Original Research Article
Attitudes Toward Learning Mathematics and Performance of Grade 11 Students in the New Normal

ABSTRACT

This study aimed to determine the relationship between students' attitudes toward learning mathematics and their mathematical performance in the New Normal at a secondary school in Davao region. Descriptive-correlational research design was used. With the stratified random sampling technique, 286 out of 1000 students were selected as respondents. Quantitative data were gathered using an adopted questionnaireand the data were analyzed using mean and Spearman correlation analysis. Results indicate that students' confidence in learning mathematics is moderate and occasionally felt. Engagement in mathematics is frequently observed. Students place importance on mathematics and understand its purpose in their lives. The mathematics performance of the students is approaching proficiency level, indicating they require minimal guidance from teachers and assistance from peers. The students' overall attitude toward learning mathematics is high, and their mathematics performance in the New Normal is satisfactory. Among the indicators, only confidence in mathematics showed a significant correlation with mathematics performance. This finding highlights the important role of confidence in shaping students' success in mathematics during the New Normal, suggesting that interventions aimed at boosting confidence could further enhance their performance.

Keywords: self-regulated learning, college mathematics performance, blended learning.

1. INTRODUCTION

Mathematics is often perceived as a challenging subject by students, leading to widespread struggles and a general dislike for the subject [1,2]. This perception is rooted in the inherent complexity of mathematical concepts and the abstract nature of the subject, which can be difficult for students to grasp. The difficulty in learning mathematics is compounded by the challenges teachers face in effectively conveying these concepts in a way that is engaging and comprehensible [3]. As a result, many students experience anxiety and frustration when dealing with mathematics [4], which negatively impacts their performance.

The recent COVID-19pandemic greatly affected the global educational system, leading to the closure of schools and negatively impacting students [5,6]. In the New Normal, teaching and learning math is even more challenging and complex, leading to doubts, concerns, and anxieties [7]. Misconceptions may arise, and students may develop a dislike for the subject or the teacher [8].Despite these challenges, efforts have been made to improve mathematics performance. Learning mathematics involves thinking and reasoning, but it also depends on students' attitudes [9]. Understanding and addressing students'

attitudes toward learning mathematics are necessary for effective education. Positive attitudes foster engagement, motivation, and better learning outcomes [10,11,12]. Teachers and educators play animportant role in identifying and addressing these attitudes to create a conducive learning environment.while the New Normal context presents unique challenges, fostering positive attitudes toward mathematics remains critical for effective learning [13,14,15].Hence, ongoing support and strategies that will enhance students' attitudes toward mathematics are important for overcoming these challenges and achieving educational success.

Students' attitudes toward learning mathematics significantly impact students' engagement and performance. Sanchal and Sharma [16] identified three components attitudes: confidence in mathematics, the perceived importance of mathematics, and emotional attachment to the subject. Confidence helps students engage actively and persist through challenges. Understanding the importance of mathematics motivates students by showing its real-world applications and relevance to their future. Positive emotions, like curiosity and interest, encourage students to explore and enjoy learning math. These attitudes are important for success, and educators can influence them by creating a supportive and engaging learning environment.

This study aims to investigate the relationship between students' attitudes towards learning mathematics and their mathematical performance in the New Normal at a secondary school in the Davao region. Using a descriptive-correlational design, this research will explore how these attitudes correlate with academic outcomes in mathematics. A stratified random sampling technique was employed to ensure a representative sample of the student population. The study used the "Attitudes toward MathematicsInstrument" used by Sanchal and Sharma [16]. By examining students' attitudes, the research seeks to provide insights into how these attitudes relate to mathematical performance in the New Normal, ultimately contributing to the development of effective educational strategies.

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~~2~~1.1. Objectives

This study focused on determining the relationship between the attitudes toward learning mathematics of Grade 11 senior high school students at a public high school in the Davao region and their mathematics performance in the new normal during the school year 2021-2022. Specifically, the study aimed to:

1. Determine the level of respondents' attitudes toward learning mathematics in terms of:
   1.1. Confidence in mathematics
   1.2. Importance of mathematics
   1.3. Engagement in mathematics
2. Assess the mathematics performance of the respondents.
3. Determine the significant relationship between students' attitudes toward learning mathematics and their mathematics performance.

~~3~~2. ~~MATERIALS AND~~ METHODOLOGY~~S~~

2.1 Research Design

This study employed a descriptive-correlational quantitative research design. Quantitative research involves the collection and analysis of numerical data, making it advantageous for identifying patterns, calculating averages, forecasting, investigating causal

relationships, and extrapolating conclusions to larger populations [11]. The primary objective of this study was to determine the attitudes toward learning mathematics and the mathematics performance of Grade 11 students at secondary school in the Davao region in the New Normal.

Specifically, this research aimed to determine the correlation between the attitudes toward learning mathematics (the independent variable) and mathematics performance (the dependent variable). By utilizing this approach, the study seeks to provide insights into how students' attitudes influence their academic outcomes in mathematics during the new normal of education.

2.2 Research Instrument

This study utilized an adopted questionnaire titled "Attitudes toward Mathematics Instrument" as used by Sanchal and Sharma [16]. The survey consists of 44 statements covering the following indicators: Confidence in Mathematics, Importance of Mathematics, and Engagement in Mathematics. Specifically, there are 21 statements for Confidence in Mathematics, 10 items for Importance of Mathematics, and 13 statements for Engagement in Mathematics. Response options included: Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree. The instrument demonstrated good reliability, with Cronbach's alpha values of 0.759, 0.792, and 0.654 for the respective indicators. The overall reliability coefficient of the instrument is 0.811.The respondents' level of attitudestowards learning mathematics was interpreted using the following scale:

MEAN RANGE	DESCRIPTIVE RATING
4.21 - 5.00	Very high
3.41 - 4.20	High
2.61 - 3.40	Moderate
1.81 - 2.60	Low
1.00 - 1.80	Very Low

Due to the pandemic and health protocols, data were collected through Google Forms.

For the mathematics performance of the students, the researcher used their grades, specifically the first and second grading period grades of the Grade 11 senior high school students. These grades were obtained from their respective subject teachers.Students' mathematics performance was interpreted using the following scale:

GRADE RANGE	DESCRIPTIVE RATING
90-100	Outstanding
85-89	Very Satisfactory
80-84	Satisfactory
75-79	Fairly Satisfactory
74 and below	Did Not Meet Expectation

2.3 Respondents of the Study

The respondents of the study were Grade 11 senior high school students from various strands - Accountancy, Business, and Management (ABM); Technical-Vocational-Livelihood (TVL); General Academic Strand (GAS); Humanities and Social Sciences (HUMSS); Information and Communications Technology (ICT); and Science, Technology, Engineering, and Mathematics (STEM) - at a public secondary school in the Davao region.

These students were officially enrolled during the school year 2021-2022, with a total population of 1,000 students. Using Slovin's formula, a sample size of 286 respondents was determined. Due to pandemic [6], the randomly selected students completed the adopted survey questionnaire via Google Forms. The distribution of respondents is detailed in Table 1 below.

Table 1. Distribution of Respondents

STRANDS	POPULATION (N)	SAMPLE SIZE (n)	PERCENTAGE (%)
ABM	37	11	3.85
TVL	263	75	26.22
GAS	289	83	29.02
HUMSS	307	88	30.77
ICT	54	15	5.24
STEM	50	14	4.90
TOTAL	1000	286	100.00

2.4 Data Gathering

The researchers began by obtaining permission from the school principal to conduct the study among senior high school students. Once approval was granted, a letter was sent to the school registrar to request a list of students. From this list, the researchers randomly selected the respondents. Following this, permission was obtained from the respective class advisers to conduct the study with their students.With the advisers' consent, an online orientation was held for the respondents to explain the nature and purpose of the study. During the orientation, it was emphasized that the data provided would be treated with the utmost confidentiality and presented as grouped data. Participants were also informed that their participation was voluntary and that they could withdraw at any time if they felt uncomfortable with the questions.After the orientation, the survey questionnaire was administered via Google Forms. The responses were then collected, tabulated, and subjected to statistical analysis.

43. RESULTS AND DISCUSSION

3.1 Level of Attitudes Toward Learning Mathematics of Senior High School Students

Confidence in Mathematics

The study's findings reveal that students' confidence in learning mathematics is within a moderate range, with an average mean score of 3.27. This suggests that, overall, students have a reasonable level of confidence in their mathematical abilities. However, the standard deviation of 0.430 indicates variability among individual students, reflecting differing levels of self-assurance.

Li and Schoenfeld [17] argue that educators can empower students to actively construct mathematical understanding rather than passively acquiring static facts and procedures. This aligns with our study's focus on students' confidence, emphasizing the importance of fostering a dynamic, active approach to learning mathematics. Additionally, Ryan, Fitzmaurice, and O'Donoghue [18] highlight the importance of motivation and positive self-belief, resonating with our findings that confidence plays a crucial role in sustaining students' interest and commitment to mathematics. Therefore, nurturing students' confidence is essential for promoting positive learning experiences and achieving better academic outcomes.

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3.2 Importance of Mathematics

The study's findings highlight the importance of mathematics, with an indicator mean of 3.90, indicating a high level of significance. The standard deviation of 0.701 suggests some variability among individual students, reflecting differing perceptions. Specifically, this indicator explores how students attribute importance to mathematics and recognize its impact on their lives.By connecting mathematics to students' everyday experiences, educators can enhance understanding and application [19]. This resonates with our study's focus on the importance of mathematics in students' lives.Recognizing the benefits of mathematics and its real-life applications contributes to students' overall success [20]. Our study aligns with this perspective, emphasizing that Grade 11 students understand the purpose of mathematics and its potential impact on their lives. Nurturing students' awareness of mathematics' relevance is essential. By connecting math to real-life contexts, educators empower students to appreciate its benefits and improve their own lives.

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3.3 Engagement in Mathematics

The study's findings indicate that students' engagement in mathematics has a moderate mean score of 3.39, with a standard deviation of 0.521. This suggests that while students are somewhat engaged in learning mathematics, there is room for improvement.Incorporating real-world applications, as suggested by the study in [19]," can enhance engagement by making math more relevant to students' daily experiences. Using tools can help students see the practical connections of mathematical concepts, fostering deeper engagement.Moreover, the study on how math and science identity affectstudents' success highlights the importance of developing positive attitudes toward math early on [21]. By linking mathematics to real-life applications and emphasizing its relevance, students are likely to develop a stronger identity in math, which can lead to greater engagement and success.The moderate engagement level observed in this study indicates that while students recognize the significance of mathematics, they may benefit from further connections between math and their everyday lives. This approach can enhance their understanding, relevance, and overall engagement in the subject.

3.4 Attitudes Towards Learning Mathematics (Overall)

The study's findings, which indicate a high overall attitude towards learning mathematics with a mean score of 3.49, are consistent with recent literature. Szczygieł [23] reported that students generally exhibit positive attitudes toward mathematics, reflected in high mean scores on attitude scales. This consistency suggests that positive attitudes can be foundational for fostering sustained interest and engagement in mathematics. Similarly, Huda and Syafmen [24] found high school students displaying a positive disposition towards mathematics, with average attitude scores consistently above the midpoint, indicating that such attitudes may lead to greater resilience and persistence in learning challenging mathematical concepts.In another study, Ober et al. [25] also reported high mean scores in students' attitudes toward mathematics, emphasizing a widespread appreciation for the subject's value and real-world applications. This appreciation is likely a key motivator for students to pursue further studies or careers in STEM fields, highlighting the importance of cultivating positive attitudes in secondary education.

However, the findings slightly differ from Rural et al. [26], who observed only moderately positive attitudes towards mathematics in online learning. This difference can be attributed to the different respondent groups, as their study focused on pre-service teachers engaged in online mathematics courses, while the current study examined Grade 11 senior high school students in a traditional learning setting.Furthermore, Capuno et al.'s [27] study in a public national high school in Mandaue City, Cebu, Philippines, found that while students had positive attitudes towards the value of mathematics, they showed a neutral

attitude regarding self-confidence, enjoyment, and motivation in the subject. This difference highlights the importance of context and specific educational environments in shaping students' attitudes toward mathematics. The implication is that educational strategies may need to be tailored to address these variations in attitude, focusing on enhancing confidence and enjoyment to improve overall engagement with the subject.

Table 2. The Respondents' Level of Attitudes Toward Learning Mathematics

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INDICATORS	MEAN	STD. DEVIATION	DESCRIPTION
Confidence in Mathematics	3.27	0.430	Moderate
Importance of Mathematics	3.90	0.701	High
Engagement in Mathematics	3.29	0.521	Moderate
Attitudes Towards Math (Overall)	**3.49**	**0.449**	**High**

3.5 Level of Mathematics Performance of Grade 11Students

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The mathematics performance of Grade 11 students at a National High School in Southern Philippines for the school year 2021-2022 is summarized in Table 3. The overall average grade in general mathematics was 83.90, with a standard deviation of 3.79, which is classified as approaching proficiency. This suggests that most students have developed a solid understanding of fundamental concepts with minimal guidance. The highest frequency of scores falls within the 80-84 range, with 49.65% of the respondents classified at the "Approaching Proficiency" level, followed by the "Proficient" level at 31.12%, and the "Advanced" level at only 5.59%. Conversely, the lowest frequency was a grade of 74 or below, indicating significant struggles for one student in understanding mathematics.

This result aligns with the findings of Bueno and Miranda [28], who observed that senior high school students generally perform at an approaching proficiency level in mathematics. Similarly, Gundaya [29] reported that the majority of student performance scores fell within the 80-84 range, with an overall average of 84, indicating a comparable proficiency level. Additionally, other studies in the region [12, 30] have also noted that high school students typically achieve an approaching proficiency level in their academic performance.

The study by Shafie et al. [31] highlights that mathematics is often perceived as challenging across all educational levels, a challenge further exacerbated by the New Normal, where the complexity of teaching and learning has increased. This aligns with the present study's findings, suggesting that despite students' relatively high performance, there are still significant challenges that need to be addressed. Gherheș et al. [32] emphasized that traditional face-to-face instruction is preferred by most students as it facilitates better communication and understanding of mathematical concepts, underscoring the potential impact of the pandemic on students' learning environments. The variability in performance may also be attributed to external factors such as parental support, socioeconomic status, and teaching approaches during the COVID-19 pandemic, further explaining the differences observed among students.

Table 3. The Respondents' Level of Mathematics Performance

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RANGE OF GRADES	DESCRIPTION LEVEL	FREQUENCY (f)	PERCENTAGE (%)
90 % and above	Advanced	16	5.59
85% - 89 %	Proficient	89	31.12

80 % - 84%	Approaching Proficiency	142	49.65
75 % - 79 %	Developing	38	13.29
74 % and below	Beginning	1	0.35

n=286; Mean= 83.90; SD= 3.78

3.6 Relationship Between the Attitudes Towards Learning Mathematics and Students' Mathematics Performance

Table 4 illustrates the relationship between students' attitudes toward mathematics and their performance in the New Normal among Grade 11 students during the first semester of 2021-2022. The r-value for "confidence in mathematics" is 0.12, indicating a slight positive correlation, meaning that higher confidence correlates slightly with better mathematics performance. With a p-value of 0.049, this relationship is statistically significant.Similar findings are seen in other studies. Wen and Dubé [33] found a positive correlation between students' confidence in mathematics and their academic performance, indicating that students who believe in their mathematical abilities tend to perform better. Similarly, He et al. [34] conducted a meta-analysis showing a positive relationship between confidence in mathematics and higher achievement across educational contexts. However, the slight correlation in this study suggests that while confidence is important, other factors also play significant roles in student performance, which aligns with Lone's [35] findings that self-confidence development is influenced by various factors, including parental and teacher attitudes. Positive support fosters confidence, while unnecessary criticism can diminish it.

The "Importance of Mathematics" indicator in this study yielded an r-value of 0.043, indicating a slight positive correlation between valuing mathematics and performance. However, with a p-value of 0.464, this relationship is not statistically significant.This result aligns with literature suggesting that while students may recognize the importance of mathematics, this recognition alone does not always translate into improved performance [36].Wong and Wong [37] emphasize that mere appreciation of the subject is insufficient for enhancing academic outcomes. Their research supports the idea that there is no significant causal relationship between students' perceptions of the importance of mathematics and their performance. Additionally, the study suggests that interest in mathematics does not significantly impact performance, highlighting that factors beyond students' perceptions and interest must be considered to effectively improve mathematics outcomes.The lack of a significant correlation between the importance of mathematics and performance, along with the weak association between these variables, underscores the complexity of academic achievement in mathematics. While students may recognize and express importance towards the subject, this alone does not guarantee better performance.

The study found that the indicator "engagement in mathematics" had an r-value of 0.102, suggesting a slight positive correlation between student engagement and performance in mathematics. However, with a p-value of 0.84, this relationship is not statistically significant, indicating that the correlation may not be meaningful. While student engagement is generally considered an important predictor of academic achievement, this result suggests that not all highly engaged students necessarily perform better in mathematics. This finding is consistent with research that highlights the complexity of academic performance, where factors beyond engagement—such as teaching quality, student motivation, and individual differences—play a critical role [38,39]. For instance, highly engaged students may still struggle with performance if the teaching methods are not effective [40] or if they lack intrinsic motivation [41]. Therefore, while engagement is important, it should be considered alongside other factors that collectively influence academic success in mathematics.

In general, the study found that the r-value for students' attitudes toward learning mathematics was 0.111, indicating a slight positive correlation. This suggests that as students develop more positive attitudes toward learning mathematics, their performance in the subject tends to improve slightly. However, the p-value of 0.084 is higher than the conventional 0.05 level of significance, indicating that there is no significant relationship between students' attitudes toward learning mathematics and their mathematics performance in the "new normal" educational environment.

These findings align with recent literature, which suggests that while positive attitudes toward mathematics can be beneficial, they do not always translate directly into improved academic performance [42,43]. The context of the "new normal," characterized by remote learning and varying access to resources, may further complicate this relationship. Research indicates that factors such as access to technology, teaching quality, home learning environments, self-regulation approaches significantly influence student performance during this period [44,45,46]. Additionally, the pandemic has amplified disparities in educational outcomes, highlighting the importance of considering a broader range of factors beyond student attitudes when assessing academic performance [47].

Table 4. The Relationship Between the Attitudes Towards Learning Mathematics and Students' Mathematics Performance

INDICATORS	r-VALUE	DESCRIPTION	p-VALUE
Confidence in Mathematics	0.116	Slight Correlation	0.049
Importance of Mathematics	0.043	Slight Correlation	0.464
Engagement in Mathematics	0.102	Slight Correlation	0.084
Attitudes Towards Learning Mathematics (Overall)	**0.110**	**Slight Correlation**	**0.064**

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54. CONCLUSIONS AND RECOMMENDATIONS

4.1Conclusion

Based on the findings and statistical results of the study, the following conclusions were drawn:

1. The study concludes that students generally have a moderate level of confidence and engagement in mathematics, and they view the subject as important. However, there are differences in how students perceive and approach mathematics, indicating that not all students are equally confident or engaged.

2. The study shows that most Grade 11 students at a secondary school in Davao region are close to being proficient in mathematics, with a solid understanding of fundamental concepts. However, a small group of students is struggling, indicating a need for additional support.

3. The study suggests that while students with higher confidence in mathematics tend to perform better, other factors like the importance they place on the subject, their engagement, and their overall attitude have less clear impacts on their performance. This highlights the need for a broader approach to improving mathematics achievement.

4.2 Recommendation

1. Teachers may consider implementing activities which may build students' confidence, such as positive reinforcement and opportunities for small successes in mathematics. Engaging teaching methods, like group work or hands-on activities, can help increase overall student engagement and improve attitudes toward the subject.

2. Provide targeted support for students who are struggling, such as after-school tutoring or peer mentoring programs. Additionally, regularly assess students to identify those who need extra help before they fall too far behind.

3. Focus on building students' confidence in mathematics through targeted support and positive reinforcement, while also incorporating a variety of teaching strategies to address different learning needs and improve overall achievement.

4. Future researchers should explore additional factors that may influence mathematics performance, such as teaching styles, classroom environment, and parental involvement, while considering longitudinal studies to gain insights into how these factors interact over time. Further, adopting a quota sampling method in future studies could ensure an equal number of respondents from each strand, enabling direct comparisons and providing more detailed insights into the specific attitudes and performance trends within each strand.

Disclaimer (Artificial intelligence)
Authors hereby declare that generative AI technology, specifically GPT-4, has been used solely for grammar checking and enhancing the composition of sentences and paragraphs in this manuscript.

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