
| 6. Make sure that there is place for the learner to study at home. | 3.97 | 0.97 | High |
| 7. Help the learner with their homework when necessary. | 3.34 | 1.02 | Moderate |
| 8. Help the learner develop good study habits. | 4.05 | 0.90 | High |
| 9. Supportive in the learners' projects and activities. | 4.14 | 0.95 | High |
| 10. Encourage the learner to join different math competitions in school. | 3.00 | 1.33 | Moderate |
| **Overall** | **3.77** | **0.37** | **High** |

**Students’ Mathematics Performance**

The students' Mathematics performance is presented in Table 5. It obtained a general mean of 85.06, which was described as Proficient. This conveys that the students developed fundamental knowledge, skills, and understanding and can transfer them automatically and flexibly through authentic tasks. In this context, students were able to formulate real-life problems involving factors of polynomials, rational algebraic expressions, linear equations and inequalities in two variables, system of linear equations and inequalities in two variables and linear functions and solve these problems accurately using a variety of

strategies. The students were also able to formulate and solve accurately real-life problems involving linear inequalities in two variables, and systems of linear inequalities in two variables and linear functions. In the study of Sur [21], he stated that students are actively engaged in Mathematics and have a satisfactory performance. Most of the students are interested in learning Mathematics and their performance exceeded the attainment standards [22].

|  |
| --- |
| **Table 5. Level of Students’ Mathematics Performance** |
| **RANGE OF SCORES** | **DESCRIPTIVE LEVEL** | **FREQUENCY (F)** | **PERCENTAGE (%)** |
| 90% and above | Advanced | 67 | 22.33 |
| 85% – 89% | Proficient | 91 | 30.33 |
| 80% – 84% | Approaching Proficiency | 89 | 29.67 |
| 75% – 79% | Developing | 48 | 16.00 |
| 74% and below | Beginning | 5 | 1.67 |

*Mean= 85.06*

**Relationship between Students’ Study Habits and Mathematics Performance**

The relationship between students' study habits and Mathematics performance is presented in Table 6. Study habits has an R-value of -0.005, indicating a very weak and negligible negative correlation to students' Mathematics performance. This suggests the inverse relationship of the variables. Thus, as the level of study habits increases, performance in Mathematics decreases. This is supported by the study of Jean [23], who states that students' use of study skills is not sufficient and effective. He added that among the noted unfavorable study habits of the students were inefficient time management, lack of planning and concentration in their studies, poor skills in reading, ineffective test-taking techniques, and failure to inform their teachers of their difficulties with schoolwork and ask for help. However, Nonis and Hudson [24] as cited by Jean [23], found that some study habits had a positive relationship with learners' academic performance. As Capuno et al. [25] argued that study habits have a weak positive correlation with students' performance in Mathematics.

The P-value is 0.945, implying no significant relationship. Since the p-value is greater than 0.05 level of significance, we failed to reject the null hypothesis and conclude that there is no significant relationship between students' study habits and Mathematics performance. The study of Landicho [26] on the factors affecting performance in general mathematics of grade eleven students revealed that the students possess good study habits and are perform low in Mathematics. A study revealed that time spent studying, attendance in class review conducted in tutorial centers, motivation, and study habits have no significant effect on students' accounting performance [27]. Many researchers have investigated different factors that are found to be responsible for students' mathematics performance. Among the achievement motivation, locus of control, and study habits, the latter was found to be not a predictor of mathematics achievement [28]. In the study of Tossavainen et al. [29] on university mathematics students' study habits and use of learning materials, it was revealed that higher grade in the mathematics matriculation exam is related only to higher interest in mathematical hobbies also in one’s spare time, not to any specific study habits.

|  |
| --- |
| **Table 6. Relationship between Students’ Study Habits and Mathematics Performance** |
| **VARIABLES** | **R- VALUE** | **DESCRIPTION** | **P-VALUE** | **INTERPRETATION** |
| Study Habits | -0.005 | Very Weak Negative | 0.945 | Not Significant |
| MathematicsPerformance |

**Relationship between Students’ Attitude towards Mathematics and Mathematics Performance**

Table 7 presents the relationship between students' attitudes toward Mathematics and their Mathematics performance. It has an R-value of 0.048, indicating a very weak positive correlation. While this suggests a slight positive relationship, it implies that students' attitudes toward Mathematics are not the sole determinant of their academic performance in the subject.

Capuno et al. [25] supported this finding, stating that there is a negligible positive correlation between students' attitudes toward Mathematics and their academic performance. However, Alorki et al. [30] argued that a positive attitude toward Mathematics enhances students' motivation to study the subject, increasing their likelihood of majoring in Mathematics or pursuing careers in related fields.

Additionally, research suggests that students who maintain a positive outlook on Mathematics are more motivated, exert greater effort, and achieve higher academic performance. Macher et al. [31], as cited by Kelz and Krammer [32], emphasized that highly motivated students invest more time and effort in learning and employ more effective study strategies. They further noted that interest in Mathematics positively influences academic achievement, as it fosters greater engagement and commitment to learning.

Moreover, Dela Cruz and Natividad [33] found that students perceive Mathematics as an enjoyable and engaging subject, particularly when learning alongside their peers. Their sense of comfort and interest in the subject encourages them to actively participate in Mathematics classes. The researchers also highlighted that students' enjoyment of learning can positively influence their cognitive and behavioral attitudes toward Mathematics, ultimately contributing to their academic success.

The P-value is 0.476, implying no significant relationship. Since the p- value is greater than 0.05 level of significance, we failed to reject the null hypothesis and conclude that there is no significant relationship between students' attitude towards Mathematics and Mathematics performance. This result is parallel to the study of Ramaprabha and Selvaganapathy [34], who argued that attitude towards Mathematics did not correlate with academic success. Furthermore, this was supported by the study of Manlangit [35] on the effects of concrete and virtual geoboard on students' geometry performance, revealing no significant correlation between students' attitude toward using manipulatives and their performance in Geometry.

|  |
| --- |
| **Table 7. Relationship between Students’ Attitude towards Mathematics and Mathematics Performance** |
| **VARIABLES** | **R-VALUE** | **DESCRIPTION** | **P-VALUE** | **INTERPRETATION** |
| Attitude towards Mathematics | 0.048 | Very Weak Positive | 0.476 | Not Significant |
| Mathematics Performance |

**4.7 Relationship between Parental Involvement and Mathematics Performance**

Table 8 presents the relationship between students' parental involvement and their performance in Mathematics. The analysis yielded an R-value of 0.748, indicating a fairly strong positive correlation. This suggests that as parental involvement increases, students' performance in Mathematics also improves. The direct impact of parental involvement on academic success highlights that students with actively engaged parents are more likely to excel in Mathematics compared to their peers with lower levels of parental support [36].

These findings align with the study of Alorki et al. [30], which demonstrated that parental support and expressions of encouragement significantly enhance students' commitment to academic excellence, particularly in challenging subjects. Moreover, students who receive necessary assistance, praise, and rewards from their parents tend to overcome their anxiety toward learning Mathematics. Parental encouragement in setting high academic expectations fosters a strong interest in the subject.

The statistical analysis further supports this relationship, with a P-value of 0.00, indicating a significant correlation. Since the p-value is less than the 0.05 level of significance, the null hypothesis is rejected, confirming that parental involvement is significantly associated with students' Mathematics performance. Prior research also emphasizes the critical role of home and family support in determining students’ academic success [37]. Wilder [38], as cited by Tang and Tran [16], argued that parental involvement has a positive influence on children's educational achievement, particularly in Mathematics [17]. Similarly, Rodriguez et al. [39] found that perceived parental involvement enhances students’ motivation in Mathematics. Almroth et al. [40] further concluded that a supportive parental attitude during adolescence, coupled with student engagement, contributes to positive academic development, fostering higher educational aspirations and achievements.

|  |
| --- |
| **Table 8. Relationship between Students’ Parental Involvement and Mathematics Performance** |
| **VARIABLES** | **R- VALUE** | **DESCRIPTION** | **P-VALUE** | **INTERPRETATION** |
| Parental Involvement | 0.748 | Fairly Strong Positive | 0.00 | Significant |
| MathematicsPerformance |

**Path Model that Best Fit to Students’ Study Habits, Attitude Towards Mathematics, and Parental Involvement and Students’ Mathematics Performance**

Figure 1 is the diagram of the best path model, showing the interaction of the independent variables with the dependent variable. As illustrated, study habits, attitude towards mathematics, and parental involvement have direct effects on the students' performance in mathematics with coefficients -0.05, -0.03, and 0.78, respectively. The model obtained an r-square value of 60.00.

The results revealed that the students' study habits directly affect their attitude towards mathematics with a coefficient of 0.26. This implied that as the student's study habits increase by one standard deviation from its mean, the students' attitude towards Mathematics also increases by 26%. Students develop a positive attitude towards the subject as a product of repeated practice towards studying. Students who value learning and effort know how to make and sustain a commitment to value goals [41].

The model showed that students' attitude towards mathematics directly affects parental involvement with a coefficient of 0.20. It denotes that, as the students' attitude toward mathematics increase, parental involvement also increases by 20%. The result is supported by the study of Lay and Davadas [42], as cited by Tang and Tran [16], which indicated that parents' effects (including parents' affective support and fathers' help and expectancy) positively link their children's attitudes towards mathematics. According to Parker and Benson [43], parents' support positively correlates with adolescents with adolescents with high self-esteem.

Consequently, results conveyed that study habits directly affect students' mathematics performance with a coefficient of -0.05. A negative path coefficient indicates an inverse relationship between variables, suggesting that as one variable increases, the other decreases. In this circumstance, as the level of students' study habits increases, the students' performance in Mathematics decreases by – 5%. Manuel [44] argued that study habits do influence mathematics performance. Similarly, Tus [45], emphasized the significance of study habits students' lives. They concluded that the success or failure of each student depends upon their study habits. However, the results indicated an inverse effect. The study of Landicho [26] on the factors affecting performance in general mathematics of grade eleven students revealed that the students do have possess good study habits and are perform low in Mathematics.

Furthermore, attitude toward mathematics has a direct effect on students' mathematics performance, with a coefficient of -0.03. As discussed above, a negative coefficient has inverse effects between variables. Given what has been said, as the level of students' attitude towards Mathematics increases, the students' performance in Mathematics decreases by -3%. This result coincides with the study of Ramaprabha and Selvaganapathy [34] and Manlangit [35], who argued that attitude toward Mathematics did not correlate with academic success. However, Naungayan [46] stated that students' attitude towards mathematics is significantly related to their performance in the subject. Further, students' experiences with success and failure in the subject matter shape their attitude toward it. Attitude towards mathematics can either be positive or negative. He added that a negative attitude is seen as an indicator of low-level performance.

In addition, the model showed that students' parental involvement directly affects students' performance in Mathematics with a coefficient of 0.78. A positive coefficient implies that when the causal variable increases, the dependent variable also increases. In this reference, as the level of parental involvement increases by one standard deviation from the mean, the students' performance in Mathematics also increases by 78%. Parental involvement and expectations positively affect students' mathematics achievement [16]. Moreover, parents' involvement and expectations regarding children's education are significantly positive influential factors in their children’s learning results. Thus, students whose parents are involved in their education are more likely to perform better in mathematics and achieve more than other students [36]. Additionally, Almroth et al. [40] also concluded that supportive parental attitude concerning their child’s education during adolescence, student engagement, and positive progress in academic achievements may contribute to a positive development of academic expectations, hence to positive educational trajectories. This result was also confirmed by the study of Wilder [38] as stated by Tang and Tran [16], who argued that parents' involvement positively influences the educational achievement of children, especially in Mathematics performance [17] and Rodriguez et al. [39] who suggested that perceived parental involvement contributes to the motivation of their children in mathematics.

The model obtained an R-squared value of 0.60. This means that the variation in the independent variables, such as study habits, attitude towards Mathematics, and parental involvement, accounts for 60% of the variability in the students' performance in Mathematics. Thus, 40% of the variability in the students' performance in Mathematics is left on the residuals. Hence, other factors contribute to the remaining variability.

**FIGURE 1:** Diagram of the Path Model

Table 9 presents the model fit values of the path model. Results showed that all seven indices successfully met the value criteria. These results indicate that the path model is a good fit.

|  |
| --- |
| **Table 9. Test Results of the Best Path Model** |
| **INDEX** | **CRITERION** | **MODEL FIT VALUES** |
| CMIN/DF | <3.0 | 0.522 |
| P-value | >.05 | 0.470 |
| NFI | >.95 | 0.998 |
| TLI | >.95 | 1.013 |
| CFI | >.95 | 1.000 |
| GFI | >.95 | 0.999 |
| RMSEA | <.05 | 0.000 |

5. CONCLUSIONs AND RECOMMENDATIONS

**Conclusion**

Based on the findings presented, the following are the conclusions drawn:

1. Students have a high level of study habits, attitude towards Mathematics, and parental involvement, and students' performance in Mathematics is at a proficient level.

2. Among the three variables, parental involvement has greatly impacted students' performance in Mathematics. It signifies that the higher the parental participation, the better the students' performance in Mathematics.

3. There is a significant relationship between parental involvement and Mathematics performance. Therefore, strengthening parental involvement and encouraging active participation in school events can help improve students’ performance in Mathematics.

4. The path analysis showed that study habits, attitude toward Mathematics, and parental involvement have a direct impact on students' performance. These factors explain a large part of the differences in students' academic results. However, further research is needed to identify other factors that may also affect their performance in Mathematics.

**recommendations**

1. Students have a high level of study habits, attitude towards Mathematics, and parental involvement. It is recommended that schools continue to reinforce and sustain these strengths. Mathematics teachers should maintain the use of engaging and varied instructional strategies that support effective study habits and foster positive attitudes. They may also continue to provide differentiated learning activities that fit students' needs to develop students' attitude toward Mathematics.
2. School administrators may design and implement school programs, activities, and interventions that will enhance and strengthen the parental participation. Programs such as, Parent-child tutorial at home and Parent-teacher regular conferences. Activities such as, parental participation during Math Olympics and obligating parents to attend recognition day, and other school activities.
3. Parents may continue to support their children financially, physically, and emotionally as their participation and involvement have a significant effect on their children's performance in Mathematics.
4. Since parental involvement revealed to be the most influential factor to enhance students' Mathematics performance, DepEd officials, school administrators, and teachers should continue and strengthen the implemented programs and activities provided with new innovations and meaningful interventions that foster parental participation.

5. Future researchers may use this as a reference for those who have plans to conduct any related study about study habits, attitude towards Mathematics, and parental involvement and performance in Mathematics. They may also explore other factors not included in this study for further verification of the results.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

The authors of this manuscript hereby certify the use of generative AI technology and was only limited to improving the composition of sentences and paragraphs and checking for grammar.

**CONSENT**

In accordance with university or international standards, the author(s) have gathered and kept the participants' written consent.

**REFERENCES**

1.Ozcan, M. 2021. Factors affecting students’ academic achievement according to the teachers’ opinion. Education Reform Journal, 6(1), 1-18. <https://files.eric.ed.gov/fulltext/EJ1318651.pdf>

2. Mijares, B. 2022. Factors Affecting the academic performance of learners in mathematics amidst pandemic. https://philarchive.org/archive/MIJFAT-2

3. Odiri, O. E. 2015. Relationship of study habits with mathematics achievement. Journal of Education and Practice, 6(10), 168-170. Https://Files.Eric.Ed.Gov/Fulltext/Ej1081665.Pdf

4. Rameli, M. R. M., & Kosnin, A. M. 2016. Challenges in mathematics learning: A study from school students' perspective. Journal of Educational Issues ISSN 2377-2263 2022, Vol. 8, No. 2. doi:10.5296/jei.v8i2.20065

5. Flores, I. 2019. Correlates of mathematics performance of students in public secondary schools in the division of Batangas, Philippines: Basis for Mathematics Intervention Programs. World Journal of Educational Research. 6. 248. 10.22158/wjer.v6n2p248.

6. Winstead, S. 2023. The best and worst places to study for school, work, or anything else. MyeLearningWorld. <https://myelearningworld.com/best-and-worst-places-to-study/>

7. Cabalquinto KE, Magallanes AO. Non-cognitive factors affecting mathematics performance using structural equation modeling: basis for a mathematics learning intervention framework. Asian Journal of Education and Social Studies. 2022;36(3):43-55

8. Bowker, J. C., & White, H. I. 2021. Studying peers in research on social withdrawal: why broader assessments of peers are needed. Child development perspectives, *15*(2), 90–95. https://doi.org/10.1111/cdep.12404

9. Singasing, R. B. 2019. Peer influence on study habits of grade 11 students. Ascendens Asia Journal of Multidisciplinary Research Abstracts, 3(2G). <https://ojs.aaresearchindex.com/index.php/AAJMRA/article/view/6044>

10. Clemente, M. G. ., Dolozon, H. ., Morta, C. G. ., Rey, B. ., Victor, R. J. ., & Catibag, R. P. . (2019). Effects of having peers and its impact on the academic performance of ABM students in BCP SY 2018-2019. Ascendens Asia Singapore – Bestlink College of the Philippines Journal of Multidisciplinary Research, 1(1). https://www.ojs.aaresearchindex.com/index.php/aasgbcpjmra/article/view/2524

11. Ngussa, B. M., & Mbuti, E. E. 2017. The influence of humor on learners’ attitude and mathematics achievement: A case of secondary schools in Arusha City, Tanzania. Journal of Educational Research, 2(3),170-181

12. Quintana, F. G. 2024. Math anxiety and development of an instructional material to improve performance in mathematics. *Recent Educational Research*, *2*(1),18–30. https://doi.org/10.59762/rer904105362120240305124927

13.Çiftçi, Ş. K., & Yildiz, P. 2019. The effect of self-confidence on mathematics achievement: The Meta-Analysis of Trends in International Mathematics and Science Study (TIMSS). International Journal of Instruction, 12(2), 683–694. <https://doi.org/10.29333/iji.2019.12243a>

14.Wilujeng, H. 2018. Analysis of students’ self-determination in learning mathematics. Journal of Physics. Conference Series, 948, 012013–012013. <https://doi.org/10.1088/1742-6596/948/1/012013>

15.Hwang, S., & Son, T. 2021. Students’ attitude toward mathematics and its relationship with mathematics achievement. Journal of Education and E-Learning Research, 8(3), 272–280. <https://doi.org/10.20448/journal.509.2021.83.272.280>

16. Tang, T. T., & Tran, D. H. T. 2023. Parental influence on high school students’ mathematics performance in Vietnam. Eurasia Journal of Mathematics, Science and Technology Education, 19(4), em2249. <https://doi.org/10.29333/ejmste/13068>

17. ‌Huang, F., Huang, Z., LI, Z., & Zhang, M. 2021. Relationship between parental involvement and mathematics achievement of chinese early adolescents: Multiple mediating roles of mental health and mathematics self-efficacy. International Journal of Environmental Research and Public Health/International Journal of Environmental Research and Public Health, *18*(18), 9565–9565. <https://doi.org/10.3390/ijerph18189565>

18. Otani, M. 2020. Parental involvement and academic achievement among elementary and middle school students. *Asia Pacific Education Review*, *21*(1), 1-25. [Https://www.Osipp.Osaka-U.Ac.Jp/Archives/Dp/2017/Dp2017e003.Pdf](https://www.Osipp.Osaka-U.Ac.Jp/Archives/Dp/2017/Dp2017e003.Pdf)

19.Playing to win. 2024. Google Books. <https://books.google.com.ph/books?hl=en&lr=&id=PKE2DwAAQBAJ&oi=fnd&pg=PR9&dq=why+parents+do+not+encourage+students+to+join+math+competitions&ots=3iESTLp8am&sig=DTm9PIEWQECU8zJSWd7LhLe1vo&redir_esc=y#v=onepage&q=why%20parents%20do%20not%20encourage%20students%20to%20join%20math%20competitions&f=false>

20. Arcillas, F. M., Diaz, G. L., Agonia, A. M., & Moneva, J. C. 2018. Parents involvement towards the studies of their learners. International Journal of Scientific and Research Publications (IJSRP*)*, *8*(12), 861-868.

21. Sur, I. 2023. Student learning engagement and performance of Grade 11 students in mathematics | Ilocos Sur Polytechnic State College. Ispsc.edu.ph. https://ispsc.edu.ph/student-learning-engagement-and-performance-of-grade-11-students-in-mathematics/

22. Thomas, L., & Mohammed, L. A. 2024. The relation between student’s interest and academic performance of secondary students in learning mathematics online. International Journal of Academic Research in Progressive Education and Development, 13(1). https://ijarped.com/index.php/journal/article/view/750/724

23. Jean, M. 2013. Study habits and attitudes: The road to academic success. https://doi.org/10.7392/education.70081928.

24. Nonis, S., Hudson, G. (2010). Performance of college students: Impact of study time and study habits. Journal of Education for Business, 85(4), 229-238.

25. Capuno, R., Necesario, R., Etcuban, J. O., Espina, R., Padillo, G., & ManguilimotaN, R. 2019. Attitudes, study Habits, and academic performance of Junior High School students in mathematics. International Electronic Journal of Mathematics Education, 14(3), 547-561.

26. Landicho, R. R. 2021. Factors affecting performance in general mathematics of grade eleven students in Talumpok Integrated School: Basis for intervention activities action research. International Journal of Innovative Science and Research Technology, 6(1), 618-626.

27. Yu, D.D. 2011. How much do study habits, skills, and attitudes affect student performance in introductory college accounting courses? New Horizons in Education. 59.

28. Villa, E. A., & Sebastian, M. A. 2021. Achievement motivation, locus of control and study habits as predictors of mathematics achievement of new college students. International Electronic Journal of Mathematics Education, 16(3), em0661–em0661. https://doi.org/10.29333/iejme/11297

29. Tossavainen, T., Gröhn, J., Heikkinen, L., Kaasinen, A., & Viholainen, A. 2020. University mathematics students’ study habits and use of learning materials. LUMAT International Journal of Math, Science and Technology Education, 8(1), 252–270. https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1473108&dswid=9586

30. Alorki, I., Tahiru, A.-W., & Tahiru, R. 2024. Exploring impact of student attitude, parental involvement, and teacher competence on mathematics performance in selected schools in Northern Ghana. Journal of Mathematics and Science Teacher, 4(1), em056. https://doi.org/10.29333/mathsciteacher/14251

31. Macher, D., Paechter, M., Papousek, I., Ruggeri, K., Freudenthaler, H., & Arendasy, M. (2013). Statistics anxiety, state anxiety during an examination, and academic achievement. The British journal of educational psychology. 83. 535-49. 10.1111/j.2044-8279.2012.02081.x.

32. Kelz, J. & Krammer, G. (2024). Synthesizing models of primary school mathematicians by putting influencing factors of mathematics performance to the test. 10.1007/s10212-024-00836-3.

33. Dela Cruz, M. P. & Natividad JR., E. B. 2022. View of parental roles, learners’ attitudes, and mathematics performance. E-Palli.com. https://journals.e-palli.com/home/index.php/ajmri/article/view/871/409

34. Ramaprabha, S. & Selvaganapathy, R. 2024. Gender differences in attitude towards mathematics and academic achievement among secondary level students. Epra International Journal of Research and Development (IJRD), 9(4), 54–57. Https://eprajournal.com/index.php/IJRD/article/view/39

35. Manlangit, S.M. (2024). Concrete and virtual geoboard: Effects on students' geometry performance. 10.13140/RG.2.2.13574.96326.

36. Nyabuto, A. N., & Njotoge, P. M. 2014. Parental involvement on pupils’ performance in mathematics in public primary schools in Kenya. Journal of Educational and Social Research. https://doi.org/10.5901/jesr.2014.v4n1p19

37. Mutodi, P., & Ngirande, H. 2014. The impact of parental involvement on student performance: A Case Study of a South African Secondary School. Mediterranean Journal of Social Sciences. https://doi.org/10.5901/mjss.2014.v5n8p279

38. Wilder, S. 2013. Effects of parental involvement on academic achievement: a meta-synthesis. Educational Review, 66(3), 377–397. <https://doi.org/10.1080/00131911.2013.780009>

39. Rodríguez, S., Piñeiro, I., Gómez Taibo, M. L., Regueiro, B., Estévez, I., & Valle, A. (2017). An explanatory model of maths achievement: Perceived parental involvement and academic motivation. Psicothema. 29. 184-190. 10.7334/psicothema2017.32.

40. Almroth, M., László, K. D., Kosidou, K., & Galanti, M. R. (2020). Individual and familial factors predict formation and improvement of adolescents’ academic expectations: A longitudinal study in Sweden. *PLOS ONE*, *15*(2), e0229505. https://doi.org/10.1371/journal.pone.0229505

41. Suan, J. S. (2014). Factors affecting underachievement in mathematics. Proceeding of the Global Summit on Education GSE, 5.

42. Lay, Y. F. & Davadas, S. D. 2017. Factors affecting students’ attitude toward mathematics: A structural equation modeling approach. Eurasia Journal of Mathematics Science and Technology Education, 14(1). https://doi.org/10.12973/ejmste/80356

43. Parker, J. & Benson, M. 2004. Parent-adolescent relations and adolescent functioning: Self-esteem, substance abuse, and delinquency. Adolescence. 39. 519-30.

44. ManueL, A. 2017. Self-esteem, study habits and academic performance among university students. Journal of Educational Psychology - Propositos Y Representaciones, 5(1), 101–127. https://eric.ed.gov/?id=EJ1139345

45. Tus, J. 2020. The influence of study attitudes and study habits on the academic performance of the students. International Journal of All Research Writings, ISSN (O) - 2582-1008, Vol.2, Issue .4, 2020

46. Naungayan, R. (2022). Attitude towards mathematics and mathematics achievement of secondary school learners in Banayoyo- Lidlidda District. 10.13140/RG.2.2.27714.45763.