

Attitude, Motivation, and Self-Regulation in Mathematics as Predictors of Achievement among Learners

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ABSTRACT

This study determined the levels of attitude toward mathematics, motivation, and self-regulation and examined their relationship with mathematics achievement among Grade 11 learners in one public high school during the School Year 2026–2027. Specifically, it analyzed whether these variables significantly predict mathematics achievement. The study employed a quantitative descriptive-correlational research design. The researchers selected 101 Grade 11 students through total enumeration. The researchers collected data using adapted and validated instruments such as the Attitudes Toward Mathematics Inventory (ATMI), the Mathematics Motivation Scale, and the Short Self-Regulation Questionnaire (SSRQ). Mathematics achievement was determined using the learners' final grades in Mathematics. Data were analyzed using frequency and percentage, mean, standard deviation, Spearman's rho correlation, and multiple linear regression analysis. Results revealed that the respondents demonstrated a high level of attitude toward mathematics, motivation in mathematics, and self-regulation. The learners also exhibited an outstanding level of mathematics achievement. Furthermore, significant positive relationships were found between mathematics achievement and attitude, motivation, and self-regulation. Multiple regression analysis revealed that attitude, motivation, and self-regulation collectively explained the variance in mathematics achievement. However, attitude toward mathematics was found as the only significant predictor of mathematics achievement. The findings emphasize the importance of fostering positive attitudes toward mathematics to enhance students' academic performance.

Keywords: attitude toward mathematics, mathematics motivation, self-regulation, mathematics achievement, multiple regression analysis

INTRODUCTION

Recent international large-scale assessments have shown continuing challenges in students' mathematics performance, highlighting the need to investigate factors influencing learning outcomes, as Filipino students continue to perform below global standards in Mathematics (Organisation for Economic Co-operation and Development, 2023). Filipino students were second to last out of 79 participating countries in the 2018 PISA rankings, with an average Mathematics score of 353 points, much lower than the OECD average of 489 points. According to Dooma et al., (2024), and Acido & Caballes (2024), this performance level is below Level 1 proficiency. These results set the need to investigate learner-related factors that may influence mathematics achievement.

The teaching and learning of mathematics have evolved in response to changing educational demands, advances in cognitive science, and developments in instructional approaches. Despite these innovations, many students continue to experience difficulties in mastering mathematical concepts, suggesting that academic success is influenced not only by cognitive abilities but also by psychological and behavioral factors. Among these factors, attitude toward mathematics, motivation, and self-regulation have been recognized as important determinants of learners' achievement.

In the Philippine setting, several studies have confirmed the roles of these factors in mathematics achievement. Abarca and Osic (2024) found that motivation significantly predicts mathematics achievement, while Mondigo and Uchang (2025) reported that highly motivated students tend to perform better academically. Similarly, Claridad and Ayson (2025) observed that positive attitudes toward mathematics are associated with higher academic performance, whereas Rivera and Canoy (2025) emphasized that students who effectively regulate their learning processes achieve better learning outcomes. These findings underscore the importance of considering affective and self-regulatory factors in mathematics education.

Given these circumstances, investigating the attitude, motivation, and self-regulation of senior high school students in one of the schools divisions in Negros Occidental is both relevant and necessary. Understanding how these factors relate to mathematics achievement may provide valuable insights for educators, school administrators, and policymakers in developing interventions and instructional strategies that enhance learner performance. Ultimately, this study seeks to contribute to the improvement of mathematics education by promoting a deeper understanding of the non-cognitive factors that support academic success and meaningful learning experiences.

METHODOLOGY

This study utilized a quantitative research design, specifically a descriptive-correlational method. This design was appropriate as it aimed to determine the relationship and predictive effect of attitude, motivation, and self-regulation on mathematics achievement among Grade 11 students.

Descriptive research was used to describe the levels of the variables, while correlational analysis determined the relationships among them. This research design was appropriate since it described the nature of the variables and examined the associations between them. In this type of design, variables were measured using instruments such that numeric data is collected and then analyzed using statistical procedures (Creswell, 2008).

The target respondents of this study were the Grade 11 students enrolled in one of the schools in the Negros Occidental during the School Year 2026–2027. These students were selected because they were expected to demonstrate higher engagement and performance in mathematics, making them suitable participants for examining the predictive effects of identified variables on academic achievement.

The study employed total enumeration, where all members of the population were included as respondents. This technique was appropriate since the population size is manageable and ensured that all Grade 11 students were represented, thereby increasing the reliability and accuracy of the results.

The study utilized a structured survey questionnaire consisting of five parts to measure the respondents' attitude toward mathematics, motivation in mathematics, and self-regulation, together with their demographic characteristics. The instrument was adapted from established and validated measures previously utilized in mathematics education research.

Part I collected the demographic profile of the students, including sex, monthly family income, and parents' highest educational attainment. Part II measured students' attitude toward mathematics, consists of forty (40) statements adapted from the Attitudes Toward Mathematics Inventory (ATMI) developed by Tapia and Marsh (2004) and utilized by Claridad and Ayson (2025). The instrument measured students' attitudes toward mathematics in terms of self-confidence, value, enjoyment, and motivation. Part III focused on students' motivation in mathematics, containing twenty-four (24) statements adapted from the Mathematics Motivation Scale developed by Zakariya and Barattucci (2021). The scale measured students' motivation in mathematics across dimensions such as self-efficacy for learning and performance, intrinsic motivation, utility of mathematics motivation, importance of mathematics motivation, and extrinsic motivation. The instrument evaluated students' interest, persistence, effort, perceived usefulness of mathematics, and desire to succeed in the subject. Part IV is the Short Self-Regulation Questionnaire (SSRQ), which consisted of thirty-one (31) statements adapted from the Self-Regulation Questionnaire (SRQ) developed by Brown, Miller, and Lawendowski (1999) and subsequently utilized by Mathew and Simon (2024). The instrument measured students' self-regulatory

behaviors, particularly in goal setting, planning, self-monitoring, self-evaluation, decision-making, and impulse control. It assessed students' capability to direct and manage their own learning processes effectively.

All items in Parts II, III, and IV utilized a five-point Likert scale to measure the degree of respondents' agreement with each statement, where 5 = Strongly Agree (SA), 4 = Agree (A), 3 = Neutral (N), 2 = Disagree (D), and 1 = Strongly Disagree (SD).

Lastly, Part V measured mathematics achievement, using their final grades in Mathematics obtained from official school records, obtained from their official academic records, as provided by the subject teacher or school.

The study utilized adapted and standardized instruments to measure attitude toward mathematics with 40 items, motivation in mathematics with 24 items, and self-regulation among Grade 11 students, with 31 items. The study utilized previously validated instruments and did not undertake a separate validation procedure because the instruments had already established evidence of validity and reliability in prior studies.

The data gathering process began with securing permission from the school principal and the Schools Division Superintendent to conduct the study among Grade 11 students. Upon approval, the researcher coordinated with the class advisers to facilitate the administration of the survey questionnaire. Before distributing the instrument, the purpose of the study was clearly explained to the respondents, and informed consent was obtained to ensure voluntary participation.

The questionnaire was administered through Google Forms, allowing respondents to answer the survey using their mobile devices or computers during a scheduled class period or thereafter. This method ensured efficiency in data collection and minimized physical contact while maintaining accuracy in recording responses. The survey research instrument included items that measured students' attitude toward mathematics, motivation, and self-regulation. Respondents were given sufficient time to complete the questionnaire honestly and independently.

After submission, the responses were automatically recorded and stored in a secure online database. The researcher reviewed the responses for completeness and accuracy before organizing the data for analysis. In addition, the students' mathematics achievement was obtained from their official academic records, particularly their quarterly grades, with permission from the class adviser or subject teacher. All collected data were treated with strict confidentiality and used solely for research purposes.

The data obtained in this study were subjected to appropriate descriptive and inferential statistical tests.

In the analyses and interpretation of data, different statistical tools were used to answer the specific research questions posed in this study.

To answer problem 1, the frequency and percentage were used to determine the demographic profile of respondents by sex, monthly family income, and parents' highest educational attainment. For problems 2 to 5, the mean and standard deviation were used to determine the level of attitude, motivation, and self-regulation among Grade 11 students as a whole and according to dimensions of the variables identified. For problem number 5, the mean and standard deviation were also used to determine the academic achievement of Grade 11 students. For problems 6 to 8, the Spearman rank correlation coefficient was used to determine the relationship between the levels of attitude, motivation, and self-regulation and academic achievement among Grade 11 students. For problem 9, multivariate linear regression was used to determine whether attitude toward mathematics, motivation in mathematics, and self-regulation significantly predict mathematics achievement among Grade 11 students.

RESULTS AND DISCUSSION

Profile of Grade 11 Students

Table 1 presents a summary of the profile of Grade 11 students by sex, monthly family income, and parents' highest educational attainment.

Table 1. Frequency and Percent Distribution of the Respondents According to Profile

Profile	Category	f	%
Sex	Male	38	37.6
	Female	63	62.4
	Total	101	100.0
Monthly Family Income	Php 10,000 and below	34	33.7
	Php 10,001 to Php 20,000	26	25.7
	Php 20,001 to Php 30,000	18	17.8
	Php 30,001 to Php 40,000	9	8.9
	Above Php 40,000	14	13.9
	Total	101	100.0
Parents' Highest Educational Attainment	Elementary	6	5.9
	High School	25	24.8
	College	58	57.4
	Postgraduate	8	7.9
	Vocational	4	4.0
	Total	101	100.0

Table 1 shows that there are more female than male learners in Grade 11. That is, the number of female learners is 63 (62.4%), while male learners are only 38 (37.6%). The results imply that female learners outnumber male learners in school. This conforms to the proportion of female learners by the Department of Education and is consistent with national data indicating that female learners often demonstrate higher participation and retention rates in formal school than their male counterparts (UNESCO, 2025).

In terms of monthly family income, 34 (33.7%) are from families earning Php 10,000 and below, followed by those with family income Php 10,001 to Php 20,000 with 26 (25.7%), Php 20,001 to Php 30,000 with 18 (17.8%), above Php 40,000 with 14 (13.9%), and Php 30,001 to Php 40,000 with 9 (8.9%). The findings suggest that a considerable proportion of the respondents belong to low-income households. This implies that most student respondents face significant financial constraints, which may significantly impact their academic resources and learning environment. This economic reality reflects national statistics indicating that a large percentage of families in public and rural schools live below or near the poverty threshold (PSA, 2024).

Regarding the parents' highest educational attainment, 58 (57.4%) of the respondents' parents are college graduates, followed by 25 (24.8%) who are high school graduates, postgraduates with 8 (7.9%), elementary graduates with 6 (5.9%), and vocational graduates with 4 (4.0%). The results indicate that most respondents come from families whose parents attained high educational backgrounds. As highlighted by Davis-Kean et al. (2021), parents with higher educational attainment are generally more capable of providing academic guidance, monitoring school progress, and fostering positive attitudes toward education.

Level of Attitude in Mathematics of Grade 11 students

Table 2 summarizes the level of attitude in mathematics among Grade 11 students, as a whole and in the following areas: self-confidence, value, enjoyment, and motivational attitude.

Table 2. Level of Attitude in Mathematics of Grade 11 students

Statements	Mean	Standard Deviation	Interpretation
Self-Confidence	3.28	0.68	Moderate
1. Mathematics is one of my most dreaded subjects.	2.97	1.02	Moderate

2. My mind goes blank and I am unable to think clearly when working with mathematics.	3.19	1.05	Moderate
3. Studying mathematics makes me feel nervous.	3.22	1.18	Moderate
4. Mathematics makes me feel uncomfortable.	3.71	1.02	High
5. I am always under a terrible strain in a math class.	3.57	0.96	High
6. When I hear the word mathematics, I have a feeling of dislike.	3.63	1.10	High
7. It makes me nervous to even think about having to do a mathematics problem.	3.49	1.16	High
8. Mathematics does not scare me at all.	3.07	0.98	Moderate
9. I have a lot of self-confidence when it comes to mathematics.	3.01	0.93	Moderate
10. I am able to solve mathematics problems without too much difficulty.	3.06	0.96	Moderate
11. I expect to do fairly well in any math class I take.	3.46	0.88	High
12. I am always confused in my mathematics class.	3.28	0.90	Moderate
13. I feel a sense of insecurity when attempting mathematics.	3.38	1.01	Moderate
14. I learn mathematics easily.	3.12	0.86	Moderate
15. I am confident that I could learn advanced mathematics.	3.12	1.01	Moderate
Value	4.06	0.78	High
1. Mathematics is a very worthwhile and necessary subject.	4.18	0.93	High
2. I want to develop my mathematical skills.	4.44	0.84	Very High
3. Mathematics helps develop the mind and teaches a person to think.	4.17	0.93	High
4. Mathematics is important in everyday life.	4.21	1.04	Very High
5. Mathematics is one of the most important subjects for people to study.	4.08	0.99	High
6. High school math courses would be very helpful no matter what I decide to study.	3.99	0.99	High
7. I can think of many ways that I use math outside of school.	3.99	1.03	High
8. I think studying advanced mathematics is useful.	3.86	0.98	High
9. I believe studying math helps me with problem solving in other areas.	3.85	1.04	High
10. A strong math background could help me in my professional life.	3.81	0.99	High
Enjoyment	3.47	0.80	High
1. I get a great deal of satisfaction out of solving a mathematics problem	3.91	1.00	High
2. I have usually enjoyed studying mathematics in school.	3.33	1.00	Moderate
3. Mathematics is dull and boring.	3.88	1.02	High
4. I like to solve new problems in mathematics.	3.42	1.04	High
5. I would prefer to do an assignment in math than to write an essay.	3.25	1.40	Moderate
6. I really like mathematics.	3.32	1.01	Moderate
7. I am happier in a math class than in any other class.	2.99	1.04	Moderate
8. Mathematics is a very interesting subject.	3.82	0.96	High
9. I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in math.	3.33	0.99	Moderate
10. I am comfortable answering questions in math class.	3.48	0.94	High
Motivation	3.18	0.71	Moderate
1. I would like to avoid using mathematics in college.	3.41	1.07	High

2. I am willing to take more than the required amount of mathematics.	2.94	0.94	Moderate
3. I plan to take as much mathematics as I can during my education.	3.06	0.99	Moderate
4. The challenge of math appeals to me.	3.29	0.95	Moderate
5. I believe I am good at solving math problems.	3.21	0.93	Moderate
Level of Attitude as a Whole	3.51	0.63	High

Legend: (4.21-5.00)-Very High;(3.41 – 4.20)-High;(2.61-3.40)-Moderate; (1.81 – 2.60)-Low;(1.00 – 1.80)-Very Low

Table 2 presents the level of attitude in mathematics of Grade 11 students. The overall mean score is 3.51 (SD = 0.63), interpreted as high. This indicates that the respondents generally possess a positive attitude toward mathematics. Among the dimensions, Value has the highest mean score of 4.06 (SD = 0.78), interpreted as high, indicating that the respondents strongly recognize the importance and usefulness of mathematics in their academic and everyday lives. The statement "I want to develop my mathematical skills" received the highest mean of 4.44, interpreted as very high. The dimension Enjoyment obtained a mean of 3.47 (SD = 0.80), interpreted as high, suggesting that the learners generally enjoy engaging in mathematics-related activities. The statement "I get a great deal of satisfaction out of solving a mathematics problem" received the highest mean score of 3.91 (SD = 1.00). Self-Confidence has a mean score of 3.28 (SD = 0.68), interpreted as moderate. This indicates that while students demonstrate confidence in learning mathematics, there are still instances of uncertainty and anxiety when dealing with mathematical concepts and problems. Similarly, Motivational Attitude obtained a mean score of 3.18 (SD = 0.71), interpreted as moderate. This finding implies that the students demonstrate a moderate willingness to pursue further mathematics-related learning experiences. Overall, the results indicate that Grade 11 students possess a generally favorable attitude toward mathematics, particularly in recognizing its value and importance.

The results are consistent with the findings which suggests that students who recognize the value and usefulness of mathematics tend to develop more positive attitudes toward the subject and demonstrate greater academic engagement. Wen and Dubé (2022) identified perceived value, enjoyment, and self-confidence as important dimensions of attitude toward mathematics that are positively associated with mathematics achievement, while Claridad and Ayson (2025) found that students with favorable attitudes toward mathematics tend to perform better academically. Therefore, the high overall attitude of the respondents, particularly in the value dimension, indicates a strong foundation for effective mathematics learning and achievement.

Level of Motivation in Mathematics of Grade 11 students

Table 3 presents a summary of the Level of Motivation in Mathematics of Grade 11 students and in the following areas: Self-Efficacy for Learning and Performance, Intrinsic Motivation, Utility of Mathematics Motivation, Importance of Mathematics Motivation, and Extrinsic Motivation.

Table 3. Level of Motivation in Mathematics of Grade 11 students

Statements	Mean	Standard Deviation	Interpretation
Self-Efficacy for Learning and Performance	3.43	0.81	High
1. I believe I will receive an excellent grade in mathematics exams.	3.31	0.90	Moderate
2. I am confident I can understand the basic concepts taught in mathematics.	3.72	0.97	High
3. I'm confident I can understand the most complex concepts presented by the mathematics teacher.	3.10	0.98	Moderate
4. I am confident that I can do an excellent job on assignments and tests in mathematics.	3.40	0.98	Moderate
5. I expect to do well in this mathematics.	3.65	1.00	High

6. I'm certain I can master the skill being taught in mathematics.	3.37	1.02	Moderate
7. I am sure that I can do well on mathematics tests and examinations.	3.46	0.96	High
Intrinsic Motivation	3.42	0.84	High
1. When I have the opportunity, I choose mathematics past questions and solve on my own.	3.21	0.93	Moderate
2. I am very interested in the content area of mathematics.	3.33	1.02	Moderate
3. I like the topics in mathematics.	3.38	0.98	Moderate
4. Understanding the topics of mathematics is very important to me.	3.85	1.04	High
5. I am willing to participate in mathematics class because it is challenging.	3.35	1.04	Moderate
Utility of Mathematics Motivation	3.73	0.87	High
1. I think I will be able to use what I learn in mathematics in other subjects.	3.71	0.98	High
2. I think that learning mathematics is important because it stimulates my thinking.	3.74	0.98	High
3. I want know mathematics so that I can teach my friends and younger ones.	3.73	1.08	High
Importance of Mathematics Motivation	3.39	0.75	Moderate
1. In a mathematics class, I prefer topics that really challenge me so I can learn new things.	3.53	1.00	High
2. I study hard in mathematics because I want to represent my school in mathematics competition.	2.66	1.11	Moderate
3. During a mathematics examination, I feel most fulfilled when I attain a good score.	3.98	0.98	High
Extrinsic Motivation	3.63	0.72	High
1. Getting good grade in mathematics is the most satisfying thing for me right now.	3.96	1.01	High
2. If I can, I want to get better grades in this class than most of the other students.	3.64	0.98	High
3. I want to do well in mathematics because it is important to show my ability to my family, friends, employer, or others.	3.67	0.97	High
4. I can do well in mathematics if my parent and teachers can give some gifts.	2.97	1.31	Moderate
5. I like studying mathematics because I know that it is a compulsory subject for admission to higher institutions.	3.51	1.07	High
6. I want to get a good grade in mathematics so as not to disappoint my parent and teachers.	4.04	1.00	High
Level of Motivation as a Whole	3.51	0.73	High

Legend: (4.21-5.00)-Very High;(3.41 – 4.20)-High;(2.61-3.40)-Moderate; (1.81 – 2.60)-Low;(1.00 – 1.80)-Very Low

Table 3 presents the level of motivation in mathematics of Grade 11 students. The overall mean score of 3.51 (SD = 0.73) is interpreted as High, indicating that the respondents are generally motivated to learn mathematics.

Among the dimensions, Utility of Mathematics Motivation obtain the highest mean score of 3.73 (SD = 0.87), interpreted as high. This suggests that the students perceive mathematics as useful in other subjects and future endeavors. Extrinsic Motivation ranked second with a mean score of 3.63 (SD = 0.72), interpreted as high, indicating that external factors such as grades, approval from parents and teachers, and future educational opportunities motivate the respondents. Self-Efficacy for Learning and Performance obtained a mean score of 3.43 (SD = 0.81), interpreted as high, suggesting that students generally believe in their ability to perform well in mathematics. Intrinsic Motivation obtained a mean score of 3.42 (SD = 0.84), interpreted as high, indicating that students are internally motivated by interest and personal satisfaction in learning mathematics. Meanwhile, Importance of Mathematics Motivation obtained the lowest mean score of 3.39 (SD = 0.75), interpreted as moderate. This implies that although students recognize the importance of mathematics, some may not strongly associate it with personal aspirations and achievements.

The findings reveal that Grade 11 students generally possess a high level of motivation in mathematics, particularly in recognizing its practical value and relevance.

It conforms with the results of Fiorella et al. (2021), who found that students' motivation in mathematics is strengthened when they perceive mathematics as useful, valuable, and relevant to their future goals. The study identified self-efficacy, intrinsic motivation, and career or utility-related motivation as important factors that promote engagement and persistence in mathematics learning. Likewise, Mondigo and Uchang (2025) reported that students with higher levels of mathematics motivation tend to demonstrate better academic performance, indicating that motivated learners are more likely to invest effort and remain committed to learning mathematical concepts. Therefore, the high level of motivation exhibited by the respondents, particularly in the utility and extrinsic motivation dimensions, suggests a strong motivational foundation that can support successful mathematics learning and achievement.

Level of Self-Regulation in Mathematics of Grade 11 students

Table 4 presents a summary of the Level of Self-Regulation in Mathematics of Grade 11 students, as a whole, and in the following areas: Goal Setting and Impulse Control.

Table 4. Level of Self-Regulation in Mathematics of Grade 11 students

Statements	Mean	Standard Deviation	Interpretation
Goal Setting	3.70	0.63	High
1. I usually keep track of my progress towards my goals.	3.67	1.02	High
2. I am able to accomplish goals I set for myself.	3.65	0.89	High
3. I can stick to a plan that's working well.	3.95	0.96	High
4. I have personal standards, and try to live up to them.	3.82	1.04	High
5. As soon as I see a problem or challenge, I start looking for all possible solutions.	3.96	0.95	High
6. When I'm trying to change something, I pay a lot of attention to how I'm doing.	3.89	0.92	High
7. I set goals for myself and keep track of my progress.	3.67	0.91	High
8. I can usually find several different possibilities when I want to change something.	3.72	0.90	High
9. Once I have a goal, I can usually plan how to reach it.	3.87	0.96	High
10. If I make a resolution to change something, I pay a lot of attention to how I'm doing.	3.79	0.94	High
11. I usually think before I act.	3.87	1.00	High

12. I know how I want to be.	3.97	0.96	High
13. I give up quickly.	2.25	1.18	Low
Impulse Control	3.28	0.48	Moderate
1. I have trouble making up my mind about things.	2.93	1.03	Moderate
2. I get easily distracted from my plans.	2.95	1.00	Moderate
3. I put off making decisions.	2.96	0.81	Moderate
4. I have trouble following through with things once I've made up my mind to do something.	2.76	1.11	Moderate
5. I have a lot of willpower.	3.46	0.97	High
6. I am able to resist temptation.	3.45	0.96	High
7. Most of the time I don't pay attention to what I'm doing.	3.50	1.04	High
8. I tend to keep doing the same thing, even when it doesn't work.	3.38	0.97	Moderate
9. I learn from my mistakes.	4.16	0.96	High
Level of Self Regulation as a Whole	3.46	0.44	High

Legend: (4.21-5.00)-Very High;(3.41 – 4.20)-High;(2.61-3.40)-Moderate; (1.81 – 2.60)-Low;(1.00 – 1.80)-Very Low

Table 4 presents the level of self-regulation in mathematics of Grade 11 students. The overall mean score of 3.46 (SD = 0.44) was interpreted as high, indicating that the respondents generally demonstrate good self-regulatory behaviors in their mathematics learning.

Among the dimensions, Goal Setting obtains a mean score of 3.70 (SD = 0.63), interpreted as high. This indicates that respondents actively establish goals, monitor their progress, and develop plans to achieve their academic objectives. The statement "I know how I want to be" obtains the highest mean score of 3.97. On the other hand, Impulse Control obtains a mean score of 3.28 (SD = 0.48), interpreted as moderate. This suggests that despite demonstrating self-control in certain situations, some students still experience difficulties in resisting distractions, making decisions, and maintaining focus on planned activities.

Despite the moderate level of impulse control, the overall findings indicate that the respondents generally practice effective self-regulation through goal-setting and consistent monitoring of their academic progress.

Results adhere to the findings of Duru and Okeke (2021), who reported that self-regulated learning skills significantly predict students' mathematics achievement, emphasizing that learners who set goals, monitor their progress, and regulate their learning behaviors tend to perform better academically. Similarly, Rivera and Canoy (2025) found that students with higher levels of self-regulation demonstrate greater mastery of mathematical concepts and more effective cognitive processing, highlighting the importance of goal-setting and self-monitoring in mathematics learning. These findings support the present result that Grade 11 students exhibit a high level of self-regulation, particularly in goal setting, which may contribute to improved learning outcomes in mathematics.

Level of Achievement in Mathematics of Grade 11 students

Table 5 presents the distribution of achievement in Mathematics of Grade 11 students and their overall mean.

Table 5. Level of Achievement in Mathematics of Grade 11 students

Academic Achievement	n	Mean	Standard Deviation	Interpretation
Outstanding	90	93.96	3.28	Outstanding
Very Satisfactory	11			

Satisfactory	0			
Fairly Satisfactory	0			
Did Not Meet Expectations	0			
Total	101			

Legend: (90-100)-Outstanding; (85-89) -Very Satisfactory, (80-84)-Satisfactory, (75-79)- Fairly Satisfactory; (Below 75)-Did Not Meet Expectation

Table 5 presents the level of mathematics achievement of Grade 11 students. Data indicated an overall mean grade of 93.96 (SD = 3.28), interpreted as outstanding. For the distribution of achievement, 90 students were classified as outstanding while 11 students were classified as very satisfactory. None of the respondents fell under the satisfactory, fairly satisfactory, or did not meet expectations categories.

The findings indicate that while the results indicate excellent mathematics achievement, it is important to note that the distribution of grades showed limited variability and should be considered in the interpretation of association results and predictive effects. As supported by Claridad and Ayson (2025), who found that students with favorable attitudes toward mathematics tend to achieve higher academic performance, while Mondigo and Uchang (2025) reported a significant positive relationship between motivation and mathematics achievement. Likewise, Duru and Okeke (2021) emphasized that students who effectively regulate their learning through goal setting, monitoring, and strategic study behaviors are more likely to attain high levels of academic success in mathematics.

Relationship Between Attitude and Achievement in Mathematics

Table 6 shows the summary of the association results between the level of attitude and achievement in Mathematics of Grade 11 students using the Spearman rho correlation coefficient.

Table 6. Relationship Between Attitude and Achievement in Mathematics

Variables	Test Statistic (rs)	p-value	Decision for Ho	Interpretation
Attitude in Mathematics and Achievement in Mathematics	0.332	< 0.001	Reject Ho	Significant

Table 6 shows the relationship between attitude in mathematics and mathematics achievement. Results indicate that the Spearman rho correlation coefficient was $r_s = 0.332$ with a p -value < 0.001 . Since the p -value is less than the 0.05 level of significance, the null hypothesis is rejected. This confirms a significant positive relationship between attitude toward mathematics and mathematics achievement. The findings imply that students with more positive attitudes toward mathematics tend to achieve better academic performance in the subject.

Findings are supported by recent studies from 2022 to 2026. For example, Claridad and Ayson (2025) found a significant positive relationship between attitudes toward mathematics and academic performance among Grade 10 students. Their study revealed that learners who demonstrated positive perceptions and interest in mathematics generally achieved better academic outcomes than those with less favorable attitudes. Likewise, Wen and Dubé (2022), in their systematic review of secondary students' attitudes toward mathematics, concluded that positive attitudes are consistently associated with higher mathematics achievement across different educational settings. These findings suggest that students' affective dispositions toward mathematics are significantly associated with academic success.

Furthermore, the present result is consistent with the findings of Dowker and Sheridan (2022), who reported that students' attitudes toward mathematics significantly influence their mathematics performance. They emphasized that learners with positive attitudes and lower levels of mathematics anxiety achieve higher scores than those

who hold negative perceptions of the subject. Similarly, Abarca and Osic (2024) found that positive academic self-concept and motivation significantly predict students' achievement in mathematics, highlighting the importance of learners' beliefs, attitudes, and confidence in enhancing academic outcomes.

Relationship Between Motivation and Achievement in Mathematics

Table 7 shows the summary of the association results between the level of motivation and achievement in Mathematics of Grade 11 students using the Spearman rho correlation coefficient.

Table 7. Relationship Between Motivation and Achievement in Mathematics

Variables	Test Statistic (rs)	p-value	Decision for Ho	Interpretation
Motivation in Mathematics and Achievement in Mathematics	0.231	0.020	Reject Ho	Significant

Table 7 presents the relationship between motivation in mathematics and mathematics achievement. Data revealed a correlation coefficient of $r = 0.231$ and a p-value of 0.020. Since the p-value is less than 0.05, the null hypothesis was rejected. With this, the results indicate a significant positive relationship between motivation and mathematics achievement. This implies that students with higher motivation levels tend to perform better in mathematics than those with lower motivation levels.

The result supports the study of Abarca and Osic (2024), who found that academic motivation significantly predicts students' achievement in mathematics. Their findings revealed that students with higher levels of motivation and positive academic self-concept demonstrated better mathematics performance than their less motivated peers. Similarly, Mondigo and Uchang (2025) reported a significant relationship between students' motivation and academic performance in mathematics, emphasizing that motivation is positively associated with learners' engagement and commitment to learning mathematical concepts.

Likewise, Lim, Lim, and Lim (2022) found that students with stronger academic motivation toward mathematics showed greater engagement and persistence in learning activities, which positively influenced their mathematics achievement. In the same vein, Zakariya and Barattucci (2021) highlighted that motivation is a crucial component of mathematics learning, as it encourages students to invest effort, maintain interest, and persevere in overcoming academic difficulties.

Furthermore, Schunk and DiBenedetto (2020) emphasized that motivation is associated with students' choice of activities, level of effort, persistence, and achievement, making it a key determinant of academic success. Moreover, Mamolo (2022) found that mathematics motivation significantly influences learners' confidence and performance, particularly in mathematics learning environments. Students with higher motivation demonstrated greater self-efficacy and lower anxiety, factors that contributed to improved mathematics achievement. Recent evidence from Wang and Guo (2026) further supports the notion that motivation enhances mathematical problem-solving skills through self-efficacy and self-regulation, ultimately leading to better academic performance.

Relationship Between Self Regulation and Achievement in Mathematics

Table 8 below shows the summary of the association results between the level of self-regulation and achievement in Mathematics of Grade 11 students using the Spearman rho correlation coefficient.

Table 8. Relationship Between Self-Regulation and Achievement in Mathematics

Variables	Test Statistic (rs)	p-value	Decision for Ho	Interpretation
Self-Regulation and Achievement in Mathematics	0.251	0.011	Reject Ho	Significant

Table 8 shows the relationship between self-regulation and mathematics achievement. The computed correlation coefficient was $r = 0.251$ with a p-value of 0.011. Since the p-value is less than the 0.05 level of significance, the null hypothesis was rejected. The findings indicate a significant positive relationship between self-regulation and mathematics achievement. This suggests that students who effectively regulate their learning behaviors tend to have higher mathematics achievement.

The findings are consistent with the study of Duru and Okeke (2021), who found that self-regulated learning skills significantly predict mathematics achievement among students. Their study emphasized that learners who actively control and monitor their learning processes demonstrate higher levels of academic performance than those with weaker self-regulation skills. Likewise, Rivera and Canoy (2025) reported that self-regulation significantly contributes to students' cognitive processing and mastery of mathematical concepts. Students who regularly evaluate their progress and adjust their learning strategies are associated with favorable learning outcomes in mathematics.

Moreover, Wang and Guo (2026) highlighted the importance of self-regulation in mathematical problem-solving. Their motivation–self-regulation model demonstrated that students with strong self-regulatory skills are better able to manage learning challenges, sustain effort, and apply effective problem-solving strategies, which ultimately improve mathematics achievement. Similarly, Schunk and DiBenedetto (2020) explained through Social Cognitive Theory that self-regulation enables learners to direct their thoughts, behaviors, and motivations toward achieving academic goals. Students who effectively regulate their learning processes tend to demonstrate better learning outcomes.

Predictors of Mathematics Achievement of Grade 11 students

Table 9 below shows the summary of the linear regression analysis results that best predict Mathematics achievement of Grade 11 students using predictor variables such as attitude, motivation, and self-regulation.

Table 9. Linear regression analysis results on the predictors of mathematics achievement

Variables	Beta coefficient	t-value	95% CI	p-value	Interpretation
Constant	81.727	37.506	77.402 ± 86.051	< 0.001	
Overall Attitude	2.902	3.382	1.199 ± 4.606	0.001	Significant
Overall Motivation	-0.560	-0.799	-1.950 ± 0.831	0.426	Not significant
Overall Self-Regulation	1.157	1.493	-0.381 ± 2.696	0.139	Not significant

$R = 0.567$; $R\text{-squared} = 0.322$; Tolerance = 0.253; VIF = 3.948

Table 9 presents the results of the multiple linear regression analysis to determine the predictors of mathematics achievement among Grade 11 students. The model yields an R value of 0.567 and an R^2 of 0.322, indicating that attitude, motivation, and self-regulation together explain approximately 32.2% of the variance in mathematics achievement. Also, the model has $F(3,97) = 15.330$, $p < 0.001$. Among the predictor variables, attitude toward mathematics significantly predicts mathematics achievement ($\beta = 2.902$, $t = 3.382$, $p = 0.001$). Since the p-value is less than 0.05, attitude toward mathematics emerging as a significant predictor of mathematics achievement. On the other hand, motivation ($\beta = -0.560$, $p = 0.426$) and self-regulation ($\beta = 1.157$, $p = 0.139$) are not significant predictors because their p-values are above the 0.05 level of significance. The regression model produced an R value of 0.567 and an R^2 value of 0.322, indicating a moderate predictive capability. The findings suggest that approximately 32.2% of the variance in mathematics achievement was explained by the combined influence of attitude, motivation, and self-regulation, while 67.8% may be attributed to other factors not included in the model.

Therefore, the results indicate that among the variables included in the model, attitude toward mathematics is the only significant predictor of mathematics achievement among Grade 11 students. This finding suggests that attitude toward mathematics is statistically associated with mathematics achievement and serves as the strongest predictor among the variables examined. However, because the study employed a cross-sectional correlational design, the results should not be interpreted as evidence of a causal relationship.

The finding that attitude toward mathematics significantly predicts mathematics achievement is supported by several studies that identified affective variables as important determinants of academic performance. Abarca and Osic (2024) found through regression analysis that academic self-concept and motivation significantly predicted students' achievement in mathematics, highlighting the role of students' internal dispositions in influencing academic outcomes. Their findings suggest that learners' perceptions, beliefs, and attitudes toward mathematics contribute substantially to their level of achievement.

Similarly, Claridad and Ayson (2025) reported that attitudes toward mathematics significantly influence students' academic performance. Their study demonstrated that learners who exhibited positive attitudes toward mathematics achieved higher academic outcomes than those with less favorable attitudes. This supports the present finding that attitude remains a significant predictor even when other learner variables are considered simultaneously.

The result is further reinforced by the systematic review of Wen and Dubé (2022), which concluded that attitude toward mathematics is one of the most consistent predictors of mathematics achievement among secondary students. Their review showed that positive attitudes are associated with greater engagement, persistence, and willingness to learn mathematics, factors that contribute to improved achievement.

Consistent with the present findings, Dowker and Sheridan (2022) found that students' attitudes toward mathematics significantly influenced mathematics performance even when other variables such as gender, working memory, and mathematics anxiety were considered. Their findings suggest that students who enjoy mathematics and perceive themselves as capable learners tend to attain higher mathematics achievement.

While motivation and self-regulation were significantly associated with mathematics achievement in the correlation analysis, they did not emerge as significant predictors in the regression model. A similar observation was noted by Rivera and Canoy (2025), who explained that self-regulation contributes to mathematics learning and mastery but may not independently predict achievement once stronger cognitive and affective factors are included in a multivariate model. Likewise, Abarca and Osic (2024) noted that the predictive influence of motivational factors may diminish when other closely related learner characteristics are entered simultaneously in regression analysis.

CONCLUSION

Based on the findings of the study, the following conclusions are drawn:

Grade 11 students, on average, have a high attitude toward mathematics and recognize its importance and usefulness in their academic and future endeavors.

The respondents demonstrate a high level of motivation in learning mathematics, indicating that they value mathematics and are willing to exert effort to succeed in the subject.

Grade 11 students exhibit high self-regulatory behaviors, particularly in goal setting and monitoring their academic progress.

The respondents perform exceptionally well in mathematics, as reflected in their outstanding level of achievement.

Attitude toward mathematics, motivation, and self-regulation are all learner characteristics associated with mathematics achievement. Students who possess more positive attitudes, higher motivation, and better self-regulation tend to achieve better academic outcomes in mathematics.

Among the three variables investigated, attitude toward mathematics emerged as the only statistically significant predictor of mathematics achievement in the regression model. The findings indicate that attitude toward mathematics demonstrates the strongest predictive association with mathematics achievement among the variables examined.

Although motivation and self-regulation are significantly related to mathematics achievement, only attitude is a significant predictor of mathematics achievement among Grade 11 students.

Given the study's single-school context, limited sample size, and cross-sectional design, the findings should be interpreted with caution. Future studies involving larger and more diverse samples across multiple schools are recommended to validate the present results and enhance their generalizability.

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