

Engagement, Attitude and Mathematics Performance of Marine Engineering Students

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ABSTRACT

This study determined the relationship between engagement, attitude, and academic performance in mathematics of 383 first-year Bachelor of Science in Marine Engineering students at a private college in the Negros Island Region enrolled during the first semester of the academic year 2026- 2027. Standardized questionnaires were utilized to measure the engagement and attitude of students towards Mathematics. The result showed that the First-year Marine Engineering students are highly engaged in mathematics, possess positive attitudes toward mathematics, and achieved a passing level of performance in mathematics. The findings also revealed that there is no significant relationship between students' engagement and their academic performance in mathematics. However, there is a significant relationship between the students' attitude toward mathematics and their performance in mathematics and between their engagement and attitude toward mathematics.

Keywords: Engagement in Mathematics, Attitude in Mathematics, Mathematics Performance, Marine Engineering Students, Higher Education

INTRODUCTION

Student engagement refers to the activity of students to participate and respond to the learning process. It includes behavioral, cognitive, and emotional aspects that contribute to their understanding of mathematics and overall learning. Students who are actively engaged tend to ask questions, prepare, participate, answer questions, and complete activities either alone or with peers. Contradictingly, students who show lack of interest in participating tend to experience hardships in learning, which can eventually affect their academic performance (Qudwatullathifah et al., 2025). Engagement in mathematics continues to be a concern due to many students find the subject difficult. This idea can lead to a lack of interest and motivation, which may affect their mathematical performance and overall achievement. Factors like classroom environment and support provided by teachers can affect a students engagement to participate in learning the subject (Gutierrez & Doronio, 2024). Aside from engagement, students' attitudes toward mathematics can also influence how they learn the subject. Attitude refers to a stability of thinking, feeling, or responding toward a particular idea or object (Philipp, 2021). In mathematics, it indicates how students generally perceive the subject, whether positively or negatively (Hwang & Son, 2021). Positive attitude students are more likely to approach learning with confidence and interest, while negative perceptions may contribute to struggle and hardships. Effective teaching methods, self-confidence, and positive experiences in mathematics can help students develop a more positive attitude toward the subject (Concha, 2024). Its abstract nature can pose challenge for students and may contribute to negative views. However, providing learning routes suited to students' needs may help elevate their attitudes and performance. Utilizing modules for learning has been found to encourage participation and support students with different levels of mathematical ability (Guinocor et al., 2021). The importance of mathematics is very evident among students preparing for aforementioned subject related careers. Mathematical knowledge helps develop the problem-solving and analytical skills needed in these fields. Despite its importance, students' mathematical competence vary, and factors like teacher quality, learning resource availability, and students' attitudes toward mathematics may factor out these differences (Masengesho & Sindayigaya, 2025). Although several studies have examined student engagement, attitudes toward mathematics, and academic performance, there is still limited research

focusing specifically on Marine Engineering students in a maritime college in the Negros Island Region. The nature of maritime education, including its specialized curriculum and training environment, may create learning experiences that differ from those in other educational settings. Therefore, there is a need to examine how Marine Engineering students engage in mathematics learning, how they view the subject, and how these factors relate to their mathematics performance. Understanding these factors may help identify the challenges students face in learning mathematics and provide useful information for improving their learning experiences. The results of the study may help educators and administrators develop strategies that encourage greater engagement, promote positive attitudes toward mathematics, and improve students' academic performance. The findings of this study are expected to provide useful information for the College of Maritime Studies Curriculum Office in developing appropriate interventions and improving mathematics-related learning strategies. Ultimately, these efforts may help strengthen students' mathematical skills and better prepare Marine Engineering students for the academic and professional demands of the maritime industry.

Research Design

This study utilized a quantitative descriptive-correlational research design, a methodological approach that enables researchers to describe the existing conditions of the variables under investigation and determine the relationships among them (Creswell & Creswell, 2018). Specifically, this study aimed to determine the level of student engagement, attitude toward mathematics, and mathematics performance of first-year Bachelor of Science in Marine Engineering (BSMarE) students, as well as examine the significant relationships among these variables. By collecting and analyzing quantitative data, the study sought to provide empirical evidence on whether students' engagement in learning and their attitudes toward mathematics are associated with their academic performance in Math A.

The descriptive component of the research was employed to determine the levels of students' engagement and attitude toward mathematics, as well as to describe their mathematics performance based on their final grades in Math A. The correlational component, on the other hand, was utilized to determine whether significant relationships exist between student engagement and mathematics performance, attitude toward mathematics and mathematics performance, and engagement and attitude among first-year Marine Engineering students. This design was deemed appropriate because it allows the researcher to investigate naturally occurring relationships among variables without manipulating the study environment or influencing the respondents' behaviors.

Subject and Respondents of the Study

The subject and respondents of this study were the First-year BS Marine Engineering Students in one of the private institution in Bacolod City during the school year 2025-2026.

Population and Sample Size

The population of the study consisted of 383 first-year Bachelor of Science in Marine Engineering (BSMarE) students enrolled during the First Semester of academic year 2026–2027. Since the entire population was included in the study, no sampling technique or sample size computation was employed. Instead, the researcher used total enumeration, wherein all members of the population served as respondents.

Data Gathering Instrument

In gathering the needed data of the study, the following instruments were used. To determine the Engagement level of the respondents, a standardized questionnaire which was based on “Students' Engagement and Their Performances in Mathematics” that was developed by Lacuarin & Bando (2021) was utilized which is composed of thirty-three (33) items and is divided into three (3) categories of level of engagement of students in developing mathematical skills namely: Behavioral Engagement, Emotional Engagement and Cognitive Engagement. They were allowed to indicate their level of engagement with this rating, 4 for highly engage, 3 for engage, 2 for not engage and 1 for highly not engage. To determine the

attitude level of the respondents, a standardized questionnaire which was based on “Numbers and notions: Exploring students’ attitudes toward mathematics across confidence, value, and enjoyment” that was developed by Magallon (2025) was utilized which is composed of twenty (20) items and is divided into three (3) categories of attitude towards mathematics namely: Self-Perception and Math Efficacy, Perceived Utility and Importance of Math, and Enjoyment and Interest in Math. They were allowed to indicate their level of attitude with this rating, 4 for Strongly Agree, 3 for Agree, 2 for Disagree and 1 for Strongly Disagree.

Data Analyses

All collected data in this study were analyzed using the Microsoft Excel software and SPSS utilizing descriptive, inferential, and correlational analyses summarize as follows:

For Statement of Problem number 1, to determine the profile of the respondents, frequency and percentage distribution were used.

For Statement of Problem number 2, to determine the level of students' engagement in mathematics, mean and standard deviation were used.

Formula for the mean:

$$\bar{x} = \frac{\sum fx}{n}$$

Where:

$\bar{x}$ = Mean of Average

$\sum fx$ = sum of all scores in the population

n = total number population

$$\text{Standard Deviation } SD = \sqrt{\frac{\sum (X - \bar{X})^2}{N-1}}$$

Where: SD = Standard Deviation

X = Individual score

$\bar{X}$ = Mean

N = Number of respondents

To interpret the mean scores describing the level of students' engagement in mathematics, the interpretation guide below was utilized.

Scale	Mean Score Range	Description	Interpretation
4	1.00 - 1.74	Highly Engage	Very high level of participation
3	1.75 - 2.49	Engage	High level of participation
2	2.50 - 3.24	Not Engage	Limited participation
1	3.25 – 4.00	Highly Not Engage	Very low participation

For Statement of Problem number 3, to determine the level of students' attitude toward mathematics, mean and standard deviation were used.

To interpret the mean of the level of attitude of the respondents, the following scale was used:

Scale	Mean Score Range	Description	Interpretation
4	1.00 - 1.74	Strongly Disagree	Negative Attitudes
3	1.75 - 2.49	Disagree	Neutral/Indifferent
2	2.50 - 3.24	Agree	Positive Attitudes
1	3.25 – 4.00	Strongly Agree	Very Positive Attitudes

For Statement of Problem number 4, What is the level of achievement in Mathematics of the first year BSMarE students, the mean and standard deviation were used.

To interpret the mean of the level of Achievement in Mathematics of the first year BSMarE students the following scale was used:

Grading Scale	Description
95-100	Excellent
80-94	Very Good
70-79	Good
60-69	Satisfactory
50-59	Pass
0-49	Failure

For Statement of Problem number 5, to determine whether significant relationships exist between students' engagement and academic performance, the Pearson Product-Moment Correlation Coefficient (Pearson's r) will be employed. This statistical technique is appropriate for determining the strength and direction of the linear relationship between the variables.

Specifically, Pearson's r was used to examine the relationship between students' engagement in mathematics and their academic performance in Mathematics (Math A), as well as the relationship between students' attitude toward mathematics and their academic performance in Mathematics (Math A). The correlation coefficients obtained indicate whether the relationships are positive or negative and whether they are weak, moderate, or strong.

The hypotheses was tested at the 0.05 level of significance. If the computed p-value is less than 0.05, the corresponding null hypothesis will be rejected, indicating a statistically significant relationship between the variables. Conversely, if the computed p-value is greater than or equal to 0.05, the corresponding null hypothesis will not be rejected, indicating that no statistically significant relationship exists between the variables.

The formula Pearson Product Moment of Correlation was:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where:

r = Correlation

$\sum xy$ = Sum of product of paired scores

$\sum x$ = Sum of x scores

$\sum y$ = Sum of y scores

Σx^2 = Sum of squared x scores

Σy^2 = Sum of squared y scores

For Statement of Problem number 7, which determine the relationship between the level of student's engagement and their academic performance in Mathematics, Pearson Product Moment of Correlation was used.

For Statement of Problem number 8, which determine the relationship between the level of student's engagement and their attitude towards Mathematics, Pearson Product Moment of Correlation was used.

RESULTS AND DISCUSSION

This chapter deals with the presentation, analysis, and interpretation of the data gathered from this study.

Table 1. Frequency and Percent Distribution of the Demographic Profile of Respondents in terms of Gender.

Profile	Category	f	%
Gender			
	Male	372	97.13
	Female	11	2.87
	Total	383	100

As shown in Table 1, the study involved a total of 383 first-year Bachelor of Science in Marine Engineering (BSMarE) students enrolled during the First Semester of academic year 2026–2027. Of the total respondents, 372 or 97.13% were male, while only 11 or 2.87% were female.

The results reveal that the respondents were predominantly male, reflecting the existing gender distribution in Marine Engineering programs where male students continue to comprise the majority of enrollees. This finding is consistent with the traditional composition of maritime education programs in the Philippines. Consequently, the findings of this study largely represent the engagement, attitude, and mathematics performance of male Marine Engineering students.

Level of Students' Engagement in Mathematics

Table 2. Level of Students' Engagement in Mathematics.

Statements	Mean	SD	Interpretation
Behavioral Engagement	3.17	0.35	engaged
1. I listen to my teacher in my math class.	3.87	0.34	highly engaged
2. I participate in the discussion in math class	3.56	0.64	highly engaged
3. I get easily distracted in math class	2.68	0.90	engage
4. I work hard in math class	3.63	0.58	highly engaged
5. At home I review math problems that I did not understand in school	3.14	0.93	engage
6. When I see difficult math problems, I stop working on them.	2.23	1.10	not engage
7. Sometimes I skip difficult math questions	2.51	1.03	engaged
8. When I make mistakes in math, I work until I correct them.	3.30	0.66	highly engaged
9. I follow my teacher's directions in math class	3.87	0.33	highly engaged
10. I sometimes act out as if I am studying in math class	2.30	0.86	not engaged
11. I ask my friends or teachers for help when I can't solve math problems.	3.76	0.43	highly engaged
Emotional Engagement	2.79	0.16	Engage

1. I am interested in learning new things in math.	3.71	0.56	highly engaged
2. I do not like attending math classes.	1.49	0.68	highly engaged
3. Learning math is fun.	3.52	0.60	highly engaged
4. I feel excited when I study in math class.	3.19	0.65	engaged
5. I feel bored when I study math	2.10	0.86	engaged
6. I am excited about solving difficult math problems.	2.77	0.88	engaged
7. I like to study other subjects rather than math.	2.72	1.11	engaged
8. Time passes very quickly when I study math.	3.03	0.94	engaged
9. I forget where I am when I study math	2.39	0.88	engaged
10. I want to spend more time solving math problems.	2.99	0.73	engaged
Cognitive Engagement	3.45	0.36	Highly Engage
1. I want to get good grade in math class.	2.61	0.89	engaged
2. Sometimes I follow my best guess when I do not the answer	3.72	0.45	highly engaged
3. When I study math, I ask myself questions to make sure I understand it correctly	3.38	0.72	highly engaged
4. I try to connect math to real life situations.	3.72	0.45	highly engaged
5. I try to think different ways to solve math problems.	3.49	0.73	highly engaged
6. I try to develop my own strategy when I solve math problems	3.58	0.59	highly engaged
7. I set goals for myself when I study math.	3.63	0.48	highly engaged
8. When I can't solve a math problem, I try to change my strategy.	3.02	0.73	highly engaged
9. I often think about something else when I study math.	3.24	0.71	engaged
10. At home, I think about what I learned in math class.	3.42	0.59	highly engaged
11. I am focused when I study math.	3.75	0.43	highly engaged
12. I memorize important facts to understand math better	3.14	0.19	engaged
Student's Engagement in Mathematics (Overall Mean)	2.61	0.89	engaged

Legend: (3.26 – 4.00)- Highly Engage, (2.51 – 3.25)- Engage, (1.76 – 2.50)- Not Engage, (1.00 – 1.75) Highly Not Engage

Table 2 presents the level of students' engagement in mathematics in terms of behavioral, emotional, and cognitive engagement. The overall mean of 2.61 (SD = 0.89) was interpreted as Engage, indicating that the respondents generally demonstrated active participation and involvement in mathematics learning.

Among the three dimensions, Cognitive Engagement obtained the highest mean of 3.45 (SD = 0.36) and was interpreted as highly engaged. This indicates that students actively employed learning strategies, established learning goals, and exerted considerable mental effort in understanding mathematical concepts. The highest-rated indicators included being focused while studying mathematics (M = 3.75), connecting mathematics to real-life situations (M = 3.72), and making use of different strategies when solving mathematical problems (M = 3.58). These findings suggest that the respondents recognize the importance of mathematics in their future profession as Marine Engineers and are willing to invest cognitive effort to achieve academic success.

Behavioral engagement recorded a mean of 3.17 (SD = 0.35), interpreted as Engage. The respondents demonstrated desirable learning behaviors such as listening attentively to their teacher (M = 3.87), following classroom instructions (M = 3.87), participating in class discussions (M = 3.56), and seeking assistance from teachers or classmates whenever they encountered difficulties (M = 3.76). However, lower mean scores were observed on statements such as stopping when encountering difficult mathematical problems (M = 2.23) and pretending to study during mathematics classes (M = 2.30), indicating that some students still experience challenges in maintaining persistence when confronted with difficult mathematical tasks.

Meanwhile, Emotional Engagement obtained the lowest dimension mean of 2.79 (SD = 0.16), although it was still interpreted as Engage. Students expressed strong interest in learning mathematics (M = 3.71) and considered mathematics enjoyable (M = 3.52). Nevertheless, moderate responses regarding excitement in solving difficult mathematical problems and preference for studying mathematics over other subjects indicate that strengthening students' emotional attachment to mathematics remains an area for improvement.

The findings support the Student Engagement Theory of Fredricks, Blumenfeld, and Paris (2004), which posits that behavioral, emotional, and cognitive engagement collectively contribute to students' academic success. According to the theory, students who actively participate in classroom activities, invest cognitive effort, and maintain positive emotional involvement are more likely to achieve favorable academic outcomes.

The present findings are consistent with Bond et al. (2021), who found that student engagement remains one of the strongest predictors of learning outcomes in higher education. Their systematic review revealed that highly engaged students exhibit greater motivation, persistence, self-regulation, and academic achievement than less engaged learners. Similarly, Mohd et al. (2022) reported that behavioral, emotional, and cognitive engagement significantly influence students' mathematics achievement, with cognitive engagement emerging as the strongest predictor of mathematics performance. Likewise, Xia et al. (2022) concluded that students who actively engage in classroom learning demonstrate higher mathematics achievement because engagement promotes deeper understanding, persistence, and effective problem-solving skills.

Overall, the findings imply that first-year Marine Engineering students exhibit a commendable level of engagement in mathematics. Their strong cognitive and behavioral engagement suggests readiness to learn mathematical concepts essential for engineering education. However, mathematics instructors may further enhance students' emotional engagement by employing learner-centered teaching strategies, collaborative activities, contextualized examples, and supportive classroom environments that increase students' confidence and enjoyment in learning mathematics.

Level of Students' Attitude towards Mathematics

The table on the next page presents the level of students' attitude towards mathematics.

Table 3. Level of Students' Attitude towards Mathematics.

Statements	Mean	SD	Interpretation
Self- perception and Math efficacy	2.43	0.86	Neutral/Indifferent Attitudes
1. Learning math will always be challenging for me.	2.98	1.02	Positive Attitudes
2. I believe I am not naturally good at learning math.	2.29	1.01	Neutral/Indifferent Attitudes
3. I often struggle when learning or solving math problems.	2.48	0.93	Neutral/Indifferent Attitudes
4. Even with effort, I find it hard to understand math concepts.	2.43	1.03	Neutral/Indifferent Attitudes
5. I feel less confident than my classmates when solving math problems.	2.44	1.10	Neutral/Indifferent Attitudes
6. I feel incapable of solving most math problems.	2.15	0.97	Neutral/Indifferent Attitudes
7. Despite my efforts, I consistently receive low grades in math.	2.23	0.97	Neutral/Indifferent Attitudes
Perceived Utility and Importance of Math	3.77	0.29	Very Positive Attitude
1. Learning mathematics is essential for everyone.	3.84	0.49	Very Positive Attitudes
2. Mathematics contributes significantly to the progress of society.	3.84	0.36	Very Positive Attitudes
3. Mathematical skills are necessary for managing life effectively.	3.77	0.42	Very Positive Attitudes
4. Gaining mathematical knowledge is crucial for my future career.	3.67	0.67	Very Positive Attitudes

5. Mathematics is a practical subject that I use in my daily life.	3.72	0.45	Very Positive Attitudes
Enjoyment and Interest in Math	3.16	0.55	Positive Attitudes
1. Mathematics is a subject I find interesting and engaging.	3.37	0.74	Very Positive Attitudes
2. I enjoy studying mathematics.	3.25	0.85	Positive Attitudes
3. Time passes quickly when I am studying mathematics.	3.25	0.78	Positive Attitudes
4. Studying mathematics feels like a burden to me.	2.19	0.94	Neutral/Indifferent Attitudes
5. I feel fully engaged when I work on math exercises.	3.19	0.61	Positive Attitudes
6. I find mathematics to be an entertaining subject.	3.32	0.84	Positive Attitudes
7. I think solving math problems is enjoyable.	3.52	0.75	Very Positive Attitudes
Students' Attitude towards Mathematics (Overall Mean)	3.12	0.40	Positive Attitudes

Legend: 4.00-3.50 - Strongly Agree/Very Positive Attitudes, 3.49-2.50 - Agree/Positive Attitudes, 2.49-1.50- Disagree/Neutral/Indifferent Attitudes, 1.49-1.00-Strongly Disagree/Negative Attitudes

Table 3 presents the respondents' level of attitude toward mathematics in terms of self-perception and mathematics efficacy, perceived utility and importance of mathematics, and enjoyment and interest in mathematics. The overall mean of 3.12 (SD = 0.40) was interpreted as Positive Attitudes, indicating that the respondents generally possessed favorable attitudes toward mathematics.

Among the three dimensions, Perceived Utility and Importance of Mathematics obtained the highest mean of 3.77 (SD = 0.29) and was interpreted as Very Positive Attitude. This finding indicates that the respondents strongly recognized the value of mathematics in everyday life and its importance in their future profession. Students strongly agreed that mathematics is essential for everyone (M = 3.84), contributes to societal progress (M = 3.84), and is crucial for their future careers as Marine Engineers (M = 3.67). These findings demonstrate that students clearly appreciate the practical applications of mathematics within engineering and maritime practice.

The dimension Enjoyment and Interest in Mathematics obtained a mean of 3.16 (SD = 0.55), interpreted as Positive Attitudes. The respondents generally considered mathematics interesting and enjoyable, particularly in solving mathematical problems (M = 3.52) and viewing mathematics as an engaging subject (M = 3.37). However, some students remained neutral regarding statements suggesting that studying mathematics is burdensome, indicating that although most students enjoy mathematics, a few still experience difficulties and lack enthusiasm toward the subject.

Meanwhile, Self-Perception and Mathematics Efficacy obtained the lowest mean of 2.43 (SD = 0.86) and was interpreted as Neutral/Indifferent Attitudes. This suggests that although students generally did not strongly agree with negative statements regarding their mathematical abilities, some remained uncertain about their competence in mathematics. This uncertainty may affect their confidence when solving complex mathematical problems encountered in engineering courses.

The findings support Ajzen's (1991) Theory of Planned Behavior, which explains that positive attitudes influence individuals' intentions and behaviors. Students who perceive mathematics as valuable and beneficial are more likely to engage actively in learning activities, persist when faced with academic challenges, and demonstrate better academic performance.

The present findings agree with the study of Wang et al. (2022), who found that students' positive attitudes toward mathematics significantly influenced their behavioral engagement and mathematics performance. Students who appreciated the usefulness of mathematics demonstrated greater participation in classroom activities and achieved higher academic outcomes. Similarly, Panaoura et al. (2024) reported that engineering students' attitudes, beliefs, and confidence toward mathematics significantly contributed to their mathematics performance. Students who possessed favorable attitudes and stronger self-efficacy

demonstrated higher levels of achievement than those with negative perceptions. Likewise, Galicia (2022) emphasized that engineering students who recognized the importance of mathematics for their future profession displayed greater motivation, persistence, and academic success in mathematics-related courses.

Overall, the findings indicate that first-year Marine Engineering students possess a generally positive attitude toward mathematics. They clearly recognize the importance of mathematics in engineering education and demonstrate genuine interest in learning the subject. However, mathematics instructors should continue implementing strategies that strengthen students' mathematical self-efficacy and confidence through meaningful learning experiences, timely feedback, collaborative activities, and contextualized engineering applications.

Mathematics Performance of the Respondents

The table below shows the mathematics performance of the respondents.

Table 4. Level of Mathematics Performance.

Level of Academic Performance	f	Mean	SD	Interpretation
Excellent	0	59.35	17.94	Pass
Very Good	26			
Good	12			
Satisfactory	145			
Pass	167			
Failure	33			
Total	383			

Legend: (95-100)-Excellent; (85-94)-Very Good; (79-84)-Good; (65-78)-Satisfactory; (50-64)-Pass; (0-49) Failure

Table 4 presents the mathematics performance of the respondents based on their final grades in Math A. The respondents obtained an overall mean grade of 59.35 (SD = 17.94), which was interpreted as pass.

The findings indicate that although the respondents generally met the minimum passing requirement, their mathematics performance remains relatively low considering the rigorous mathematical competencies expected of first-year Marine Engineering students. Mathematics is one of the core foundation subjects in engineering education, serving as the basis for higher-level courses such as engineering mechanics, thermodynamics, marine propulsion, fluid mechanics, and electrical engineering. Thus, students who perform satisfactorily in mathematics are more likely to succeed in these professional courses.

The result suggests that while the respondents were able to meet the minimum academic standard, many may still experience difficulties in mastering mathematical concepts and solving complex mathematical problems. This finding highlights the need for continuous instructional support, effective teaching strategies, and intervention programs to further improve students' mathematical competence.

The present finding is consistent with the study of Laroga et al. (2024), who reported that mathematics performance among college students is influenced by multiple factors, including student engagement, learning motivation, self-efficacy, and instructional quality. Their study emphasized that students who actively participate in learning activities and employ effective learning strategies generally demonstrate better mathematics achievement.

Similarly, Panaoura et al. (2024) found that first-year engineering students' mathematics performance is strongly associated with their attitudes, self-confidence, and previous mathematical preparation. Students with higher confidence and positive perceptions toward mathematics exhibited significantly better academic performance than those who possessed negative attitudes and lower self-efficacy.

Likewise, Rubio (2024) emphasized that supportive instructional practices and engaging learning environments contribute positively to the mathematics performance of maritime students. The study concluded that contextualized teaching approaches, meaningful classroom interactions, and increased student participation encourage learners to understand mathematical concepts more effectively, thereby improving their academic achievement.

Overall, the findings imply that although the respondents achieved a passing level of mathematics performance, there remains considerable opportunity for improvement. Mathematics instructors may strengthen students' conceptual understanding by implementing learner-centered teaching strategies, integrating engineering-related applications into mathematics lessons, and encouraging active student engagement. Such initiatives may help students develop stronger mathematical competencies that are essential for success in Marine Engineering education.

Relationship between Students' Engagement and Mathematics Performance

The table on the next page illustrates the relationship between students' engagement and mathematics performance.

Table 7. Relationship between Students' Engagement and Mathematics Performance.

Variable	Test Statistics (r_s)	p-value	Decision for H_0	Interpretation
Level of Students' Engagement vs.	0.060	0.243	Fail to Reject H_0	Not Significant
Level of Mathematics Performance				

Table 7 presents the relationship between students' engagement and mathematics performance. The results reveal a Spearman's rho (r_s) of 0.060 with a p-value of 0.243, which is greater than the 0.05 level of significance. Consequently, the null hypothesis was not rejected, indicating that there is no statistically significant relationship between the level of students' engagement and their mathematics performance.

Although the correlation coefficient is positive, its magnitude ($r_s = 0.060$) indicates a very weak positive relationship between the two variables. This suggests that students who reported higher levels of engagement in mathematics did not necessarily achieve higher academic performance in Mathematics (Math A). Likewise, students with lower engagement did not consistently obtain lower mathematics grades. Thus, students' engagement alone was not a significant predictor of mathematics performance among the Freshmen Marine Engineering students included in this study.

The findings imply that while engagement is generally considered beneficial to learning, it may not directly translate into higher academic achievement in mathematics. Mathematics performance may be influenced by several other factors, including students' prior mathematical knowledge, self-efficacy, study habits, cognitive ability, instructional quality, mathematics anxiety, and the difficulty of course content. These variables may have a stronger influence on students' academic performance than engagement alone.

The findings of the present study do not support the commonly reported positive association between student engagement and academic achievement. Wong and Liem (2022) emphasized that behavioral, emotional, and cognitive engagement are essential components that promote meaningful learning and are generally associated with improved academic outcomes. Similarly, Nkomo et al. (2021) concluded that engaged students tend to participate actively in learning activities, demonstrate greater persistence, and achieve better academic performance. These studies suggest that students who invest greater effort and participate actively in learning are more likely to perform well academically.

However, the present findings are not entirely inconsistent with previous research. Fredricks et al. (2023) argued that the relationship between engagement and academic achievement is often influenced by contextual factors such as instructional strategies, classroom environment, assessment methods, and individual learner characteristics. In highly specialized academic programs such as Marine Engineering,

students' mathematics performance may depend more heavily on prior mathematical competence, analytical reasoning skills, and problem-solving ability than on engagement alone. Therefore, although engagement remains an important aspect of the learning process, it may not independently predict academic performance without considering other cognitive and motivational factors.

Overall, the findings indicate that enhancing students' engagement remains valuable for promoting active participation and positive learning experiences. However, improving mathematics performance among Freshmen Marine Engineering students may also require interventions that strengthen mathematical competence, self-efficacy, effective learning strategies, and instructional support.

Relationship between Students' Engagement and Attitude in Mathematics

The table below illustrates the relationship between relationship between students' engagement and attitude in mathematics.

Table 6. Relationship between Students' Engagement and Attitude in Mathematics.

Variable	Test Statistics (r_s)	p-value	Decision for H_0	Interpretation
Level of Students' Engagement vs.	0.611	<0.001	Reject H_0	Significant
Level of Attitude in Mathematics				

Table 6 presents the relationship between students' engagement and attitude toward mathematics. The analysis was conducted using **Spearman's Rank-Order Correlation (r_s)** to determine whether a significant relationship exists between the two variables. The results revealed a **Spearman's correlation coefficient (r_s) of 0.611** with a **p-value of less than 0.001**. Since the obtained p-value is lower than the 0.05 level of significance, the null hypothesis was rejected. This indicates that there is a **statistically significant positive relationship** between students' engagement and their attitude toward mathematics.

The obtained correlation coefficient of **0.611** indicates a **moderately strong positive relationship**, suggesting that as students' attitudes toward mathematics become more positive, their level of engagement also tends to increase. Likewise, students who exhibit higher levels of engagement are more likely to possess favorable attitudes toward mathematics. This finding implies that engagement and attitude are closely associated and mutually reinforcing in the learning process. Students who enjoy mathematics, recognize its value, and feel confident in learning the subject are more likely to participate actively in classroom discussions, complete assigned tasks, collaborate with classmates, and persevere in solving mathematical problems. Conversely, increased engagement in meaningful learning experiences may further enhance students' positive perceptions and appreciation of mathematics.

This finding supports the theoretical perspective that attitude and engagement are interconnected components of student learning. According to **Fredricks et al. (2023)**, students' behavioral, emotional, and cognitive engagement is strengthened when they develop positive attitudes toward learning, resulting in greater participation and persistence in academic activities. Similarly, **Eccles and Wigfield (2020)** explained that students' beliefs, values, and expectations influence their motivation to engage in learning tasks, while positive learning experiences further shape favorable attitudes toward academic subjects. Furthermore, the **OECD (2023)** reported that students with positive attitudes toward mathematics consistently demonstrate higher levels of classroom engagement, motivation, and academic achievement.

The result is also consistent with previous empirical studies which found that students who possess positive attitudes toward mathematics are generally more engaged in learning activities and are more willing to invest time and effort in academic tasks. This relationship is particularly relevant among Marine Engineering students, whose future profession requires strong mathematical competence in engineering calculations, navigation, mechanics, thermodynamics, and other technical maritime courses. Developing both positive attitudes and active engagement can therefore contribute to improved mathematical understanding and academic success.

The significant positive relationship observed in this study suggests that mathematics instructors and academic administrators should implement instructional strategies that simultaneously enhance students' attitudes and engagement. Integrating authentic maritime applications into mathematics lessons, utilizing collaborative and problem-based learning approaches, providing timely feedback, and fostering a supportive classroom environment may increase students' interest and active participation in mathematics. Such initiatives can strengthen both engagement and positive attitudes, ultimately contributing to better mathematics performance among Marine Engineering students.

Relationship between Attitudes Towards Mathematics and Performance

The table below illustrates the relationship between attitudes towards mathematics and performance.

Table 8. Relationship between Attitudes Towards Mathematics and Performance.

Variable	Test Statistics (r_s)	p-value	Decision for H_0	Interpretation
Level of Attitudes Towards Mathematics vs.	0.226*	<0.001	Reject H_0	Significant
Level of Mathematics Performance				

Table 8 presents the relationship between students' attitude toward mathematics and their mathematics performance. The results reveal a Spearman's rank-order correlation coefficient (r_s) of 0.226 with a p-value of < 0.001, which is lower than the 0.05 level of significance. Consequently, the null hypothesis was rejected, indicating that there is a statistically significant relationship between students' attitude toward mathematics and their mathematics performance.

The correlation coefficient of 0.226 indicates a weak positive relationship between the variables. Although the strength of the relationship is relatively low, the positive direction suggests that students with more favorable attitudes toward mathematics tend to achieve better academic performance in Mathematics (Math A). Conversely, students with less positive attitudes are more likely to obtain lower mathematics performance. This finding implies that while attitude is not the sole determinant of academic achievement, it contributes meaningfully to students' success in mathematics.

The results suggest that students who possess positive self-perceptions of their mathematical abilities, recognize the usefulness and importance of mathematics, and demonstrate enjoyment and interest in learning mathematics are more likely to perform better academically. Positive attitudes encourage students to participate actively in learning activities, persist when solving difficult mathematical problems, and develop confidence in their ability to succeed. These characteristics promote greater effort, motivation, and perseverance, which are essential for academic achievement in mathematics.

The findings of the present study are consistent with the literature emphasizing the importance of students' attitudes toward mathematics as a significant predictor of mathematics achievement. Wen and Dubé (2022), in their systematic review of empirical studies, concluded that students with positive attitudes toward mathematics consistently demonstrate higher levels of mathematics achievement than those with negative attitudes. The authors explained that positive attitudes enhance students' motivation, confidence, persistence, and willingness to engage in mathematical learning, thereby contributing to improved academic outcomes.

Similarly, Bejarano et al. (2025) reported that attitude toward mathematics is a multidimensional construct encompassing students' confidence, enjoyment, perceived value, and motivation to learn mathematics. Their review emphasized that students who value mathematics and enjoy learning it are more likely to invest greater effort in academic tasks, apply effective learning strategies, and achieve higher levels of academic performance. The authors further noted that fostering positive attitudes toward mathematics should be an important objective of mathematics instruction because affective factors substantially influence students' learning behaviors and achievement.

Furthermore, Caviola et al. (2022) highlighted that affective variables, including confidence in mathematics and mathematics-related anxiety, significantly influence students' mathematics performance. Students who exhibit positive attitudes and confidence are generally better equipped to manage academic challenges, persist through difficult learning tasks, and perform successfully in mathematics. These findings reinforce the present study's conclusion that cultivating positive attitudes toward mathematics can contribute to improved academic performance, even though other cognitive, instructional, and environmental factors also influence students' achievement.

Overall, the findings indicate that students' attitudes toward mathematics play a meaningful role in their academic success. Although the observed relationship is weak, it is statistically significant, suggesting that promoting positive attitudes through engaging instructional strategies, supportive classroom environments, and confidence-building learning experiences may enhance mathematics performance among Freshmen Marine Engineering students..

CONCLUSION

Based on the findings of the study, the following conclusions were drawn: First-year Marine Engineering students generally demonstrate a satisfactory level of engagement in mathematics, particularly in cognitive engagement, indicating that they actively apply learning strategies and exert mental effort in understanding mathematical concepts. The respondents generally possess positive attitudes toward mathematics, particularly in recognizing its usefulness and importance to their future profession. However, their confidence in their mathematical abilities still requires improvement. Although the respondents achieved a passing level of mathematics performance, there remains considerable room for improvement to meet the mathematical demands of higher engineering and maritime courses. There is no significant relationship between students' engagement and mathematics performance. This indicates that students' level of engagement alone does not necessarily translate into higher academic achievement in Mathematics A. Other factors beyond engagement may have a greater influence on students' mathematics performance. There is a significant positive relationship between students' attitude toward mathematics and mathematics performance. This implies that students who possess more positive attitudes toward mathematics are more likely to achieve better academic performance in Mathematics A, highlighting the importance of fostering positive mathematical attitudes among Marine Engineering students. Students' engagement and attitude toward mathematics are significantly and positively related. This implies that improving students' attitudes toward mathematics is likely to enhance their engagement, which may contribute to better academic performance in mathematics.

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