Original Research Article

Students' Attitudes and Academic Achievement in Mathematics in the Modern World: A Correlational Analysis

ABSTRACT

Aims: This study aims to examine the relationship between students' attitudes toward mathematics and their academic achievement in Mathematics in the Modern World (MMW) at the University of Eastern Philippines. It seeks to determine whether a positive attitude significantly influences students' performance in MMW.

Study Design: A descriptive-correlational research design was employed, with the descriptive method used to characterize students' attitudes toward mathematics and their achievement, while the correlational approach assessed the relationship between these two variables.

Place and Duration of Study: The study was conducted at the University of Eastern Philippines, including its main campus, Pedro Rebadulla Memorial Campus, and Laoang Campus, during the second semester of the 2024–2025 academic year.

Methodology: The study utilized proportional sampling, involving 310 students enrolled in MMW. A structured questionnaire was used for data collection, consisting of two sections: a checklist on students' attitudes toward mathematics, adapted from Bangalan and Hipona, and a 40-item achievement test, covering the four mandated topics in MMW, adapted from Garcia. Statistical analyses, including the Pearson correlation, were conducted to determine the significance of the relationship between attitudes and achievement.

Results: Findings revealed that students generally hold a positive attitude toward mathematics, with an overall mean attitude score of *3.524 (SD = 0.4808),* interpreted as positive. The students' achievement in MMW was categorized as satisfactory, with a mean score of 19.00 *(SD = 7.638)*. A significant positive correlation *(r = .386, p < .01)* was found between students' attitudes and their academic achievement, indicating that students with more favorable perceptions of mathematics tend to achieve higher scores in MMW.

Conclusion: The study underscores the importance of fostering positive attitudes toward mathematics to enhance academic achievement. It recommends interactive teaching methodologies, confidence-building initiatives, curriculum integration of practical applications, and individualized learning support to improve student engagement and mathematical proficiency. These findings reinforce the need for strategic educational interventions to optimize learning outcomes in mathematics.

1. INTRODUCTION

Mathematics has been an integral part of human civilization since ancient times. Early societies, such as the Egyptians and Babylonians, utilized mathematics for practical purposes like constructing pyramids, managing agricultural products, and conducting trade (Smith, 2018). The Greeks further advanced mathematical knowledge, with figures like Pythagoras and Euclid laying the groundwork for modern mathematical theories (Johnson, 2020). This historical context underscores the presence of mathematics everywhere, demonstrating its essential role in various aspects of life and its enduring significance across different cultures and eras.

The practical applications of mathematics in numerous fields have led to its inclusion in educational curricula from an early age. Mathematics is not just an abstract discipline; it has profound implications in areas such as engineering, technology, finance, and medicine (Brown & Lee, 2019). For instance, engineers rely on mathematical principles to design infrastructure (Garcia, 2021), financial analysts use statistical models to predict market trends (Rodriguez, 2022), and medical professionals apply mathematical concepts to analyze data and improve patient care (Harris, 2020). Recognizing these applications, educational systems worldwide have integrated mathematics into the curriculum to equip students with essential problem-solving and critical-thinking skills that are valuable in both personal and professional contexts (Miller et al., 2023).

One notable example of the inclusion of mathematics in the curriculum is the course Mathematics in the Modern World (MMW). The course aims to provide students with a comprehensive understanding of mathematical concepts and their applications in everyday life (Bangalan & Hipona, 2020). The curriculum covers a wide range of topics, including the nature of mathematics, its practical, intellectual, and aesthetic dimensions, and the use of mathematical tools in daily activities (Campos & Edig, 2022). The course provides an opportunity for students to explore the patterns around them, the nature of mathematics, mathematics as a language, and mathematical problem-solving (Roman & Villanueva, 2019). Along with statistics, the course allows students to explore the many applications of mathematics as emphasized in the optional topics such as geometric designs, codes, linear programming, mathematics of finance, apportionment and voting, logic, mathematics of graphs, and mathematical systems (Carbonel et al., 2022).

The all-in-one nature of MMW poses a challenge to the attainment of its outcomes. Since the subject includes several branches of mathematics, there is limited time for a thorough discussion of topics and the practice of skills (Rodrigo & Prudente, 2024). Bangalan and Hipona (2020) found that there are too many topics and terminologies, and there is a lack of practice in problem-solving in the course. With this, Campos and Edig (2022) discussed that teachers tend to rush lessons just to finish the syllabus within the given timeframe, which compromises students' creativity and understanding and impedes their learning in mathematics. Students also struggle to apply concepts to problem-solving as they fail to develop a deep understanding of these concepts and simply rely on rote memorization of formulas, as the delivery of content is rushed to fulfill the course syllabus (Villa & Sebastian, 2021).

As the only mathematics course among the General Education Courses prescribed by the Commission on Higher Education, the attainment of the learning outcomes in MMW has been the focus of many studies (Garcia, 2022). Carbonel et al. (2022) analyzed students' achievement in the course and examined their association with variables such as interest and attitudes. Their findings revealed that students demonstrated a moderate level of achievement based on their course grades. Similarly, Roman and Villanueva (2019) explored related variables and their connection to the attainment of course learning outcomes. Their study also reported satisfactory results, as evidenced by students' course grades. Results in both studies imply that there is still considerable room for improving the extent to which the learning outcomes are achieved. While course grades are widely considered a measure of learning outcomes, achievement tests provide a uniform and direct measure across different contexts (Musa et al., 2022). Achievement tests also provide immediate feedback to both teachers and students, helping them identify areas for improvement (Núñez et al., 2024). Since MMW allows teachers to choose elective topics after Data Management, measuring outcomes through course grades may be inconsistent as one class may have different elective topics from another. Thus, in the context of this course, outcomes are better measured in terms of student achievement (Hwang & Son, 2021).

As the teaching-learning process involves reciprocal interactions, several factors associated with students' mathematics achievement must be considered (Chen et al., 2018). Some of these are individual factors, which examine how students engage with instruction and receive knowledge and skills, and instructional factors, which pertain to how teachers deliver instruction—whether they simply provide knowledge or facilitate learning (Brezavšček et al., 2020). These factors, along with achievement, provide valuable information that enables educators to improve instructional quality, minimize difficulty, and enhance the attainment of learning outcomes in the course (Al-Mutawah & Fateel, 2018).

Objectives

This study aimed to determine the students' attitudes toward mathematics and its relationship with their achievement in Mathematics in the Modern World (MMW).

Specifically, it aimed to:
1. Identify the students' attitudes toward mathematics
2. Determine the students' level of achievement in MMW
3. Determine if there is a significant relationship between the students' attitudes towards mathematics and their achievement in MMW.

2. METHODS

Research Design

This study used the descriptive-correlational method of research. A descriptive method was used as it described the students' attitudes towards mathematics and their achievement in Mathematics in the Modern World. In addition, a correlational method was used as well, since the researcher attempted to identify if there is a significant relationship between the students' attitudes towards mathematics and their achievement in MMW.

Population and Sampling

This study used proportional sampling, involving 310 students enrolled in the course Mathematics in the Modern World during the second semester of the 2024–2025 academic year at the University of Eastern Philippines. The sample comprised 234 students from the main campus, 55 from Pedro Rebadulla Memorial Campus, and 21 from the Laoang Campus, proportionally selected based on the distribution of the total population of MMW students across these campuses during the said term.

The Respondents

The respondents of this study were 310 students who were officially enrolled in the University of Eastern Philippines and were taking up the course Mathematics in the Modern World during the second semester of the academic year 2024-2025.

Research Instrument

To gather the necessary data, a questionnaire was used in this study. The instrument was composed of two parts. The first part is composed of a checklist to assess the students' attitude towards mathematics, adapted from the study of Bangalan and Hipona(2020). To measure achievement in MMW, the second part of the instrument was an achievement test composed of 40 items covering the four mandated topics in MMW, which was adapted from the study of Garcia (2022).

3. RESULTS AND DISCUSSION

Students' Attitudes

Table 1 presents the students' attitudes towards mathematics, consisting of a range of perspectives towards mathematics, providing indicators of the extent of students' agreement and confidence in the subject. Among the statements, statement 1, "Math is a worthwhile, necessary subject" (M = 4.20, SD = .828), ranked the highest, interpreted as highly positive. This suggests that students acknowledge the fundamental importance of mathematics in their education. Additionally, statement 10, "I'll need a good understanding of math for my future work" (M = 4.05, SD = .855), statement 16, "I study math because I know how useful it is" (M = 4.05, SD = .903), statement 20, "School math is relevant to life in today's world" (M = 4.04, SD = .939), and statement 6, "I will use mathematics in many ways as an adult" (M = 3.96, SD = .911), all received high mean scores, interpreted as positive. These findings reveal that students recognize mathematics as a practical skill essential for their future careers and daily life applications.

Conversely, statements with the lowest mean scores—statements 14, "Math is not important in my life" (M = 1.93, SD = 1.128), 3, "Taking math is a waste of time" (M = 1.96, SD = 1.095), and 12, "Doing well in math is not important for my future" (M = 2.09, SD = 1.137)—were the least agreed upon, and were all interpreted as positive. The low agreement with these statements reinforces the perception that mathematics is valued by students despite possible challenges in comprehension or engagement, especially when statement 19, "I find math difficult" (M = 3.63, SD = .999), was the only

statement interpreted as negative. This perceived difficulty by the students indicates a barrier to their engagement with the subject.

The overall mean attitude towards mathematics is 3.524 (SD = .4808) and is interpreted as positive. This suggests that students hold a favorable perception of mathematics as something essential for their education and their future careers, despite finding it difficult.

The findings of this study agree with those of Bangalan and Hipona (2020) and Cabugwason et al (2024). The study found that students recognize the importance of mathematics in their education and their lives, without neglecting its difficulty. The overall results of this study in terms of attitudes also affirm that of the said study, as both resulted in a positive attitude from the students.

Table 1. Students' Attitudes Towards Mathematics

Statements	M	SD	Interpretation
1. Math is a worthwhile, necessary subject.	4.20	.828	Highly Positive
2. I'm not the type to do well in math.[*]	3.20	1.001	Neutral[**]
3. Taking math is a waste of time.[*]	1.96	1.095	Positive[**]
4. Math has been my worst subject.[*]	2.74	1.221	Neutral[**]
5. I think I could handle more difficult math.	3.05	.944	Neutral
6. I will use mathematics in many ways as an adult.	3.96	.911	Positive
7. I see mathematics as something I won't use very often when I get out of school.[*]	2.71	1.176	Neutral[**]
8. Most subjects I can handle well, but I just can't do a good job with math.[*]	3.24	1.033	Neutral[**]
9. I can get good grades in math.	3.44	.797	Positive
10. I'll need a good understanding of math for my future work.	4.05	.855	Positive
11. I know I can do well in math	3.70	.894	Positive
12. Doing well in math is not important for my future.[*]	2.09	1.137	Positive[**]
13. I am sure I could do advanced work in math.	3.26	.882	Neutral
14. Math is not important in my life.[*]	1.93	1.128	Positive[**]
15. I'm not good at math.[*]	3.05	.989	Neutral[**]
16. I study math because I know how useful it is.	4.05	.903	Positive
17. I can usually manage the math we do at school.	3.60	.867	Positive
18. I like learning math.	3.66	.978	Positive
19. I find math difficult.[*]	3.63	.999	Negative[**]
20. School math is relevant to life in today's world.	4.04	.939	Positive
Grand Mean	**3.524[***]**	**.4808**	**Positive**

*. Negative Statements
**. Interpretations were based on reversed scoring
***. The grand mean was obtained after the reversed scoring of the negative statements.

Students' Achievement in Mathematics in the Modern World

Table 2 shows the students' achievement in MMW as reflected in the results of the achievement test. 111 students (35%) scored within 8-15, which indicates a Fair level of achievement, while 95 students (30.6%) were within the scores of 16-23 interpreted as satisfactory, and 78 students (25.2%) a very satisfactory level. Meanwhile, less than 10% achieved an outstanding (f = 17, 5.5%) and poor (f = 9, 2.9%) levels of achievement. These findings indicate that most students performed at Fair to Satisfactory levels, with a notable portion reaching Very Satisfactory. Few achieved Outstanding or Poor levels, showing that extreme scores were less common.

The mean score was 19.00 (SD = 7.638), which falls within the satisfactory category. These findings align with Rodrigo and Prudente's (2024) study whose findings reveal an average level of achievement of the students in the subject. The high variability in students' scores (SD = 7.638) indicates that students have differing levels of understanding of the course concepts.

Similarly, Villa and Sebastian's (2021) and Lupas et al (2024) findings revealed an average level of overall achievement in MMW, which aligns with the results of this study. Additionally, the low percentages of both high and low achievers further support the findings of this study.

The overall results of this study affirm the findings of Dagdag et al. (2021) and Garcia (2022), both of which indicate a satisfactory level of student achievement in the course.

Table 2. Students' Achievement in Mathematics in the Modern World

Scale	f	%	Interpretation
32 – 40	17	5.5	Outstanding
24 – 31	78	25.2	Very Satisfactory
16 – 23	95	30.6	Satisfactory
8 – 15	111	35.8	Fair
0 – 7	9	2.9	Poor
Total	**310**	**100**	
Mean		**19.00**	**Satisfactory**
SD		**7.638**	

Relationship between Students' Attitudes toward Mathematics and their Achievement in MMW

In Table 3, the results of the test of the relationship between the individual factors in terms of students' attitudes and students' achievement in MMW are presented. The results indicate a significant positive correlation between students' attitudes toward mathematics and their achievement in MMW ($r = .386$, $p < .01$). This indicates that students who develop positive attitudes towards mathematics tend to have high achievement.

These findings align with those of Chen et al. (2018), Brezavšček et al. (2020), Hwang and Son (2021), Peteros et al. (2019), Al-Mutawah and Fateel (2018), Musa et al. (2022), and Núñez et al. (2024) all of which identified students' attitude as positively correlated with achievement.

Table 3. Test of Relationship between Individual Factors in terms of Students' Attitudes and Students' Achievement in MMW

Students' Attitudes toward Mathematics	Students' Achievement in MMW
Pearson-r	.386[*]
Sig. (2-tailed)	.000
Interpretation	Significant

*. Correlation is significant at .01 level (2-tailed)

4. CONCLUSION

The findings of this study indicate that students generally hold positive attitudes toward mathematics, recognizing its relevance and necessity in their academic and future careers. The majority of students strongly agree that mathematics is essential, highlighting its practical application in various fields. Despite this positive outlook, some students perceive mathematics as difficult, which could present challenges to engagement and performance.

Regarding student achievement in Mathematics in the Modern World (MMW), the results show that most students perform at satisfactory levels, with fewer students scoring in the outstanding and poor categories. The variability in scores suggests differing levels of understanding among students.

The study also reveals a significant positive correlation between students' attitudes toward mathematics and their achievement in MMW. This supports the notion that fostering positive attitudes toward mathematics can contribute to improved academic achievement. These findings align with previous studies, reinforcing the importance of students' perceptions in their academic success.

Recommendations

Based on the findings of this study, the following recommendations are put forth:
1. Enhancing Engagement Strategies. Since some students find mathematics difficult, educators should implement engaging and interactive teaching methods, such as gamification, real-world applications, and technology integration.

2. Building Confidence in Mathematics. Programs that boost confidence, such as peer tutoring, mentorship, and supplemental learning materials, should be encouraged to help students develop a stronger grasp of mathematical concepts.
3. Curriculum Development. Schools should consider integrating practical applications of mathematics into lessons to emphasize its relevance to daily life and future careers.
4. Individualized Support. Given the variability in students' achievement levels, personalized interventions should be provided for students struggling with mathematics, including remedial classes and tailored learning resources.
5. Further Research. Future studies could investigate the impact of specific teaching methodologies on student attitudes and achievement to refine strategies for improving math education.

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