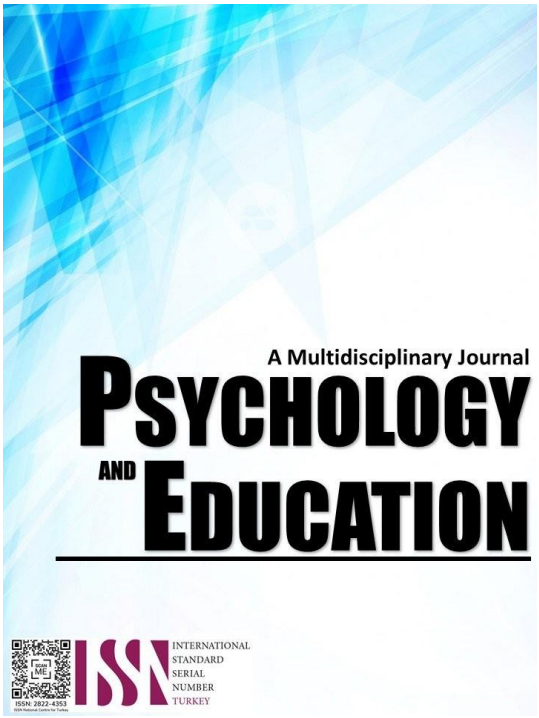
CONFIDENCE AND MASTERY OF GRADE-11 STEM STUDENTS IN SOLVING ALGEBRA-RELATED PROBLEMS



PSYCHOLOGY AND EDUCATION: A MULTIDISCIPLINARY JOURNAL

Volume: 35
Issue 1
Pages: 39-58
Document ID: 2025PEMJ3341
DOI: 10.70838/pemj.350105
Manuscript Accepted: 03-15-2025

Psych Educ, 2025, **35**(1): 39-58, Document ID:2025PEMJ3341, doi:10.70838/pemj.350105, ISSN 2822-4353

Research Article

Confidence and Mastery of Grade-11 STEM Students in Solving Algebra-Related Problems

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Abstract

The significance of mathematics education has gained increasing recognition worldwide due to its essential role in various fields, particularly science, technology, engineering, and mathematics (STEM). Algebra, a fundamental branch of mathematics, is crucial for developing students' problem-solving and analytical skills. However, many students struggle with algebraic concepts, affecting their overall mathematical proficiency. The field of mathematics education has long examined students' algebraic difficulties, seeking to understand their causes and improve learning outcomes. This study aims to provide insights into the perceived confidence and mastery of Grade 11 STEM students in solving algebra-related problems. It also explores variations in confidence and mastery based on different profile variables and examines their relationship. A mixed-methods approach was used to collect data through a survey questionnaire administered to two sections of Grade 11 STEM students at Saint Mary's University Senior High School. Findings indicate that Grade 11 STEM students generally exhibit moderate confidence and mastery in solving algebra-related problems but may require additional support, particularly with advanced topics like logarithmic properties. Perceived Level of Confidence did not significantly differ based on sex, junior high school curriculum, or learning styles but varied according to academic standing. However, mastery levels showed notable differences, with male students and those from science-oriented junior high schools performing better. A small positive correlation between confidence and mastery suggests that factors such as learning style and academic background influence algebra success. The study recommends tailored tutoring, regular feedback, and teaching strategies aligned with students' learning styles to strengthen both confidence and mastery.

Keywords: *mathematics education, algebraic difficulties, student's perceived level of confidence and mastery*

Introduction

The significance of mathematics education has gained more and more recognition on a global scale in recent years. It is essential for the academic success of senior high school students, especially those enrolled in the Science, Technology, Engineering, and Mathematics (STEM) strand (Just & Siller, 2022), making it among the most significant subjects in the educational curriculum (Suleiman and Hammed, 2019). Furthermore, it opens up various career opportunities and allows students to apply mathematical processes to different aspects of their lives and work. Mathematics is the study of quality, structure, space, and change (Tennessee Tech, 2022). It is an excellent approach to improving cognitive abilities and developing logical reasoning (Leeds ISC, 2019). Additionally, mathematics provides different fundamental branches essential to understanding higher mathematics concepts (Britannica, T. Editors of Encyclopaedia, 2021). In the Philippines, mathematics is necessary for students because it plays a significant role in their daily lives, particularly in decision-making (Mabandos & Movena, 2020), critical thinking, and problem-solving skills (Medina, 2023), which is why mathematics is considered one of the most fundamental subjects in the Philippines (Almerino et al., 2020).

However, as stated in the Programme for International Student Assessment (PISA) summary report in 2022, a significant drop in average mathematics performance was recorded among the Organization for Economic Cooperation and Development (OECD) countries between 2018 and 2022, showing a decrease of 15 points. PISA assesses the knowledge and abilities of 15-year-old students in mathematics, reading, and science (OECD, 2023). The OECD is a unique forum where the governments of 37 democracies with market-based economies interact to create policy guidelines to achieve long-term economic growth (U.S. Department of State, n.d.). The Philippines joined for the first time in 2018 and participated in the most recent occurrence in 2022. Based on the PISA report, the Philippines' mathematics performance was significantly worse than the global average in all categories, with a score of 353 in 2018 and 355 in 2022, indicating no significant improvement and leaving students in the Philippines among the world's weakest in math. The OECD stated that changes in PISA scores must be at least 20 points to be equivalent to the learning gains or losses of at least a year's worth of schooling, whereas one- to two-point changes are not considered significant. This means that the Philippines' score is still below the OECD average with two points better in mathematics, making the Philippines the second-lowest ranking in the performance of mathematics in Southeast Asia while ranking the sixth-lowest in mathematics compared to 81 OECD countries. According to Alexander Sucalit (2022), a senior education program specialist at the Department of Education (DepEd), Filipino students appear to be five to six years behind the rest of the world in terms of schooling, based on the Philippines' gap with other countries.

Another study from the Philippine Honorary Consulate in the Republic of Moldova revealed that the Philippines placed worse, with only 19% possessing fundamental mathematical knowledge and 81% failing to reach the basic level. In contrast, the country's neighbor,

Singapore, topped the list (Education in the Philippines – Philippine Honorary Consulate in the Republic of Moldova, n.d..). In an unpublished study conducted by Agduyeng et al. (2024) on determining the senior high school students' level of basic math skills, they found that most senior high school students demonstrated basic math skills at the beginning level, with low variation in their scores. The study shows that students' fundamental basic math skills in geometry, arithmetic, and particularly in algebra can affect their ability to solve more advanced mathematical concepts such as basic calculus and preparatory calculus. Therefore, knowing the complexity of algebraic comprehension, its implications for mathematical expertise, and having a foundation in mathematics is important.

Algebra

The field of mathematics education has been looking into students' algebraic difficulties for a long time. Although it has been one of the challenges for students (Pramesti et al., 2019), learning algebra is still crucial for people to step up in another aspect. Algebra is a branch of mathematics that helps illustrate problems or situations using mathematical expressions (Hoon et al., 2020). It serves as the foundation of mathematics that needs to be mastered so that Grade 11 STEM students can easily grasp advanced mathematical concepts such as basic calculus and preparatory calculus. Learning algebra plays an important role in having a strong basic understanding of mathematics because it helps students build their techniques and algebraic abilities by applying different approaches to problem-solving (Sengul & Erdogan, 2014). It is also an essential part of teaching mathematics since it exposes students to the realm of abstract quantities and relationship modeling in mathematics. (Beste, et. Al., 2023). A study conducted by Abocejo and Cabuquin (2023) discovered a positive and highly significant correlation between mathematics performance and academic achievement for Filipino high school students. This indicates that high performance in mathematics, which includes algebra skills, is closely related to overall academic success because algebra teaches students to follow a logical path to solve a problem, allowing students to have a better understanding of how numbers function and work together in an equation (Cedar Tutoring Academy, 2019). By obtaining the ability to better understand numbers, students will be able to do any type of math. Moreover, the unpublished study of Agduyeng et al. (2024) revealed that one of the most challenging mathematical concepts for students to solve is algebra. This suggests that students encounter difficulties in understanding and applying algebraic principles, hindering their overall mathematical mastery of advanced mathematical concepts. According to Mayor et al. (2018), there is a significant moderately strong positive relationship between senior high school students' algebra skills and their performance in basic calculus. This indicates that algebra skills have a significant impact on the performance in basic calculus for Filipino students. The lack of knowledge about algebra will make it more difficult for people to understand other things because it is a crucial component of mathematics education and also the foundation of higher concepts of mathematics, such as preparatory calculus and basic calculus in STEM (Maudy et al., 2019). The result of unpublished research in SMUSHS conducted by Antalan et al. (2024) revealed that the students from STEM 12 have low scores on the provided test for limits & continuity and derivatives in basic calculus. They have acquired a very low percentage level in their retention or the ability to store new information in one's long-term memory to be used in the future, which was interpreted as no evidence of learning. This means that there is an impact of SMUSHS STEM 12 students' algebra knowledge on their significantly low performance in limits & continuity and derivatives in basic calculus which may correlate with a study conducted by Sugiarti and Retnawati (2019) which states that most Filipino students experience difficulties in solving algebra-related problems, particularly related to understanding the concepts and principles of algebra.

Algebra-related problems involve not only algebraic expressions but also various types of equations in mathematics where a quantity or variable is unknown. These equations are mathematical statements asserting the equality of two expressions, often containing constants, coefficients, and variables. The primary goal in solving such equations is to determine the values of the unknown variables that satisfy the given equality (Algebra Problems with Solutions | for Class 6, 7, and 8, n.d.). These are important as they develop problem-solving skills, it is the foundation for advanced mathematics, are essential in different STEM fields, and many more. The difficulties encountered by students in algebraic expressions include conceptualizing algebraic facts, constructing examples and non-examples, understanding the meaning of symbols and quantifiers (Subedi, 2020), understanding the problem, understanding the meaning of variables, and performing algebraic operations (Pramesti Retnawal, 2019). Because of these difficulties, students tend to overlook the importance of algebra-related problems and focus more on trying to avoid such problems, raising their math anxiety (Sparks, 2019). Anxiety may harm self-confidence, leading to a sense of lower self-esteem and self-worth and reinforcing negative core beliefs (Fennell 1997, as cited in Li et al., 2023). This means that confidence has a direct impact on students' ability to solve algebra-related problems.

Confidence

A significant portion of the research on students' achievement in mathematics has focused on confidence, one of the most significant psychological structures. It suggests that the individual accept and trust themselves and that they feel in control of their life. One who is self-assured and aware of their abilities and limitations. Confidence is defined as self-assurance, the conviction that one can overcome obstacles and succeed in life, and the readiness to act following that belief (Psychology Today, 2019). Healthy self-confidence is not just about feeling good about oneself. It significantly influences a student's academic performance, creativity, resilience, and relationships with peers. A student with a healthy level of self-confidence is more likely to take on challenges, overcome academic difficulties, and express their thoughts and ideas (Tarim, 2024). They can set realistic expectations and goals, speak assertively, and handle criticism. On the other hand, low self-esteem can cause someone to feel weak, submissive, or insecure and can also make it hard for them to trust other people.

In the study of Akbari and Sahibzada (2020), students' self-confidence affected their learning in areas such as student' participation, seeking goals, developing interest in lessons, decreasing students' anxiety, being comfortable with their instructors and classmates, and also sharing their opinions about class lessons. One factor that influences the ability of students to learn algebra is their level of confidence because confidence plays an important role in the student's ability to tackle challenging algebraic concepts. A study by Wahyuni et al. (2024) found differences in the performance of a subject with low math anxiety and high self-confidence and a subject with high math anxiety and low self-confidence. They have more self-confidence in problem-solving situations and are better prepared to make informed decisions, more capable of processing information, and more competent at understanding the world around them. Self-confident people trust their abilities, have a general sense of control in their lives, and believe that, within reason, they will be able to do what they wish, plan, and expect to solve algebra (Prigge, n.d). With high self-confidence, students will be more motivated to learn mathematics, which will lead to more optimal mathematics achievement. This implies that the level of confidence in mathematics skills and the learning process influences the achievement and mastery of students in mathematics (Waini et al., 2014).

Alternatively, a meta-analysis by Çiftçi and Yıldız (2019) examined the impact of self-confidence on mathematics achievement, finding that it has a moderate effect on students' performance in the subject. The study analyzed data from 336 independent studies conducted across 76 countries, encompassing over a million students. The results indicated that students with higher self-confidence achieved greater success in mathematics. Similarly, research by Kunhertanti and Santosa (2018) demonstrated that students' self-confidence in learning mathematics significantly influenced their academic performance. This highlights the crucial role self-confidence plays in enhancing students' mathematical abilities. The study also emphasized the impact of self-confidence on learning outcomes in mathematics. Developing confidence requires a realistic understanding of one's abilities and a sense of security in that knowledge. Furthermore, Cerbito (2020) supported these findings by establishing a significant relationship between students' attitudes toward mathematics, particularly their selfconfidence, and their proficiency in the subject. Specifically, students who feel comfortable and confident in solving algebraic problems are more likely to excel in mathematics, leading to improved problem-solving skills and a deeper comprehension of advanced mathematical concepts. However, Dr. Colin Foster (2022) from Loughborough University states that many school students, even those who struggle in mathematics, are overconfident, meaning that they expect more of their answers to be correct than they are. Other students are underconfident and are repeatedly surprised that their answers are correct. Students' poor calibration gets in the way of learning because it discourages over-confident students from attending to their weaker areas and delays under-confident students from moving on to new material. This means that self-confidence is one of the influential factors that are unrecognized regarding students' mathematics mastery. Thus, this study aims to determine the perceived level of confidence of Grade 11 STEM students in solving algebra-related problems.

Mastery

Mastery is the level at which students have a complete understanding and competency in basic algebraic ideas and methods. This includes an understanding of variables, equations, expressions, inequalities, functions, and problem-solving 5 Iustitia Christi 2025 St. Agatha of Sicily strategies, as well as the ability to solve algebra-related problems. It is the degree to which pupils possess a thorough comprehension and proficiency in basic algebraic ideas and methods. According to the study by Stripp (2014), mastery is an approach that can help individuals who struggle to grasp certain concepts by ensuring they fully understand the basics before advancing their knowledge. This method provides a structured learning process that allows students to build a strong foundation, ultimately leading to deeper comprehension and long-term retention of information. The study of Dua Riong et al. (2022) reveals that Concept mastery and mathematical problem-solving ability are complemented by one another. Students' concept mastery correlates with their problem-solving abilities and vice versa: the higher the level of concept mastery, the larger the problem-solving abilities. Mastery of mathematical concepts means a child can use their understanding of the concept to solve unfamiliar word problems and conduct complex reasoning using the appropriate mathematical vocabulary (Almond, 2019). In the concept of confidence, mastery has a positive impact. Recent studies continue to support the idea that mastery experiences significantly influence self-confidence beliefs through cognitive processing. For instance, the study of Annette Løvheim Kleppang et al. (2023) examined the association between mastery experiences, social support, and self-efficacy among adolescents in secondary schools. The findings indicated that positive mastery experiences were linked to higher self-efficacy beliefs, highlighting the importance of successful personal experiences in building confidence. Additionally, research by Yeh et al. (2019) explored how mindful learning experiences, flow states, self-efficacy, and mastery experiences affect self-evaluation of creative ability and confidence. The study found that individuals with higher levels of mindful learning and mastery experiences reported greater improvements in creative ability and confidence and vice versa, suggesting that engaging in focused, mindful practice can enhance self-efficacy. Lack of mastery creates gaps in student understanding, hindering them from gaining conceptual understanding (Agduyeng et al., 2024). Thus, this study aims to determine the level of mastery of Grade 11 STEM students in solving algebra-related problems.

Moreover, many studies are revealing the poor performance of students in mathematics and the common factors affecting the students' performance, such as students' attitudes towards mathematics, motivation, or anxiety. However, they are not dealing with the root cause of students' affecting their performance in mathematics, that is the poor performance in algebra, which is the foundation of mathematics to understand higher mathematical concepts. Additionally, there are also no studies indicating the relationship of confidence to the student's ability to solve well in algebra, and no studies have used the type of Junior High School (JHS) curriculum and learning styles as the profile variables of the respondents.

Research Questions

This study aimed to find the perceived level of confidence and mastery of grade-11 STEM students in solving algebra-related problems. Specifically, this study sought to answer the following questions:

1. What is the Grade 11 STEM students' perceived level of confidence in solving algebra-related problems?
2. What is the Grade 11 STEM students' level of mastery in solving algebra-related problems?
3. Is there a significant difference in the Grade 11 STEM students' perceived level of confidence in solving algebra-related problems when grouped according to the following profile variables:
    1.1. sex;
    1.2. academic standing;
    1.3. type of jhs curriculum; and
    1.4. learning style?
4. Is there a significant difference in the Grade 11 STEM students' level of mastery in solving algebra-related problems when grouped according to the following profile variables:
    2.1. sex;
    2.2. academic standing;
    2.3. type of jhs curriculum; and
    2.4. learning style?
5. Is there a significant relationship between the perceived level of confidence and mastery of STEM-11 students in solving algebra-related problems?
6. What are the ways that can be suggested to improve the confidence and mastery of STEM-11 students in solving algebra-related problems?

Methodology

Research Design

This study utilized both quantitative and qualitative research designs to determine the confidence and mastery of STEM 11 students in solving algebra-related problems. This study aims to provide information on the level of confidence and mastery of STEM-11 students in solving algebra-related problems and to explore the differences in confidence and mastery based on the variables included in the demographic profile, such as sex, academic stand, type of JHS curriculum, and learning style, and the relationship between confidence and mastery.

For the quantitative part of this study, the researchers used descriptive-comparative-correlational designs, which align with the study's objectives. The descriptive-comparative-correlational design was used to describe the differences and determine the relationship between the varying levels of confidence and mastery of the STEM-11 students in solving algebra-related problems. The qualitative part was used to collect data from the STEM-11 students about the ways that can be suggested to improve the confidence and mastery of the STEM-11 students through an open-ended question.

Participants

The researchers of this study obtained 79 responses from two different sections of 11 STEM Students in SMUSHS, Bayombong, Nueva Vizcaya to determine their confidence and mastery in solving algebra-related problems. The researchers used cluster sampling as the types of sampling method as the respondents were classified according to sex, academic standing, type of recently graduated school, and learning style.

Table 1. *Demographic profile*

Profile variables	*Frequency*	*Percentage*
Sex		
Male	33	41.80
Female	46	58.20
Academic Standing		
With Highest Honor	3	3.80
With High Honor	25	31.60
With Honor	40	50.60
With Academic Distinction	6	7.60
None	5	6.30
Type of Junior Highschool Curriculum		
JHS Regular Curriculum	47	59.50
JHS Science Curriculum	32	40.50
Learning Style		
Visual	18	22.80
Auditory	5	6.30

Physical	8	10.10
Verbal	24	30.40
Social	9	11.40
Solitary	7	8.90
Logical	8	10.10
Total	79	100

Table 1 shows the demographic profiles used in the study and the total number of respondents in each profile. The respondents' sex, academic standing, type of Junior high school curriculum, and learning styles were considered. For sex, there were slightly more females (P=58.2) than males (P=41.8). Next, in terms of academic standing, the majority of the respondents are with honors (P=50.6). Meanwhile, the least of the respondents in terms of academic standing is the one with the highest honor (P=3.80). Moreover, in terms of the type of junior high school curriculum, there were more students in the regular curriculum (P=59.50) than in the science curriculum (P=40.50). And lastly, there were varying numbers of respondents who have different learning styles specifically, 18, 5, 8, 24, 9, 7, and 8 respondents are visual, auditory, physical, verbal, social, solitary, and logical learners respectively.

Instrument

The researchers used a survey questionnaire as the primary data-gathering instrument that is based on different mathematics guides and modules of the Department of Education (DepEd) K-12 curriculum.

The questionnaire was divided into four parts. Part one included the necessary information, regarding the profile of the respondents which includes sex, academic standing, type of JHS curriculum, and Learning style. Part two consisted of a Likert Scale measuring the level of confidence in solving algebra-related problems. This part evaluated the respondent's confidence based on different algebra-related problems such as Properties, Expressions and Equations, Functions, Inequalities, and Word problems. The third part consists of multiple-choice questions to measure the level of mastery of students in solving algebra-related problems. Lastly, part four is the respondent's perception. It is used in determining the ways that can be suggested to improve the confidence and mastery of STEM-11 students in solving algebra-related problems.

To ensure the validity and reliability of the research instrument, it undergoes a validation process from the mathematics teacher and Cronbach's alpha reliability test. Additionally, for the level of mastery, it undergoes item analysis using Excel to retain or revise items based on the result.

Table 2. *Result of Reliability test for the Perceived Level of Confidence*

Cronbach's Alpha	*N of Items*
0.96	24

Shown in Table 2 is the result of the reliability test for the perceived level of confidence. The table shows that with 24 items, Cronbach's alpha is equal to 0.96. Therefore, its internal consistency is equivalent to excellent (a>0.9). Hence, the questionnaire is reliable.

Procedure

The researchers based the questionnaire on DepEd math competencies, lesson plans, and test papers from grade seven to grade ten. It underwent content validation from the mathematics teacher, Cronbach's alpha reliability test, and item analysis, and then was checked by the research adviser. Furthermore, a written permit was forwarded to the principal of Saint Mary's University Senior High School department to allow the researchers to float questionnaires. Upon the grant of the request, questionnaires were distributed to the respondents. The collected data was tabulated, analyzed, and interpreted. Lastly, after a thorough interpretation, the researchers report the results.

Data Analysis

The tests that contained algebraic problems and questions for the level of confidence were handed to two sections of STEM-11 students for them to answer. Once the results were present, the researchers collected the answer sheets so they could analyze the given data. Descriptive and inferential statistics were used to generate graphs and tables for the data collected in this study and analyze the data to measure the student's mastery and confidence in algebraic problems. The respondents are classified, grouped, and described according to their profile. Frequency count and percentage distribution were utilized which determined the level of confidence and level of mastery in solving algebra-related problems of the respondents. Independent t-test, one-way ANOVA, and Pearson correlation were used to conduct the analysis.

The descriptive-comparative-correlational design, as well as both qualitative and quantitative data analysis, was utilized in this study. For the quantitative data analysis, the following tools and techniques were used to process the collected data:

a) Descriptive statistics. This study utilized frequency count and percentage distribution to summarize the demographic profile (sex, academic standing, type of JHS curriculum, and learning style) and additional information on the level of mastery. Moreover, mean and standard deviation were used to get the perceived level of confidence and the level of mastery of Grade-11 STEM students in solving algebra-related problems. Table 3 shows the mean range and interpretation for the perceived level of confidence of Grade-11

STEM students in solving algebra-related problems.

Table 3. *Perceived Level of Confidence*

Mean range	*Qualitative Description*	*Qualitative Interpretation*
3.50 – 4.00	Strongly Agree	Very Confident
2.50 – 3.49	Agree	Confident
1.50 – 2.49	Disagree	Not Confident
1.00 – 1.49	Strongly Disagree	Very Not Confident

Meanwhile, Table 4 shows the mean range and interpretation for the level of mastery of Grade-11 STEM students in solving algebra-related problems.

Table 4. *Level of Mastery under Bloom's cutoff*

Knowledge Level	*Equivalent Numerical Value*
Low	Below 60%
Moderate	60% - 79%
High	80% - 100%

Method of Transmutation

Total Algebra Math Score/Total Item of Algebra Items×100 = Transmutated score

Additionally, the data collected from the algebra mastery test aligned with Bloom's cutoff to assess the knowledge score. Each correct answer was scored one point and incorrect questions were scored zero points.

Moreover, the researchers specifically calculated the mean and standard deviation for the students' raw scores, which were then transmuted using a standardized scale of DepEd's transmutation table. These transmuted scores were utilized to offer a more accurate representation of student performance in the evaluation process.

From Bloom's cutoff, the levels are defined as follows:

A. Low – Students at this level struggle with understanding because they haven't learned or developed the basic knowledge and skills needed to help them understand.

B. Moderate – The student at this level has a moderate level of knowledge, skills, and core understanding but needs assistance when performing real-world tasks.

C. High – The student at this level has developed the fundamental knowledge, skills, and core understandings with little guidance from the teacher and some assistance from peers.

b). Comparative Statistics. An independent T-test was used to compare the significant difference in the perceived level of confidence and the level of mastery of Grade-11 STEM students in solving algebra-related problems based on their sex and the type of JHS curriculum. Meanwhile, One-way ANOVA was used to compare the significant difference in the perceived level of confidence and the level of mastery of Grade-11 STEM students in solving algebra-related problems based on their academic standing and learning style.

c). Correlational Statistics. Pearson's Correlation was used to correlate the significant relationship between the perceived level of confidence and the level of mastery of Grade-11 STEM students in solving algebra-related problems.

d) Thematic analysis. The study employed thematic analysis to examine the qualitative questions. Responses from the participants sharing similar themes or content were categorized and summarized into distinct groups.

Results and Discussion

This section presents the results and discussion of the gathered data on the perceived level of confidence and mastery of Grade 11 STEM students in solving algebra-related problems. The Perfect Statistics Professionally Presented (PSPP) alternative statistical analysis tool developed by IBM is used to analyze quantitative data.

Table 5 shows the perceived level of confidence of Grade 11 STEM students in solving algebra-related problems. Based on the gathered data, the student's overall level of confidence is categorized as confident ($\bar{x}$=2.61, S=0.42). In the Algebraic Properties category, students showed the highest confidence in applying the properties of solving negative and positive numbers ($\bar{x}$=3.00, S=0.75), but the lowest confidence in applying logarithmic properties ($\bar{x}$=2.28, S=0.64) and in using different algebraic properties and concepts ($\bar{x}$=2.48, S=0.70). The general level of confidence in this category is confident ($\bar{x}$=2.63, S=0.52). For Algebraic Expressions and Equations, students were most confident in solving quadratic equations ($\bar{x}$=2.84, S=0.71) and least confident in solving word problems ($\bar{x}$=2.27, S=0.59), followed by applying different techniques in factoring and expanding algebraic expressions ($\bar{x}$=2.46, S=0.64), in solving systems of linear equations ($\bar{x}$=2.47, S=0.55), and in factoring algebraic expressions and equations ($\bar{x}$=2.49, S=0.64). The overall confidence in this category is also confident ($\bar{x}$=2.59, S=0.44). Similarly, in the Algebraic Functions category, students showed the highest confidence in understanding quadratic functions ($\bar{x}$=2.82, S=0.66) and the lowest in finding different parts of functions, such

as the slope, intercepts, and dependent and independent variables ($\bar{x}$=2.57, S=0.57). The general confidence level in this category is confident ($\bar{x}$=2.70, S=0.48). Lastly, in the Algebraic Inequalities category, students were confident in using inequality symbols ($\bar{x}$=2.76, S=0.64) but were less confident with word problems involving inequalities ($\bar{x}$=2.32, S=0.42). The overall confidence level in this category is confident ($\bar{x}$=2.61, S=0.42).

Table 5. *Descriptive Statistics of the Perceived Level of Confidence of Grade 11 STEM Students in Solving Algebra-Related Problems in Solving Algebra-Related Problems*

Components	*Mean*	*SD*	*Interpretation*
Algebraic Properties			
1. I am confident in using different algebraic properties and concepts.	2.48	0.70	Not Confident
2. I am confident in applying the rules of exponents.	2.76	0.64	Confident
3. I am confident in applying the properties of logarithms.	2.28	0.64	Not Confident
4. I am confident in applying the rules of radicals.	2.62	0.72	Confident
5. I am confident in applying the properties of solving negative and positive numbers.	3.00	0.75	Confident
Mean (Algebraic Properties)	2.63	0.52	Confident
Algebra Expressions and Equations			
1. I am confident in solving linear equations.	2.75	0.71	Confident
2. I am confident in solving quadratic equations.	2.84	0.71	Confident
3. I am confident in solving polynomial equations.	2.68	0.65	Confident
4. I am confident in solving rational expressions and equations.	2.67	0.61	Confident
5. I am confident in solving systems of linear equations.	2.47	0.55	Not Confident
6. I am confident in simplifying algebraic expressions and equations.	2.59	0.63	Confident
7. I am confident in factoring algebraic expressions and equations.	2.49	0.64	Not Confident
8. I am confident in multiplying algebraic expressions.	2.65	0.66	Confident
9. I am confident in applying different techniques in factoring and expanding algebraic expressions.	2.46	0.71	Not Confident
10. I am confident in solving word problems involving algebraic expressions and equations.	2.27	0.59	Not Confident
Mean (Algebra Expressions and Equations)	2.59	0.44	Confident
Algebraic Functions			
1. I am confident in understanding linear functions.	2.65	0.66	Confident
2. I am confident in understanding quadratic functions.	2.82	0.66	Confident
3. I am confident in understanding polynomial functions	2.67	0.59	Confident
4. I am confident in understanding rational functions.	2.77	0.64	Confident
5. I am confident in finding different parts of the function such as the slope, intercepts, and dependent and independent variables.	2.57	0.57	Confident
Mean (Algebra Function)	2.70	0.48	Confident
Algebraic Inequalities			
1. I am confident in using different inequality symbols.	2.76	0.64	Confident
2. I am confident in solving quadratic inequalities.	2.65	0.64	Confident
3. I am confident in solving polynomial inequalities.	2.57	0.67	Confident
4. I am confident in solving word problems involving algebraic inequalities.	2.32	0.57	Not Confident
Mean (Algebraic Inequalities)	2.57	0.48	Confident
Overall	2.61	0.42	Confident

Legend: Very Not Confident (1.00 – 1.49); Not Confident (1.50 – 2.49); Confident (2.50 – 3.49); Very Confident (3.50 – 4.00)

The results suggest several key implications for teaching and learning in algebra. Although students generally feel confident in most algebraic tasks, there are areas where their confidence is lower, especially in logarithms, word problems in both Algebraic Expressions and Equations and Algebraic Inequalities, and in factoring algebraic expressions. Additionally, while students may grasp fundamental algebraic concepts, they struggle with more complex or abstract applications, such as word problems and logarithms. The low confidence in solving word problems, particularly in algebraic expressions and inequalities, implies that students may find it difficult to apply academic understanding to real-world situations. This calls for instructional strategies that focus on these weaker areas, possibly by incorporating more hands-on, real-life examples and exercises that can build both conceptual understanding and problem-solving skills. Additionally, specific attention to topics like factoring and working with systems of linear equations is needed, as these are foundational skills for advanced mathematics. By addressing these gaps, educators can help students become more confident and competent in their algebraic abilities, eventually preparing them for future STEM and school challenges. Moreover, it suggests that while students feel exceptionally confident, they may not experience significant self-doubt. When students have moderate confidence levels, they may overestimate their capabilities, which could lead to unrealistic expectations that could, unfortunately, deter them from seeking help and reviewing difficult content.

According to a study by Wahyuni R., Juniati D., & Wijayanti P. (2024), confidence significantly impacts students' problem-solving abilities in mathematics. When students feel confident in their skills, they are more likely to tackle challenging problems and persist through difficulties. This confidence not only leads to improved performance on assessments but also creates a more positive learning environment. Moreover, students with higher confidence levels tend to be more engaged and motivated, enhancing their understanding

of algebraic concepts. Ultimately, fostering confidence in students can greatly contribute to their academic success in math.

Table 6. *Descriptive Statistics of the Level of Mastery of Grade 11 STEM Students in Solving Algebra-Related Problems*

	Mean	*SD*	*Qualitative Interpretation*
Level of Mastery	73.92	8.32	Moderate

Legend: Low (Below 60%); Moderate (60% - 79%); High (80% - 100%)

Descriptive Statistics of the Level of Mastery of Grade 11 STEM Students in Solving Algebra-Related Problems

Table 7. *Additional Information About the Level of Mastery of Grade 11 STEM Students in Solving Algebra-Related Problems per Question Using Frequency and Percentage*

Question	*Frequency*	*Percentage*
1. What do you call the process of finding the factors of an expression?		
correct	63	79.7
incorrect	16	20.3
2. Simplify the algebraic expression: 9x4-27x6 3x2		
correct	53	67.1
incorrect	26	32.9
3. Find x: 8 =x		
correct	9	11.4
incorrect	70	88.6
4. Evaluate: 6416		
correct	51	64.6
incorrect	28	35.4
5. Which of the following is true?		
correct	54	68.4
incorrect	25	31.6
6. Find x: 2(3x+2)=4x-6		
correct	37	46.8
incorrect	42	53.2
7. What can be a value of x? x2-2x-3=0		
correct	38	48.1
incorrect	41	51.9
8. What is x+2x2-x2-2x?		
correct	16	20.3
incorrect	63	79.7
9. What polynomial will have a quotient of x-3 when divided by x+3?		
correct	48	60.8
incorrect	31	39.2
10. Simplify: 2x+4x+2		
correct	19	24.1
incorrect	60	75.9
11.Find x and y in this system of linear equation: {y=2-x y=1-2x		
correct	27	34.2
incorrect	52	65.8
12. Factor: x2-2x+1		
correct	19	24.1
incorrect	60	75.9
13. Find the 2nd term of (x-6)2		
correct	35	44.3
incorrect	44	55.7
14. This is an easier way that is used for dividing polynomials in a form of x – c.		
correct	60	75.9
incorrect	19	24.1
15. Dominic has a number of apples. If the square of the number of apples, plus eight, is twelve. How many apples does Dominic have?		
correct	41	51.9
incorrect	38	48.1
16. Which of the following is a linear function?		
correct	34	43.0
incorrect	45	57.0
17. Which of the following is a quadratic function?		
correct	55	69.6
incorrect	24	30.4
18. Which of the following is a polynomial function?		

correct	27	34.2
incorrect	52	65.8
19. Which of the following is a rational function?		
correct	33	41.8
incorrect	46	58.2
20. What is the y-intercept of the equation 3y=3x+3?		
correct	21	26.6
incorrect	58	73.4
21. Which of the following ordered pair is the solution of $y \geq 5-x$?		
correct	53	67.1
incorrect	26	32.9
22. Which of the following coordinates of points belong to the solution set of the inequality of y < 2x2 + 3x - 5?		
correct	36	45.6
incorrect	43	54.4
23. Is $y \leq 2x2+1$, if y=3 and x = 1?		
correct	42	53.2
incorrect	37	46.8
24. Barbarra wants to buy oranges and bananas for her mother. 1 kilogram of oranges costs ₱10 and 1 kilogram of bananas costs ₱20. Which of the following kilograms of oranges and bananas can Barbarra buy if she has ₱100?		
correct	62	78.5
incorrect	17	21.5
25. What is the interval notation of $-1 \leq x < 2$?		
correct	36	45.6
incorrect	43	54.4
Total	79	100

Tables 6 and 7 show the level of mastery of Grade 11 STEM students in solving algebra-related problems. Based on the data, students demonstrate a moderate level of mastery, with a high variation in scores ($\bar{x}$=73.92, s=8.32). In Table 6, the majority of students answered question number three incorrectly (f=70, %=88.6), while only a few answered correctly (f=9, %=11.4). Conversely, most students answered question number one correctly (f=63, %=79.7), with fewer answering incorrectly (f=17, %=20.3).

The result implies that students are doing moderately well, but could improve with extra focused teaching or practice to strengthen their skills. Their overall mastery level shows they have a basic understanding of the subject, but there is still a lot of room for growth. A moderate level of mastery means students understand key concepts but may not fully grasp more difficult or advanced areas. This often means they can handle straightforward problems but may struggle when faced with more complex or challenging questions. They may be able to solve simple or familiar problems confidently but struggle with more difficult or less familiar questions. This lack of full comprehension could result in students feeling confident in their knowledge of the easier parts of algebra while not being aware of the gaps in their understanding. At this stage, many students might not recognize their weaknesses, making them less likely to seek help or additional resources. Furthermore, the variation in student performance across different algebra problems suggests that a one-size-fits-all approach to teaching may not be sufficient. Instead, educators should consider differentiated teaching strategies that address both the strengths and weaknesses of their students. By helping students build on their existing knowledge and targeting the areas where they struggle, teachers can guide them toward a higher level of mastery in algebra, ultimately leading to greater success in both basic and advanced topics.

The result connects to the study of Osborne (2021), teaching methods where the teacher leads (teacher-directed instruction) help 15-year-old students in the U.S. do better in math. This was true even when considering other factors like students' backgrounds and the schools they attend. On the other hand, teaching methods that focus more on students figuring things out on their own (student-centered instruction) were linked to lower math scores, which was surprising because many recent studies have praised these methods. This result suggests that a structured approach, in which the teacher actively assists students, may provide clearer explanations and more direct support, resulting in a better understanding of mathematical topics. In contrast, the findings challenge the concept that student-centered instruction, which promotes independent problem-solving, remains helpful to student learning. It might imply that, while freedom is vital, certain kids may require more direct assistance to succeed, particularly in disciplines such as math, where fundamental skills are important.

Table 8 shows the comparison between the perceived level of confidence of Grade 11 STEM students in solving algebra-related problems when grouped according to sex. Based on the gathered data, both male ($\bar{x}$=2.70, s=0.37) and female ($\bar{x}$=2.54, s=0.44) students are confident. Although male students have a slightly higher mean compared to Female students, the results show no significant difference in the perceived level of confidence between the two groups (p.=0.345).

The result suggests that there may be a positive and inclusive trend in mathematics education, where both sexes feel equally capable of solving algebra-related problems, which shows that confidence in algebra problem-solving is not influenced by sex. Additionally,

the results also show many significant implications for mathematics education. Educators can use this general confidence to enhance participation in more challenging mathematical concepts by promoting collaborative learning environments that encourage interaction among students regardless of sex. Furthermore, the findings highlight the need to promote positive attitudes toward mathematics among all students and address students' needs and experiences that may affect students' confidence.

Table 8. *Comparison of the Perceived Level of Confidence of Grade 11 STEM Students in Solving Algebra-Related Problems in Terms of Sex*

	Male		*Female*		*t(77)*	*p*
Level of Confidence	M	SD	M	SD	1.71*	0.345
	2.70	0.37	2.54	0.44		

**Not Significant (p>0.05)*

The result is supported by the study of Jean and Sabug (2023), which found no significant difference in the level of mathematics confidence when students were grouped by sex. This suggests that both male and female students have similar levels of confidence in math, indicating that gender does not play a major role in shaping students' self-assurance in their mathematical abilities. This finding highlights the importance of focusing on other factors, such as teaching methods or individual learning experiences, that might influence confidence in math.

Table 9. *Comparison of the Perceived Level of Confidence of Grade 11 STEM Students in Solving Algebra-Related Problems in Terms of Academic Standing*

Factors	*Groups*	*f*	*Mean*	*SD*	*F-value*	*p-value*
Level of Confidence	With Highest Honor	3	3.06	0.42	3.0*	0.23
	With High Honor	25	2.78	0.46		
	With Honor	40	2.50	0.35		
	With Academic Distinction	6	2.49	0.39		
	None	5	2.50	0.35		

**Not Significant (p>0.05)*

Table 9 shows the comparison between the perceived level of confidence that STEM students in Grade 11 have in solving algebra-related problems when grouped according to academic standing. Based on the gathered data, although students with the highest honor have a slightly higher perceived level of confidence ($\bar{x}$=3.06, s=0.42) compared to the students with no academic standing ($\bar{x}$=2.50, s=0.35) and other groups that also exhibit confidence, the result shows a significant difference between the perceived level of confidence across academic standings (p.=0.023).

This implies that a student's academic standing significantly influences their confidence in solving algebra problems. Those with the highest honors tend to feel more assured in their mathematical abilities compared to those without academic recognition. This suggests that students who perform well academically may develop greater confidence due to their stronger understanding of algebra, consistent practice, and exposure to more challenging problem-solving tasks. Their success in academics likely reinforces their belief in their abilities, motivating them to take on more complex mathematical challenges with a positive mindset. On the other hand, students with lower academic standing may struggle with confidence, which can stem from difficulties in grasping algebraic concepts, a lack of practice, or previous negative experiences with math. When students lack confidence, they may feel intimidated by mathematical problems, leading to avoidance and decreased motivation to engage in learning. Over time, this can create a cycle were low confidence results in lower effort and weaker performance, further diminishing their belief in their abilities.

These findings align with the study by Driver (2023), which highlights confidence as a crucial factor in academic success and a strong predictor of student performance. Driver explains that students with low confidence often face challenges in higher education, particularly in STEM fields, where subjects tend to be more demanding. If students struggle with self-assurance, they may experience frustration and anxiety, which can negatively impact their learning experience. In some cases, prolonged low confidence may even lead students to drop out, as they feel incapable of handling academic challenges.

Table 10. *Comparison of the Perceived Level of Confidence of Grade 11 STEM Students in Solving Algebra-Related Problems in Terms of Type of Junior High School Curriculum*

	Regular		*Science*		*t(77)*	*p*
Level of Confidence	M	SD	M	SD	-0.01*	0.293
	2.61	0.39	2.61	0.46		

**Not Significant (p>0.05)*

Table 10 shows the comparison between the perceived level of confidence of Grade 11 STEM students in solving algebra-related problems when grouped according to the type of JHS curriculum. Based on the gathered data, both regular ($\bar{x}$=2.61, s=0.39) and science ($\bar{x}$=2.61, s=0.46) high schools are confident in solving algebra-related problems, with no significant difference in perceived confidence levels between the two groups (p=0.293).

This implies that the type of junior high school curriculum is not a factor in the student's confidence in solving algebra-related problems. One possible reason is that both types of junior high schools might have access to similar support systems that could contribute to their

confidence in algebra. Factors like teaching quality, exposure to math challenges, or individual student efforts during junior high school may have a more significant impact on confidence than the school type itself.

At present, there are no available studies that directly support the finding that the type of junior high school curriculum, whether regular or science high school, does not significantly impact the confidence levels of students in solving algebra-related problems. Additionally, no existing research has specifically investigated whether there is a significant difference in confidence between students based on the type of junior high school curriculum. This highlights a gap in the literature, as previous studies have typically focused on other factors that influence students' confidence in mathematics, such as gender, academic performance, or socio-economic background, but have not explored the potential impact of different types of educational institutions at the junior high level.

Table 11. *Comparison of the Perceived Level of Confidence of Grade 11 STEM Students in Solving Algebra-Related Problems in Terms of Learning Styles*

Factors	*Groups*	*f*	*Mean*	*SD*	*F-value*	*p-value*
Level of Confidence	Visual	18	2.69	0.33	0.62*	0.711
	Auditory	5	2.65	0.51		
	Physical	8	2.67	0.47		
	Verbal	24	2.54	0.43		
	Social	9	2.44	0.37		
	Solitary	7	2.59	0.51		
	Logical	8	2.75	0.44		

**Not Significant (p>0.05)*

Table 11 shows the comparison between the perceived level of confidence of Grade 11 STEM students in solving algebra-related problems when grouped according to their learning styles. Based on the gathered data, although the students with a logical learning style exhibit a slightly higher level of confidence ($\bar{x}$=2.75, s=0.44) compared to the students with a social learning style that is not confident ($\bar{x}$=2.44, s=0.37) and other groups that are confident, the result shows no significant difference between the perceived level of confidence across all learning styles (p=0.711).

This implies that confidence in solving algebra problems is generally present among most learning styles, suggesting that many students feel capable of applying their algebra knowledge, regardless of how they prefer to learn. Moreover, this suggests that students who prefer logical, analytical approaches may find it easier to engage with algebra, thereby enhancing their confidence in their problem-solving abilities. Conversely, social learners may struggle with confidence, potentially due to their preference for collaborative learning environments, where they might feel less secure when working independently on algebra tasks. Our study aligns with the idea that confidence in applying algebra concepts is not significantly influenced by students' preferred learning styles. While differences in confidence levels may exist among learning styles, the overall results show no significant variations, suggesting that confidence is shaped by factors such as prior knowledge, experiences with mathematics, and support from teachers and peers, rather than learning style.

This finding mirrors Rahman (2021), who noted that while learning styles affect self-esteem, they do not significantly impact confidence in solving algebra problems. Overall, confidence is influenced by multiple factors and should be supported through comprehensive educational strategies, not just by focusing on learning styles.

Table 12. *Comparison of the Level of Mastery of Grade 11 STEM Students in Solving Algebra-Related Problems in Terms of Sex*

	Male		*Female*		*t(77)*	*p*
Level of Mastery	M	SD	M	SD	0.32*	0.024
	74.30	9.89	73.65	1.05		

**Significant (p<0.05)*

Table 12 shows the comparison in the level of mastery of Grade 11 STEM students in solving algebra-related problems when grouped according to sex. Based on the gathered data, both males ($\bar{x}$=74.30, s=9.89) and females ($\bar{x}$=73.65, s=1.05) have moderate mastery in solving algebra-related problems. However, the results show a significant difference between the Level of Mastery of Grade 11 STEM students in solving algebra-related problems when grouped according to sex (p=0.024). Therefore, male students perform slightly better on average in solving algebra-related problems despite the close mean score, while female students exhibit more consistent performance due to less variability.

This implies that male students may benefit from additional support to develop more consistent performance in math. Even though they often have higher average scores than female students, they can still have more ups and downs in their scores. This could be because male students may rely on their strong skills in certain areas but struggle with others, leading to inconsistency. On the other hand, female students usually do well if they use certain strategies, which helps them maintain steady performance. This means that teachers might need to use different methods to support male and female students effectively. By understanding these differences, teachers can help each group succeed in math class. Giving focused support can make a big difference for both male students and female students.

According to a research study by Vos et al. (2023) to determine the gender differences in young adults in their performance in mathematics, women scored significantly lower than men on the arithmetic and cognitive reflection tests. This connects to the findings, which indicate that male Grade 11 STEM students have a slightly higher average mastery in solving algebra-related problems but also show less consistent performance compared to female students. The research also points out that male students may take more risks when solving problems, which can lead to higher scores but also more ups and downs in performance. This supports the idea that male students might need extra help to perform more steadily, while female students could benefit from strategies that help them maintain their consistent mastery. Overall, the result of the study highlights the need to address these gender-specific challenges in math education to support all students effectively.

Table 13. *Comparison of the Level of Mastery of Grade 11 STEM Students in Solving Algebra-Related Problems in Terms of Academic Standing*

Factors	*Groups*	*f*	*Mean*	*SD*	*F-value*	*p-value*
Level of Mastery	With Highest Honor	3	85.00	15.13	8.55*	0.000
	With High Honor	25	79.00	9.21		
	With Honor	40	71.75	5.34		
	With Academic Distinction	6	68.50	3.89		
	None	5	65.80	1.92		

**Significant (p<0.05)*

Table 13 shows the comparison between the level of mastery of Grade 11 STEM students in solving algebra-related problems when grouped according to academic standing. Based on the gathered data, the students with the highest honor standing scored the highest ($\bar{x}$=85.00, s=15.13), showing a high level of mastery compared to the students with no academic distinction scored that scored the lowest ($\bar{x}$=65.80, s=15.13) that shows a moderate level of mastery with the other groups. This result reveals a significant difference in the level of mastery when grouped according to academic standing (p=0.000). Additionally, among the group, those with the highest honor, with honor, with academic distinction, and those with no academic standing have a significant difference from each other in solving algebra-related problems, while those with high honor show no significant difference among the other groups.

This implies that students with the highest honors possess a deeper knowledge and have better problem-solving skills, suggesting that academic achievement may be linked to effective study habits, a strong understanding of mathematical concepts, or access to better learning resources. Conversely, the lower scores of students with no academic distinction may suggest a need for targeted support and intervention, as their scores are close to the low mastery range. These students may struggle with fundamental concepts or lack motivation, highlighting the importance of specific educational strategies addressing their specific challenges. Additionally, a moderate level of mastery is seen in most students in having a basic understanding of algebra, which shows a potential area for improvement.

The result is supported by the study of Suhaedi (2013, as cited in Harti and Agoestanto 2019). In the study, it was stated that mastering algebra is important for its usefulness in daily life. However, some students are still experiencing difficulties in solving such problems because they have not mastered the concept of algebra, which suggests that students who do not understand or master algebra experience difficulty in solving problems, thus affecting their academic standing..

Table 14. *Comparison of the Level of Mastery of Grade 11 STEM Students in Solving Algebra-Related Problems in Terms of Type of Junior High School Curriculum*

	Regular		*Science*		*t(77)*	*p*
Level of Mastery	M	SD	M	SD	-4.80*	0.000
	70.32	4.42	79.22	9.83		

**Significant (p<0.05)*

Table 14 shows the comparison between the level of mastery of Grade 11 stem students in solving algebra-related problems when grouped according to the type of JHS curriculum. Based on the gathered data, the students who curriculum a regular JHS curriculum ($\bar{x}$=70.32, s=4.42) are more consistent compared to those who attended a science JHS curriculum ($\bar{x}$=79.22, s=9.83). However, those who attended a science junior high school curriculum performed better than the regular JHS curriculum. This indicates a significant difference between the level of mastery across the type of JHS curriculum (p.=0.000).

This implies that the curriculum and teaching methods employed in science JHS may provide a stronger foundation in algebra concepts, contributing to better performance in algebra-related problems. This difference means that students from science JHS likely benefit from more specialized lessons that focus on critical thinking and problem-solving, which are important for algebra. Educators could look at using similar strategies in regular schools to help all students improve their skills and confidence in algebra. Additionally, the scores of students from science schools show more variation, as indicated by the standard deviation. This could be because science programs might challenge students in different ways, with some excelling greatly while others might struggle with more advanced topics. Furthermore, the results suggest that schools should review their math programs to make sure they are giving all students the best chance to succeed. By recognizing these differences in students' mastery based on their junior high school backgrounds, teachers can create better support systems that help everyone improve in algebra. This can lead to a fairer learning environment where every student has a chance to do well in math. Lastly, there may be reasons for this difference, such as some schools having tougher algebra

programs or being better at teaching problem-solving skills. It may also be because of the resource availability in their junior high school and the teaching methods of each type of junior high school.

The result of our study aligns with the study of Mendoza (2021), which shows that the curriculum of a science high school is heavily loaded with math and science subjects. The students also receive education under free tuition, but according to Mendoza and her guests, part of the deal is that they would have to take a college degree program that's STEM-related while regular high school is just a regular high school. This can mean that the more math-heavy curriculum of the science high school may have affected their level of mastery in solving algebra-related problems therefore creating a significant difference.

Table 15. *Comparison of the Level of Mastery of Grade 11 STEM Students in Solving Algebra-Related Problems in Terms of Learning Styles*

Factors	*Groups*	*f*	*Mean*	*SD*	*F-value*	*p-value*
Level of Mastery	Visual	18	71.44	6.00	2.53*	0.028
	Auditory	5	71.00	3.54		
	Physical	8	74.38	10.72		
	Verbal	24	73.17	6.81		
	Social	9	71.11	4.57		
	Solitary	7	82.43	12.53		
	Logical	8	78.87	10.82		

**Significant (p<0.05)*

Table 15 shows the comparison between the level of confidence of Grade 11 STEM students and their learning styles in solving algebra-related problems. Based on the gathered data, the students with the solitary learning style scored the highest ($\bar{x}$=82.43, s=12.53), showing a high level of mastery, compared to students with the auditory learning style who scored lowest ($\bar{x}$=71.00, s=3.54) showing a moderate level of mastery together with the other groups. This result shows a significant difference between the level of mastery across different learning styles (p.=0.028). Moreover, the solitary learning style and visual learning style are the ones that have a significant difference within the group. Conversely, the auditory learning style garnered the lowest mean score and standard deviation, suggesting that they have the lowest mastery in solving algebra-related problems, though their scores are consistent.

This implies that students' preferred learning style is significant in enhancing their mastery in solving algebra-related problems, suggesting that teaching methods should be adjusted to satisfy the student's preferred learning style to effectively enhance their mastery. To illustrate, solitary learners may enhance their mastery by studying independently, whereas visual learners may perform better by viewing information that is represented by graphs, diagrams, or visual aids when teaching algebra-related concepts. Additionally, the solitary learning style garnered the highest mean score, suggesting that they tend to have a higher mastery in solving algebra-related problems compared to the other learning styles. Their standard deviation is also high, which implies that their scores greatly vary from each other, indicating that some solitary learners got high scores while others got low scores.

This is supported by the study of AL-Roomy (2023), which states that every person has their own preferred learning style which affects their approach towards the subject matter. Additionally, students who know their preferred learning styles will help them comprehend information effectively and activate their metacognitive awareness. This suggests that students who are aware of their preferred learning style can gain a deeper understanding of algebraic concepts, allowing them to enhance their mastery level in solving algebra-related problems even more.

Table 16. *Relationship Between the Perceived Level of Confidence and the Level of Mastery of Grade 11 STEM Students in Solving Algebra-Related Problems*

	Pearson's r	*p-value*	*QD*
Perceived Level of Confidence Level of Mastery	0.259*	0.021	Moderately Low Positive Correlation

Legend: Pearson r Qualitative Description – ±0.40 to ±0.59 (High Correlation), ±0.80 to ±0.99 (Very High Correlation), ±0.20 to ±0.39 (Moderately Low Correlation), ±0.60 to ±0.79 (Moderately High Correlation), ±0.01 to ±0.19 (Very Low Correlation). Significant (p<0.05)

Table 16 presents the relationship between the perceived level of confidence and the level of mastery among Grade 11 STEM students in solving algebra-related problems. Based on the gathered data, the relationship between the two variables falls has a moderately low positive correlation (r=0.259). Additionally, the result shows a significant relationship between the Level of Confidence and the Level of Mastery among Grade 11 STEM students in solving algebra-related problems (p.=0.021).

This suggests that more confident students tend to do better in algebra problems. When students feel more assured, they are more likely to solve challenging algebraic problems. By building self-confidence, students may have improved their level of mastery in solving algebra-related problems. Additionally, the results indicate that students who understand algebra may feel a bit more confident and vice versa. Although their correlation is positive, the connection is moderately low, meaning confidence alone may not ensure the level of mastery of students in solving algebra-related problems. Other factors might also play a role in how well students master math. This indicates that while having confidence can help students perform better in math, it is not the only factor influencing their success. Other elements, such as teaching methods, practice opportunities, and prior knowledge, also play important roles in how well students master algebra.

According to a study conducted by Byiringiro (2024), self-confidence significantly influences mathematical achievement suggesting that an increase in confidence can boost learning effectiveness, which can result in better performance on mathematics exams. In other words, when students feel confident in their understanding of algebra, they will likely apply their knowledge more effectively during exams. This could improve accuracy in solving problems, increase persistence in difficult tasks, and ultimately better exam scores. Confidence also reduces anxiety, allowing students to focus better and utilize their cognitive resources more efficiently. It indicates that the higher the confidence of learners, the greater their ability to solve mathematical problems, implying that developing self-confidence should be a primary goal in math education. When students believe in their abilities, they are more likely to tackle difficult problems and persevere in finding solutions. As a result, self-confidence-boosting strategies can improve mathematical performance.

Table 17. *Thematic Analysis on the Ways to Improve Confidence and Mastery of Grade 11 STEM Students in Solving Algebra-Related Problems*

Theme/s	*Sample Responses*	*f(n=76)*	*%*
Practice	Practicing/ giving them solving activities (thrill: plus points to encourage them) Try and try, more practice and execution	28	32.94
Listen	Listen attentively and try to understand the lessons carefully Be mindful and listen to teacher	11	12.94
Tutor	Tutor or summer class Tutoring, and making videos about the lessons	8	9.41
New programs	Proper curriculum must be observed/program/more engaging way of learning/ teaching	7	8.24
Review	Review and always listen and try the equations Reading books and browsing	7	8.24
More examples	Give learning models with enough explanations Focus on students and give more examples	6	7.06
Fun and Joyful Teaching	Reducing/ preventing bullies. Fun and joyful teaching Teaching with no pressure	5	5.88
Group studies	Group study/review Someone to teach them the problems one by one Study groups/review	2	2.38
Make it simple	Teach slowly lessons should be explain clearly and accurate deliveration and give more examples	2	2.38
Advance reading	advance reading advance reading and searching	2	2.38
Better Teaching	Better Teachers improve the ways od teaching	2	2.38
Study more	study more and always understand the lesson reading books and browsing	2	2.38
Consult teachers	Consult to teachers, and find ways to improve	1	1.18
Summer class	Tutor or join summer class	1	1.18
Bond with teachers	create a strong bond with the teacher	1	1.18

Table 17 shows the thematic analysis of the suggestions on how to improve the level of confidence and mastery of the respondents in solving algebra-related problems. Based on the gathered data, most of the students suggested practicing (f=28, %=32.94) highlighting it as a key factor for improving both mastery and confidence. The second most suggested strategy is listening (f=11, %=12.94), followed by tutoring (f=8, %=9.41). Less frequently mentioned strategies were to consult teachers (f=1, %1.18), study more (f=1, %1.18), bond with teachers (f=1, %1.18), improve teaching (f=1, %1.18), summer class (f=1, %1.18), better teachers (f=1, %1.18), and read books (f=1, %1.18).

This implies that the responses emphasizing practice suggest that students believe that hands-on activities and consistent practice are crucial for confidence and mastery in solving algebra-related problems. This highlights the need for educators to provide ample opportunities for students to engage in practice exercises, as regular practice can lead to better understanding and increased confidence. The emphasis on practice suggests that students recognize its importance in reinforcing their skills and improving their ability to solve algebra-related problems. Additionally, the suggestion to listen during lessons points to the value of active engagement and attentiveness in class, which can enhance comprehension and retention of algebra concepts. The recommendation for tutoring also implies that students may benefit from more personalized support, where one-on-one guidance can help address individual challenges they face in mastering algebra.

Though strategies like consulting teachers, studying more, or improving teaching methods were mentioned less frequently, they still underscore the variety of ways students believe they can improve. This suggests that while practice is central, other approaches like seeking help from teachers or focusing on self-study also play a role in boosting both mastery and confidence. Educators can use these insights to offer diverse learning methods, ensuring that students have access to resources that cater to different learning needs and preferences. The relatively low mention of improved teaching and better teachers suggests that the respondents are not generally

satisfied with their current teachers and teaching styles. This could indicate that students feel the teaching methods being used are not fully addressing their learning needs, leading to a reliance on self-directed strategies like practice and tutoring for improvement.

The result aligns with the study by Mlgs and Mlgs (2020) which states that through practice one can solve and match math problems more quickly. Practice is important in increasing the level of mastery in solving math problems including but not limited to algebra. Furthermore, it's been found by the study of Kendall-Waters and Kendall-Waters (2019) that even though knowledge is important without deliberate practice mastery cannot be achieved. to put simply the studies mentioned state that practice is essential when achieving mastery, and higher mastery has a positive increase in confidence in solving algebra-related problems (febrianto, et al. 2022)

Conclusions

In general, the data gathered in this study indicates that Grade 11 STEM students are generally confident and have a moderate level of mastery in solving algebra-related problems suggesting that while they feel assured in their algebra skills, they may still need targeted support to improve their understanding and problem-solving abilities. Significant differences in mastery were found across various student characteristics. Students demonstrated a foundational knowledge of basic algebraic concepts but struggled with more advanced topics like logarithmic properties. No significant differences in confidence were observed when students were grouped by sex, academic standing, and type of junior high school curriculum but significant differences were found when grouped by academic standing. However, mastery levels varied significantly, with male students and those from science-oriented JHS programs demonstrating higher mastery. Additionally, significant differences in mastery were noted based on learning styles, particularly between visual and solitary learners. There was a moderately low positive correlation between confidence and mastery, suggesting that while confidence can influence performance, it is not the only factor determining mastery. Factors such as sex, academic standing, and type of JHS curriculum significantly impacted students' mastery levels. Therefore, the overall results suggest that teachers should provide extra help to students who need it, especially for more difficult algebra topics. This could include tutoring sessions, lessons that fit different learning styles, more practice opportunities, or implementing a mathematics enhancement program. Schools should also look at how different backgrounds affect students' performance and fill any gaps in their knowledge. Encouraging students to work together can improve their learning experience. Building a classroom environment that boosts students' confidence may also help them solve problems better. Regular tests and feedback can help teachers see where students struggle and provide help quickly. By understanding the factors that affect both confidence and mastery, teachers can better support their students' learning in math. In the end, a balanced approach that combines practice, support, and encouragement can lead to better mastery and greater success in algebra.

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