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Attitudes and Mathematics Proficiency among Second Year Higher Education Students

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ABSTRACT: *This study compared the attitudes and mathematics proficiency among second-year university students. Utilizing a descriptive-comparative research design, 88 students were selected through random sampling, with data analyzed using frequency counts, weighted mean, percentages, standard deviation, and One- way analysis of variance (one-way ANOVA). Findings revealed that most most of the respondents have access in basic mathematical books, and 78.41% of the population spent 1-2 hours per week in studying mathematics. Students demonstrated a generally neutral attitude towards learning mathematics; however, comparative analyses indicated no significant difference in attitudes based on the programs enrolled which implies their attitudes towards mathematics are the same regardless of the academic program students are enrolled in. In contrast, the comparative test of mathematics proficiency revealed significant differences related to the programs enrolled which suggests that the academic program in which students are enrolled has an impact on their mathematics skills. The study concludes with a recommendation to implement the proposed action plan to address identified gaps and support holistic students' development. In the long run, this will result in a well-rounded education for the students, equipping them with the knowledge and attitude needed for success both in and outside the classroom. The university will be proactive in ensuring that students are not only mathematically proficient but also professionally and academically successful.*

Key words*: Enjoyment, mathematics attitudes, proficiency, self-confidence, value.*

1. Introduction

Mathematics plays a vital role in shaping analytical and problem-solving abilities among university students (Yang, 2024). At the tertiary level, especially in science, engineering, and business-related fields, mathematical proficiency is closely linked to academic success and employability (Feher et al., 2022). However, consistent challenges persist in student performance and engagement in mathematics. Recent research has revealed that many students enter university with inadequate preparation and low confidence in their mathematical skills (Weaver, 1957; Chand et al., 2021). This concern underscores the need to examine both the cognitive and affective dimensions of mathematics learning in university contexts.

A student's attitude toward mathematics can either fuel academic success or hinder it. Attitude encompasses a variety of factors confidence, motivation, perceived value of the subject, and anxiety levels (Wen & Dubem 2022; Tan et al., 2025). Negative attitudes, such as fear of failure or lack of confidence, often translate into lower performance and a tendency to avoid engaging with math-related subjects (Laranang & Bondoc, 2020). On the other hand, students who believe in their mathematical abilities and view the subject as important to their lives are more likely to invest time and effort in learning it (Raj et al., 2022). A growing body of research emphasizes the need to cultivate positive attitudes early in education to lay the groundwork for success at higher levels

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(Saleh, 2015). Understanding students' emotional and cognitive disposition toward mathematics provides educators with critical insights into how best to support them (Huda & Syafmen, 2021).

Numerous studies have examined the correlation between students' attitudes and their mathematics proficiency. For example, Cerbito (2020) found that senior high school students who held negative attitudes toward mathematics also exhibited lower proficiency levels (Cerbito, 2020). Similarly, attitudes such as confidence and motivation have been identified as significant predictors of students' success in mathematics (Clyde et al., 2022). These findings suggest a strong interplay between affective factors and academic performance.

At the university level, the complexity and abstraction of mathematics often intensify existing challenges. Research shows that many students experience anxiety, lack of confidence, and disconnection from mathematical content (Yusof & Tall, 1998; Anson, 2021). Moreover, when traditional teaching methods dominate, students may resort to rote memorization rather than meaningful understanding (Bano et al., 2025). In a study of calculus students, those who engaged in reflective and problem-based learning developed more positive attitudes and higher comprehension (Alkhateeb & Hammoudi, 2006).

Students' mathematical attitudes and proficiencies are shaped by numerous background variables including socioeconomic status, and previous academic achievement. A study conducted at Hawassa University found that male students and those with strong prior achievement had significantly more positive attitudes toward mathematics (Zeleke & Semela, 2015). Meanwhile, South African research on pre-service accounting teachers showed that external influences such as parental support and quality of secondary education also played important roles in shaping mathematical attitudes (Mkhize & Maistry, 2017). These findings imply that no single factor operates in isolation. Instead, a web of personal, educational, and cultural factors contribute to how students perceive and perform in mathematics. Therefore, identifying these factors within the local context of the University of the Visayas is essential for crafting responsive and effective educational interventions.

While global and regional studies provide valuable insights, localized research remains essential to address the specific needs of student populations. The University of the Visayas, with its diverse student body, presents a unique context in which to explore the connection between attitudes and mathematics proficiency. Understanding the psychological and academic profiles of second-year students can inform targeted interventions and pedagogy. Contextualizing findings within the local education system, this study aims to contribute to improving mathematics education practices and student outcomes in the Philippines.

2. Review of Related Literature

The relationship between students' attitudes toward mathematics and their academic performance has been extensively explored in educational research. Numerous studies suggest that attitudes, including enjoyment, motivation, and self-confidence, are strong predictors of mathematics proficiency. For instance, Cerbito (2020) found that Filipino senior high school students with positive attitudes toward mathematics measured via the Attitudes Toward Mathematics Inventory (ATMI) tended to perform better in mathematical assessments. However, the same study revealed that many students still exhibited negative attitudes, particularly in terms of confidence and motivation, which were directly correlated with lower proficiency levels (Cerbito, 2020). Similarly, Clyde et al. (2022) demonstrated that among university students engaged in online learning, those with higher self-regulation and more positive math attitudes achieved significantly better proficiency outcomes. Interestingly, while self-regulated learning was important, students' attitudes emerged as the more powerful predictor of performance (Clyde et al., 2022).

At the university level, attitudes toward mathematics can shift dramatically due to changes in instructional style, course complexity, and student expectations. Yusof and Tall (1998) conducted an intervention study showing that when students were exposed to a collaborative, problem-solving-

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focused mathematics course, their attitudes became significantly more positive. However, after returning to traditional lecture-based teaching, most students regressed to earlier negative attitudes, highlighting how pedagogy influences affective responses to learning (Yusof & Tall, 1998). Similarly, Alkhateeb and Hammoudi (2006) found that students who adopted a deep learning approach to mathematics characterized by understanding and reflection reported more positive attitudes and achieved better academic outcomes compared to those using surface-level strategies (Alkhateeb & Hammoudi, 2006). These findings underscore the importance of both instructional design and students' mindset in fostering mathematics success.

3. Methodology

This study adopted a descriptive-comparative research design to examine the relationship between students' attitudes and their mathematics proficiency, and to explore potential differences among students enrolled in different academic programs. This approach was chosen because it allows for the analysis of variables without manipulating any conditions, which is suitable for comparing naturally occurring groups, such as undergraduate students from varied academic disciplines (Cantrell, 2011); (Polit & Beck, 2007). The research focused on second-year students at the University of the Visayas – Main Campus who were enrolled in the "Mathematics in the Modern World" course during the academic year 2024–2025. Out of a total population of 88 students from the BS Communication, BS Biology, and BS Psychology programs, a sample of 88 was selected using simple random sampling, ensuring each student had an equal chance of selection (Cochran, 1977). Data collection involved two main instruments: a researcher-made Mathematics Proficiency Test based on CHED's General Education Curriculum guidelines, and the validated Attitudes Toward Mathematics Inventory (ATMI) developed by Tapia and Marsh (2004). The math test included 40 multiple-choice items covering preliminary topics such as patterns in nature, the Fibonacci sequence, and set theory, while the attitude survey measured self-confidence, enjoyment, motivation, and perceived value of mathematics using a 5-point Likert scale. Data were gathered through a face-to-face format using the Blackboard Learning Management System, with students allotted 90 minutes to complete both the test and the survey. The data collection followed three key phases: preparation and consent, administration of instruments, and post-assessment analysis. The results were analyzed using weighted mean, standard deviation, and one-way ANOVA to interpret average scores, measure variability, and identify statistically significant differences in proficiency and attitude across groups. This methodology aimed to provide a comprehensive understanding of both the cognitive and affective dimensions of students' mathematical learning experiences, contributing meaningful insights to teaching practices and institutional strategies.

4. Results and Discussion

Table 1. Reading Materials Available at Home.

Reading Materials	f	Rank
Mathematics Videos/DVD tutorials	2	6
Practice Workbooks/Problem Solving Guides	4	4
Basic Mathematics Books	30	1
Online Resources	27	3
Advanced Mathematics Books	3	5
Magazines	0	0
None	28	2

The data presented in Table 1 highlight the types of reading materials available at home to support students' mathematics learning. Unsurprisingly, basic mathematics books were the most

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common resource, available to 30 students, suggesting that foundational materials remain a primary tool for academic support. Interestingly, online resources came in third with 27 students reporting access, reflecting the growing reliance on digital platforms for learning particularly among today's tech-savvy students. However, a concerning finding is that 28 students, or nearly one-third of the population, reported having no reading materials at home related to mathematics. This lack of access may contribute to difficulties in reinforcing concepts outside the classroom. Practice workbooks and problem-solving guides were moderately available (4 students), while advanced mathematics books (3 students) and math tutorial videos (2 students) were less common. These findings highlight the need for schools to consider supplemental material access when designing instructional support strategies.

Table 2. Time Spent Studying Math Per Week.

Time Spent (In Hours)	f	%
5-6	4	4.55
3-4	15	17.05
1-2	69	78.41
Total	88	100.00

The results in Table 2 reveal that the majority of students dedicate relatively little time to studying mathematics each week. A striking 78.41% of the respondents reported spending only 1 to 2 hours per week on math, which suggests that most students may not be engaging deeply or consistently with the subject outside of classroom instruction. Only 17.05% of the students indicated studying for 3 to 4 hours weekly, while a very small fraction just 4.55% spent 5 to 6 hours on mathematics. This limited time allocation could be due to several factors, including lack of motivation, difficulty understanding the subject, competing academic responsibilities, or even limited access to learning materials, as seen in the previous table. The findings raise concerns about whether students are investing enough time to develop and reinforce mathematical understanding, especially given the subject's cumulative nature. It highlights the importance of encouraging effective study habits and providing structured support for students outside class hours.

Table 3. Level of attitudes of the respondents in learning Mathematics in terms of self-confidence.

S/N	Indicators	WM	SD	Verbal Description
1	Mathematics is one of my most dreaded	3.20	0.79	Neutral
2	My mind goes blank and I am unable to think	2.83	0.87	Neutral
3	Studying mathematics makes me feel nervous.	2.84	1.03	Neutral
4	Mathematics makes me feel uncomfortable.	2.75	0.97	Neutral
5	I am always under a terrible strain in a math	2.99	1.06	Neutral
6	When I hear the word mathematics, I have a	2.93	0.99	Neutral
7	It makes me nervous to even think about	3.09	0.97	Neutral
8	Mathematics does not scare me at all.	2.99	0.93	Neutral
9	I expect to do fairly well in any math class I take.	3.59	0.83	Positive
10	I am always confused in my mathematics class.	2.89	0.89	Neutral
11	I have a lot of self-confidence when it comes to	2.99	0.99	Neutral
12	I am able to solve mathematics problems	2.81	0.80	Neutral
13	I feel a sense of insecurity when attempting	2.93	1.01	Neutral
14	I learn mathematics easily.	2.69	0.86	Neutral
15	I believe I am good at solving math problems.	2.70	0.85	Neutral

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The findings in Table 3 reveal that students generally hold a neutral level of confidence in learning mathematics. Out of fifteen indicators, only one expecting to do fairly well in any math class received a positive rating (WM = 3.59), while all others were rated neutral, indicating uncertainty or lack of strong belief in their math abilities. The lowest rating (WM = 2.81) was for the belief in being good at solving math problems, pointing to challenges in critical thinking and problem-solving. The overall mean of 2.95 and standard deviation of 0.92 further support a pattern of moderate self-confidence. Research supports that low self-confidence in math is linked to anxiety, avoidance, and reduced performance (Ciftci & Yildiz, 2019; Amiyani & Widjajanti, 2019; Kaur & Prendergast, 2022). These results underscore the need for targeted interventions that build students' math self-efficacy through supportive teaching and fostering a growth mindset.

Table 4 presents the respondents' attitudes toward the value of learning mathematics, showing an overall positive perception with an aggregate weighted mean of 4.08 and a standard deviation of 0.80. This indicates that most students recognize the importance and relevance of mathematics, which positively influences their motivation and engagement. Notably, statements such as "Mathematics is important in everyday life" and "I want to develop my mathematical skills" received very positive ratings, reflecting strong appreciation for the subject's practical utility. Supporting research affirms that students who see the real-life value of math tend to perform better and are more inclined to pursue further studies in the field (Abdulrahim & Orosco, 2020; Wigfield, 2023; Fong et al., 2021). These findings suggest that connecting math instruction to practical applications can enhance students' attitudes and academic outcomes, reinforcing the importance of value-based learning strategies in mathematics education.

Table 4. Level of attitudes of the respondents in learning Mathematics in terms of Value.

S/N	Indicators	WM	SD	Verbal Desc.
1	Mathematics is very worthwhile and necessary	4.02	0.88	Positive
2	I want to develop my mathematical skills	4.30	0.68	Very Positive
3	Mathematics helps develop the mind and teachers to think.	4.38	0.76	Very Positive
4	Mathematics is important in everyday life.	4.48	0.76	Very Positive
5	Mathematics is one of the most important subjects for people to study.	4.15	0.82	Positive
6	High school math courses would be very helpful	4.01	0.75	Positive
7	I can think of many ways that I use math outside	3.75	0.95	Positive
8	I think studying advanced mathematics is useful	4.01	0.88	Positive
9	I believe studying math helps me with problem solving in other areas.	3.91	0.80	Positive
10	A strong math background could help me in my professional life.	3.78	0.73	Positive
	Aggregate Weighted Mean	4.08		Positive
	Aggregate Standard Deviation		0.80	Positive

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Table 5. Level of attitudes of the respondents in learning Mathematics in terms of Enjoyment

S/N	Indicators	WM	SD	Verbal Desc.
1	I get a great deal of satisfaction out of solving a mathematical problem.	3.83	0.75	Positive
2	I have usually enjoyed studying mathematics in school.	3.23	0.78	Neutral
3	Mathematics is dull and boring.	2.17	1.01	Negative
4	I like to solve new problems in mathematics	3.07	0.81	Neutral
5	I would prefer to do an assignment in Math than to write an essay.	3.20	1.35	Neutral
6	I really like in mathematics.	3.06	0.88	Neutral
7	I am happier in a mathematics class that in any other classes.	2.43	0.77	Negative
8	Mathematics is a very interesting subject.	3.51	0.83	Positive
9	I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in Math,	2.83	0.90	Neutral
10	I am comfortable answering questions in Math.	2.94	0.91	Neutral
	Aggregate Weighted Mean	**3.03**		Neutral
	Aggregate Standard Deviation		0.90	

Table 5 presents the respondents' attitudes toward enjoyment in learning mathematics, revealing an overall neutral stance with an aggregate weighted mean of 3.03 and a standard deviation of 0.90. While a few indicators, such as enjoying problem-solving and preferring math assignments over essays, received mildly positive responses, most items such as comfort in answering questions or expressing problem-solving ideas were rated neutral, reflecting mixed feelings about math enjoyment. Some students appreciated the challenge of solving problems, which aligns with findings from Yeh et al. (2019) that enjoyment often comes from overcoming mathematical challenges. However, the presence of negative responses, particularly on statements like "Mathematics is dull and boring," signals a disconnect in engagement. Studies by Nazari (2021), Staus et al. (2020), and Aikenhead (2021) emphasized that low enjoyment is linked to anxiety, reduced motivation, and poor academic outcomes. These results suggest that educators must adopt more relevant, interactive, and real-world approaches to boost enjoyment and foster a more positive learning environment.

Table 6. Level of attitudes of the respondents in learning Mathematics in terms of Motivation.

S/N	Indicators	WM	SD	Verbal Desc.
1	I am confident that I could learn advanced mathematics	3.14	0.89	Neutral
2	I would like to avoid using mathematics in college.	2.69	0.98	Neutral
3	I am willing to take more than the required amount of mathematics.	2.68	0.88	Neutral
4	I plan to take as much mathematics as I can during my education.	2.74	0.85	Neutral
5	The challenge of math appeals to me.	3.35	0.87	Neutral
	Aggregate Weighted Mean	2.92		Neutral
	Aggregate Standard Deviation		0.89	

Table 6 reflects students' attitudes toward motivation in learning mathematics, revealing an overall neutral stance, with a total weighted mean of 2.92. While some students expressed interest in the challenge that math offers evidenced by the highest rating of 3.35 for the statement "The challenge of math appeals to me" many were less enthusiastic about going beyond the minimum requirements, as seen in the lowest rating of 2.68 for "I am willing to take more than the required amount of mathematics." This suggests that while students may enjoy solving problems, they do not necessarily feel motivated to pursue the subject further. The findings highlight a key issue: students' motivation appears situational and limited. Some are driven by the satisfaction of overcoming challenges, but this does not always translate into a deeper or sustained interest in mathematics. This aligns with research indicating that students' motivation often depends on how they perceive their own competence and the value they assign to the subject (Li et al., 2021; Mackowski et al.,

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2022; Pramita, 2022). If students don't see math as relevant to their personal goals or future careers, they may struggle to stay engaged. Ultimately, the neutral attitude toward motivation suggests the need for more supportive and inspiring learning environments. When students are given autonomy, relevance, and encouragement, they are more likely to develop a stronger drive to explore mathematics further (Meece, 2023).

Table 7. Level of performance of mathematics proficiency of the respondents.

Level	Numerical Range	f	%
Advanced	33-40	15	17.05
Proficient	25-32	37	42.05
Approaching Proficiency	17-24	28	31.82
Developing	9-16	5	5.68
Beginning	0-8	3	3.41
Total		88	100
Mean		25.72	
St. Dev.		6.62	

Table 7 presents a detailed look at the mathematics proficiency levels of 88 student respondents and paints a mixed, yet insightful picture of their performance. The majority of students 42.05% fell into the Proficient category, suggesting that many have a solid grasp of key mathematical concepts. Meanwhile, 31.82% were in the Approaching Proficiency level, indicating that they're on the verge of mastery but still need support to bridge that final gap. A smaller but notable portion, 17.05%, achieved an Advanced level, showing strong performance and potential for excelling in higher-level math. However, the presence of students in the Developing (5.68%) and Beginning (3.41%) levels highlights the need for targeted interventions. These students may struggle with foundational skills and would benefit from individualized support and early remediation strategies (Go, 2023; Santos et al., 2022). The average score of 25.72 falls within the Proficient range, suggesting a generally capable cohort but with room for improvement. This distribution reflects broader research findings that emphasize the importance of instructional quality and student motivation in moving students toward proficiency (Macdonald et al., 2020; Birgin et al., 2020). The data underscore the importance of continued academic support, differentiated instruction, and encouragement, especially for those just below or well below proficiency. By addressing both high achievers and those needing assistance, educators can help all students reach their full mathematical potential.

Table 8. Test of Difference on the respondents' attitudes when grouped by the program enrolled

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value	Remarks
Between Groups	0.093	2	0.047	0.722	0.489	Not Significant
Within Groups	5.500	85	0.065			
Total	5.594	87				

Note: *Significant at p<0.05.

Table 8 reveals that students' attitudes toward learning mathematics did not significantly differ across the various academic programs they were enrolled in. With an F-value of 0.722 and a p-value of 0.489, the analysis confirms that the differences observed between groups were not statistically significant, as the p-value exceeded the common significance threshold of 0.05. This means whether students were studying Communication, Biology, or Psychology, their attitudes toward math were largely similar. These findings suggest that students' perceptions of mathematics may be shaped more by shared learning experiences, teaching methods, or internal factors like personal motivation rather than their specific academic discipline.

This aligns with previous research by Berger et al. (2020) and Moreno-Guerrero et al. (2020), who emphasized that factors such as classroom environment, instructional style, and general curriculum structure play a greater role in shaping students' math attitudes than their chosen field of study. In short, math-related challenges and beliefs appear to be universal among students, pointing to the need for cross-program interventions that address common barriers to enjoying and succeeding in mathematics.

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Table 9. Test of Difference on the mathematics proficiency when grouped by the program enrolled.

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value	Remarks
Between Groups	417.894	2	208.947	5.224*	0.007	Significant
Within Groups	3400.003	85	40.000			
Total	3817.898	87				

Note: *Significant at p<0.05.

Table 9 highlights a statistically significant difference in mathematics proficiency among students from different academic programs, with an F-value of 5.224 and a p-value of 0.007, which is below the standard 0.05 threshold. This means that unlike attitudes, students' actual performance in mathematics varied depending on their academic track. Some programs likely place more emphasis on math-related subjects or use more effective teaching strategies, which may contribute to stronger performance. The results suggest that program-specific factors such as curriculum focus, teaching methods, and the amount of math instruction play a critical role in shaping students' mathematical abilities. This supports findings by Correa & Haslam (2021) and Retnawati & Wulandari (2019), who noted that educational context significantly influences math learning outcomes. Given these disparities, there is a clear need for tailored interventions. Programs where students struggle with proficiency may benefit from curriculum revisions, added learning support, or enhanced instructional practices (Malasari et al., 2020; Jonsson et al., 2020). In essence, the findings point to the importance of creating program-specific strategies to boost math performance and ensure all students, regardless of their major, have a solid mathematical foundation.

5. Discussion

Based on the analysis of the results presented across various tables, several key insights emerge about students' attitudes and proficiency in mathematics. A significant finding is the disparity in mathematics performance across academic programs despite relatively uniform attitudes. As shown in Table 9, students from different programs showed statistically significant differences in math proficiency levels ($p = 0.007$), suggesting that curriculum design, teaching strategies, and program-specific academic support may influence students' performance. This is consistent with findings by Correa and Haslam (2021), who emphasized the role of differentiated instructional practices and curricular emphasis in enhancing mathematics outcomes across diverse student populations. Furthermore, Retnawati and Wulandari (2019) echoed this view, stating that well-structured learning environments and contextualized teaching methods significantly contribute to students' success in mathematics. Conversely, the results from Table 8 demonstrated no statistically significant differences in attitudes toward mathematics across programs ($p = 0.489$). This implies that students, regardless of their academic track, share similar perspectives whether positive or neutral toward learning mathematics. Such uniformity in attitude may be shaped more by shared educational experiences and common teaching methodologies than by field-specific influences. This finding is supported by Berger et al. (2020), who noted that personal learning experiences and teacher engagement often shape students' attitudes more strongly than their academic disciplines. Similarly, Musthafa and Naseer (2024) found that teacher approach, foundational knowledge, and home support were more influential than program-based factors in shaping students' mathematical perceptions and success. Collectively, these results call for both targeted academic interventions in underperforming programs and broad-based strategies that enhance the overall learning environment and pedagogical quality in mathematics education.

6. Conclusion

The study revealed that while students value mathematics and recognize its importance, their confidence, motivation, and enjoyment remain neutral. Most students spend limited time studying math and lack access to learning resources at home, which may affect their proficiency. Attitudes toward math were consistent across programs, but actual performance varied significantly, suggesting that instructional quality and program-specific factors influence outcomes. To improve both attitude and performance, schools should promote supportive, engaging learning environments and provide targeted interventions where needed.

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