Critical Thinking Skills in Relation to Performance of Students in Procedural and Word Problem Assessment

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ABSTRACT

This study entitled "Critical Thinking Skills in Relation to Performance of Students in Procedural and Word Problem Assessment," examined the relationship between critical thinking skills and mathematics performance on procedural and word-problem assessments among Grade 10 students in Algebra. The study involved one hundred thirty (130) Grade 10 students from a public high school in the Negros Island Region during the school year 2025–2026. Data were gathered using the Critical Thinking Questionnaire (CThQ) developed by Kobylarek et al. (2022) and researcher-made procedural and word-problem assessments that underwent validation and reliability testing. Findings revealed that the students demonstrated an average level of critical thinking skills and attained average performance in both procedural and word-problem assessments. Moreover, the results indicated no significant relationship between students' critical thinking skills and their performance in either procedural or word-problem assessments. The findings suggest that factors other than critical thinking skills may influence students' performance in Algebra.

Keywords: Mathematics, critical thinking skills, procedural assessment, word problem assessment, high school students

INTRODUCTION

Education in the twenty-first century has moved beyond routine skills and basic knowledge. It involves cultivating higher-order thinking skills needed to navigate complex and unfamiliar scenarios. Among these skills, including the ability to think critically, has been the focus of much attention in contemporary education. Critical thinking is the ability to analyze information and evaluate evidence in order to make informed decisions about what to believe and what actions to take (Ryan, 2022; Stanford Encyclopedia of Philosophy, 2022). It is a collection of skills needed in both academic and real-life situations.

Within mathematics education, critical thinking is especially important in higher-order tasks. Many mathematics problems go beyond the need for students to memorize information or mechanically apply a procedure. Rather, students must analyze a set of information, identify the underlying order, and draw a reasoned conclusion. A clear example is the solution of a mathematics word problem. The steps of a calculation are the least of the considerations. An understanding of the problem's real-world context is imperative. Moreover, the answer must be justified, and the solution verified. When faced with the demands of a given task, critical thinking is also evident in a student's rationale for anticipating and detecting errors. Critical thinking is what allows students to reason, be flexible, go beyond the limitations of memorization and mechanical application, and draw on relationships to solve mathematical problems.

Performance is, in part, measured through assessments of procedural and word problems. A procedural task is a problem in which a learner is presented with a set of rules, a formula, or an algorithm, and a solution must be determined through a series of defined steps (Van de Walle et al., 2022). In contrast, a word-problem task is an assessment in which learners are presented with a real-world situation or verbal context. Learners are expected to interpret the situation, transform the verbal representation into a representation, and/or execute the appropriate operation(s) to obtain the desired outcome (Vicente et al., 2022).

Many learners struggle to solve non-routine problems, and this struggle is especially felt in worded problems that require the learner to interpret and analyze the problem, rather than just require basic arithmetic. In practice, many learners engage in a high level of procedural learning, which can come at the expense of conceptual learning and critical thinking. For this reason, learners may succeed at routine exercises but fail to apply their knowledge to word problems. This situation highlights the importance of understanding the relationship between the critical thinking skills and the student's success on procedural versus word problem assessments.

METHODOLOGY

Research Design

This study utilized a descriptive–correlational research design. The descriptive approach was used to profile Grade 10 students by sex, average monthly family income, and parents' educational attainment. It also determined students' critical thinking skills and their performance in Algebra, as measured by procedural and word-problem assessment tools. The correlational method was used to examine whether a significant relationship exists between students' critical thinking skills and their performance in Algebra, as measured by procedural and word-problem assessments. A descriptive correlational design seeks to examine the relationship between variables without attempting to manipulate any of them (Bhandari, 2022).

Subject and Respondents of the Study

The subject and respondents of the study were the 130 Grade 10 students from one of the public high schools in Negros Island Region, school year 2025-2026.

Population and Sample Size

The population of the study consisted of 191 Grade 10 students enrolled in the regular curriculum from one of the public high schools in Negros Island Region. The total population consisted of 191 students distributed across five sections: A, B, C, D, and E. The researcher used Yamane's formula to compute the required sample size.

The sample size was determined using the following formula:

$$n = \frac{N}{1 + Ne^2}$$

Where:

n= sample size

N= total population

e= margin of error

Computation

$$n = \frac{191}{1 + 191(0.05)^2}$$
$$n = \frac{191}{1.4775}$$
$$n = 129.29 \approx 130$$

Using Yamane's formula with a 0.05 margin of error, a sample size of 130 students was determined from a total population of 191 students.

Data Gathering Instrument

The researcher used the critical thinking test tool developed by Aleksander Kobylarek et al. (2022) to assess the respondents' level of critical thinking skills. The questionnaire contained 25 items, with individual areas including Analyzing (4 items), Evaluating (4 items), Creating (6 items), Remembering (3 items), Understanding (4 items), and Applying (4 items). To evaluate individual statements, a 5-point Likert scale was used, where 1 meant “strongly disagree” and 5 “strongly agree”.

Additionally, the study used a researcher-developed test as the research instrument to determine the level of mathematics performance of Grade 10 students in both procedural and word-problem assessments. The tests focused on Algebra, based on their first-quarter competencies. Each of the two instruments has thirty (30) items. The first is a procedural assessment tool focused on using symbols, which students will immediately carry out the processes suggested by. Hence, the second is a modified word-problem assessment tool focused on using word problems that require students to analyze the interrelationships among words to choose the appropriate concept to answer the problem.

The items in the two instruments are grouped according to difficulty, with 60% considered easy, 30% average, and 10% difficult. The easy items, which include 18 questions, focus on the basic cognitive skills of Remembering and Understanding as outlined in Bloom’s Taxonomy. The average items, 9 in total, are designed to assess Applying and Analyzing skills, while the difficult items, 3 questions, target higher-order thinking skills, specifically Evaluating and Creating. This approach allows the instruments to cover a wide range of cognitive levels, from foundational knowledge to more complex problem-solving. An item in one questionnaire corresponds to a specific item in the other, with both items having the same answer but being worded or symbolized differently. For each item, if answered correctly, the student earned 1 point; otherwise, no point was awarded.

These two instruments align with the first-quarter competencies in Grade 10 Mathematics, and the researcher created a Table of Specifications to ensure that the questions matched the respondents’ lessons and learning. Moreover, students' mathematics performance depends on their test scores on either assessment tool.

Validity and Reliability of the Research Instrument

To ensure the quality, accuracy, and credibility of the data gathered, the research instruments used in this study underwent rigorous validity and reliability testing before their administration to the actual respondents.

The study utilized the Critical Thinking Questionnaire (CThQ) developed by Kobylarek et al. (2022) to measure the critical thinking skills of Grade 10 students. The instrument had previously undergone psychometric testing and demonstrated high reliability. The final reliability coefficient for the entire questionnaire was 0.877 after correction, with the minimum factor loading power at $r > 0.86$. Furthermore, all 25 statements met the required criteria and were retained in the final version of the instrument, indicating that the questionnaire consistently and accurately measures students' critical thinking skills.

For the researcher-made Procedural Assessment and Word Problem Assessment, validity was established through expert evaluation. The instruments were tested and found to be valid, ensuring that they measured what they were intended to measure. The researcher consulted three (3) expert jurors in the field of Mathematics Education, composed of one Program Head in Mathematics with a Doctorate Degree, one Master Teacher II and school coordinator in Mathematics, and one teacher with a Master’s Degree major in Mathematics. These experts carefully examined the instruments' content for clarity, relevance, appropriateness, and alignment with the Grade 10 Algebra competencies and the study's objectives.

To further establish content validity, the Lawshie Content Validity Ratio (CVR) was utilized to determine the extent to which each questionnaire item was considered essential by the panel of experts. The Critical Thinking Questionnaire obtained a mean CVR of 1.00 for 25 items, while the Procedure Assessment Tool obtained a mean CVR of 1.00 for 30 items, and the Word Problem Assessment Tool obtained a mean CVR of 1.00 for 30 items.

These results indicate strong content validity, signifying that all items were considered essential by the validators and adequately represented the dimensions of the study.

Moreover, the research instruments underwent reliability testing to assess their stability and consistency. The reliability testing involved 30 Grade 10 students who were not included in the actual sample of respondents. To further establish the consistency of the researcher-made assessments, the researcher employed the test–retest method. The procedural and word-problem assessment instruments were administered to the respondents, and two weeks later, the same instruments were administered again to the same group. This process was conducted to determine the extent to which the instruments could yield consistent results over time.

After administering the tests, the results were analyzed using Pearson r in the Statistical Package for the Social Sciences (SPSS). The findings revealed that the 30-item Procedural Assessment obtained a Pearson Correlation of 0.877, while the Word Problem Assessment obtained a Pearson Correlation of 0.865. Both assessments indicated good internal consistency. These results suggest that both instruments are reliable and suitable for measuring students' performance in procedural and word problem assessments in Algebra.

Data Analyses

The data gathered in this study were analyzed systematically to address the specific problems stated in the research. Both descriptive and inferential statistical techniques were employed to ensure an accurate interpretation of the results.

The first problem, to describe the profile of Grade 10 students in terms of sex, average monthly family income, and parents' educational attainment, used frequency counts and percentages.

For the second problem, the level of Critical Thinking Skills of Grade 10 students. The respondents' level of critical thinking skills, as measured by the Critical Thinking Skills Questionnaire (CThQ) developed by Aleksander Kobylarek (2022), was determined using the Mean and Standard Deviation. The mean was used to determine the overall level of students' critical thinking skills using the formula:

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

Where:

$\bar{X}$= Mean score

$\sum x$= Sum of all scores

n= Number of respondents

The standard deviation was used to determine the variability of responses and was calculated using the formula.

$$SD = \sqrt{\frac{\sum(X-\bar{X})^2}{n-1}}.$$

Where:

SD= Standard deviation

X= Individual score

$\bar{X}$= Mean score

$(X-\bar{X})$= Deviation of each score from the mean

$\sum(X - \bar{X})^2$= Sum of squared deviations from the mean

n= Number of respondents

$n - 1$= Degrees of freedom

The Critical Thinking Questionnaire (CThQ) developed by Kobylarek et al. (2022) consists of 25 statements rated using a five-point Likert scale. Rather than counting items alone, the instrument measures critical thinking skills using a cumulative score derived from respondents' ratings across all items. Each statement is assigned a score ranging from 1 to 5, resulting in a minimum possible score of 25 and a maximum possible score of 125. Consequently, the interpretation of critical thinking skills is based on the total score obtained by a respondent rather than the number of questionnaire items. Following the instrument's scoring procedure, scores ranging from 25–58 indicate low critical thinking skills, scores from 59–92 indicate average critical thinking skills, and scores from 93–125 indicate high critical thinking skills. These score intervals allow for a more comprehensive assessment of the respondents' level of critical thinking by capturing variations in the degree of agreement across the 25 indicators.

The respondent's response was interpreted as:

Score	Interpretation	Verbal Description
25 – 58	Low Critical Thinking Skills	Respondents within this range demonstrate limited use of critical thinking abilities. They may have difficulty analyzing information, evaluating evidence, identifying logical inconsistencies, and making well-reasoned judgments. Additional support or training may be beneficial to strengthen critical thinking competencies.
59 – 92	Average Critical Thinking Skills	Respondents within this range exhibit a moderate level of critical thinking ability. They are generally capable of analyzing information and making reasoned decisions, although these skills may not be applied consistently across all situations. Continued practice and development can further enhance their critical thinking proficiency.
93 - 125	High Critical Thinking Skills	Respondents within this range demonstrate strong critical thinking abilities. They are likely to effectively analyze and evaluate information, consider multiple perspectives, identify assumptions and biases, and make informed, evidence-based decisions. These individuals exhibit a well-developed capacity for reflective and logical thinking.

For the third problem, the performance level of the Grade 10 students in Algebra using the Procedural Assessment tool was computed as the mean, the most reliable measure of central tendency, and the standard deviation. The computed mean scores were then interpreted using the study's performance descriptors (very good, good, average, poor, and very poor) to describe the students' procedural skills in Algebra.

Mean Score	Interpretation	Verbal Description
24.01 - 30.00	Very Good	Students within this range demonstrate a very high level of procedural proficiency in Algebra. They can accurately and consistently apply algebraic rules, procedures, and algorithms to solve problems with minimal errors. Their mastery of algebraic processes indicates strong computational and problem-solving skills.
18.01 - 24.00	Good	Students within this range exhibit a satisfactory level of procedural proficiency in Algebra. They are generally capable of applying appropriate algebraic procedures and solving problems correctly, although occasional errors or

		inconsistencies may occur. Their understanding of algebraic processes is well developed.
12.01 - 18.00	Average	Students within this range demonstrate a moderate level of procedural proficiency in Algebra. They show a basic understanding of algebraic procedures and can solve routine problems, but may encounter difficulties when applying procedures to more complex tasks. Additional practice may help improve their performance.
6.01 - 12.00	Poor	Students within this range exhibit limited procedural proficiency in Algebra. They often struggle to apply algebraic rules and procedures correctly, resulting in frequent errors. Their understanding of fundamental algebraic processes requires further development and reinforcement.
0.00 - 6.00	Very Poor	Students within this range demonstrate very low procedural proficiency in Algebra. They experience significant difficulty in applying basic algebraic procedures and solving algebraic problems. Intensive instructional support and practice are recommended to improve their procedural understanding and skills.

For the fourth problem, the performance level of Grade 10 students in Algebra, as measured by the Word Problem Assessment tool, was determined using the mean, the most reliable measure of central tendency, and the standard deviation. The computed mean scores were then interpreted using the study's performance descriptors (very good, good, average, poor, and very poor) to describe the students' procedural skills in Algebra.

Mean Score	Interpretation	Verbal Description
24.01 - 30.00	Very Good	Students within this range demonstrate a very high level of proficiency in solving algebraic word problems. They can accurately interpret problem situations, identify relevant information, formulate appropriate algebraic equations, and arrive at correct solutions with minimal difficulty.
18.01 - 24.00	Good	Students within this range exhibit a satisfactory level of proficiency in solving algebraic word problems. They generally understand problem situations and apply appropriate strategies to obtain correct solutions, although occasional errors in interpretation or computation may occur.
12.01 - 18.00	Average	Students within this range demonstrate a moderate level of proficiency in solving algebraic word problems. They can solve straightforward problems but may experience difficulty in analyzing more complex situations, selecting appropriate problem-solving strategies, or interpreting results accurately.
6.01 - 12.00	Poor	Students within this range exhibit limited proficiency in solving algebraic word problems. They often struggle to identify relevant information, translate verbal statements into algebraic expressions, and apply correct procedures, resulting in frequent errors and incomplete solutions.
0.00 - 6.00	Very Poor	Students within this range demonstrate very low proficiency in solving algebraic word problems. They have substantial difficulty understanding problem contexts, formulating mathematical representations, and obtaining correct solutions. Intensive intervention and guided practice are recommended to improve their problem-solving skills.

The interpretation of students' performance in the procedural and word-problem assessments was based on the mean scores obtained from the 30-item tests. The highest possible score was 30, and the lowest was 0. To classify performance levels, the score range was divided into five equal intervals corresponding to the descriptive

categories: very poor, poor, average, good, and very good. The class interval was obtained by dividing the score range (30) by the number of categories (5), resulting in an interval width of 6. Consequently, mean scores ranging from 24.01 to 30.00 were interpreted as very good; 18.01 to 24.00, as good; 12.01 to 18.00, as average; 6.01 to 12.00, as poor; and 0.00 to 6.00, as very poor. This classification provided a basis for describing students' performance levels on the procedural and word-problem assessments.

To answer problem number 5, the Pearson Product-Moment Correlation Coefficient (r) was used to assess the relationship between students' critical thinking skills and their performance on the Procedural Assessment Tool.

The resulting correlation coefficient indicates the degree to which variations in critical thinking skills are associated with variations in procedural performance. A positive correlation suggests that students with higher critical thinking skills tend to achieve higher procedural assessment scores, whereas a negative correlation suggests the opposite.

The formula for Pearson Product-Moment Correlation Coefficient (r) is:

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

Where:

r = Pearson correlation coefficient

$n =$ Number of data points or pairs

$\sum xy =$ Sum of the products of paired x and y scores

$\sum x$ and $\sum y =$ Sum of the x scores and sum of the y scores, respectively

$\sum x^2$ and $\sum y^2 =$ Sum of the squared x scores and squared y scores

To answer problem number 6, the Pearson Product-Moment Correlation Coefficient (r) was used to assess the relationship between students' critical thinking skills and their performance on the Word Problem Assessment Tool.

The resulting correlation coefficient indicates the degree to which variations in critical thinking skills are associated with variations in procedural performance. A positive correlation suggests that students with higher critical-thinking skills tend to achieve higher word problem assessment scores, whereas a negative correlation suggests the opposite.

RESULTS AND DISCUSSION

This chapter presents, analyzes, and interprets the data gathered in the study. The information is arranged in an organized manner to clearly address the research questions and objectives, with the use of appropriate statistical methods and tools for accurate interpretation of the results.

Socio-Demographic Profile of the Respondents

The table below reveals the Socio-Demographic Profile of the respondents.

Table 1. Frequency and Percent of Distribution of the Demographic Profile of Grade 10 Students.

Profile	Category	f	%
Sex			
	Male	48	36.92

	Female	82	63.08
	Total	130	100.00
Family Monthly Income			
	Php 3,250 – Php 7,500	68	52.31
	Php 7,501 – Php 15,000	28	21.54
	Php 15,001 – Php 30,000	22	16.92
	Php 30,001 – Php 40,000	9	6.92
	Php 40,001 – Php 50,000	3	2.31
	Total	130	100.00
Parent's Highest Educational Attainment			
	Elementary Level	3	2.31
	Elementary Graduate	2	1.54
	High School Level	21	16.15
	High School Graduate	60	46.15
	College Level	16	12.31
	College Graduate	25	19.23
	Master's Degree Holder	3	2.31
	Total	130	100.00

Table 1 presents the Socio-Demographic Profile of the respondents in terms of Sex, Family Monthly Income, and Parents' Highest Educational Attainment.

In terms of Sex, the majority of respondents were female (82, 63.08%), while 48 (36.92%) were male. Regarding Family Monthly Income, 68 respondents or 52.31% reported a monthly family income ranging from Php 3,250 to Php 7,500, followed by 28 respondents or 21.54% with an income of Php 7,501 to Php 15,000. Meanwhile, 22 respondents or 16.92% belonged to families earning Php 15,001 to Php 30,000, 9 respondents or 6.92% reported an income between Php 30,001 and Php 40,000, and only 3 respondents or 2.31% came from families with a monthly income of Php 40,001 to Php 50,000.

With regard to Parents' Highest Educational Attainment, 3 respondents or 2.31% reported that their parents had reached the elementary level, while 2 or 1.54% were elementary graduates. Twenty-one respondents or 16.15% had parents who reached the high school level, whereas the largest group, consisting of 60 respondents or 46.15%, had parents who completed high school. In addition, 16 respondents or 12.31% had parents with college-level education, 25 respondents or 19.23% had parents who were college graduates, and only 3 respondents or 2.31% reported having parents who earned a master's degree. The findings indicate that the respondents were predominantly female and mostly came from families with relatively low monthly incomes. Furthermore, the majority of their parents had completed high school, while only a small proportion had attained higher education. These results suggest that most learners came from households with limited financial resources and parents whose educational experiences were generally confined to basic education.

The findings are consistent with recent studies emphasizing that socioeconomic conditions and parental educational attainment play significant roles in students' academic achievement. Learners from families with limited financial resources often face barriers that affect their academic engagement and performance due to unequal access to educational materials and learning opportunities (UNESCO, 2023). Also, research has shown that parents with higher educational attainment are generally better equipped to provide academic guidance, foster positive learning habits, and create supportive home learning environments, thereby contributing to improved student outcomes (OECD, 2023). Moreover, evidence suggests that socioeconomic disparities continue to influence educational equity, making targeted school support essential for promoting student success (UNICEF, 2024).

The Level of Critical Thinking Skills of Grade 10 Students

The level of critical thinking among Grade 10 students is shown in the table below.

Table 2. Level of Critical Thinking Skills of Grade 10 Students.

Level of Critical Thinking Skills	f	Mean	SD	Interpretation
High	27	80.77	15.05	Average Critical Thinking Skills
Average	93			
Low	10			
Total	130			

Legend: 93-125 (High); 59-92 (Average); 25-58 (Low)

Table 2 presents the level of Critical Thinking Skills among Grade 10 students, as measured by the Critical Thinking Questionnaire (CThQ). The instrument evaluates students' critical-thinking dispositions through statements that assess how they verify information, analyze different viewpoints, connect ideas, justify opinions with evidence, and apply what they have learned in real-life situations.

The findings showed that of the 130 respondents, 27 demonstrated a high level of critical thinking skills, 93 were classified at the average level, and 10 were at the low level. The respondents obtained an overall mean score of 80.77 with a standard deviation of 15.05, which falls within the average level of critical thinking skills.

A standard deviation of 15.05 suggests that the students' critical thinking scores are moderately varied. This means that while many students scored close to the average of 80.77, some scored much higher and others much lower. The differences in scores among the students are noticeable, indicating that not all students demonstrated the same level of critical thinking.

The results suggest that most students have developed basic critical-thinking skills but have not yet consistently demonstrated higher-level reasoning. Their responses indicate that they generally make an effort to understand information, compare different ideas, and relate new knowledge to what they already know. They also tend to think before accepting information and to support their opinions with examples when needed. However, the average rating suggests that these practices may not always be evident, especially when students face unfamiliar or more challenging situations that require deeper analysis and careful judgment.

The findings may imply that the respondents are beginning to develop the habits of reflective and analytical thinking, but these skills still need further improvement. Critical thinking is strengthened through regular opportunities to question ideas, evaluate evidence, and solve meaningful problems. When students are consistently exposed to learning activities that encourage these processes, they become more confident in making decisions and explaining their reasoning.

Recent studies emphasize that critical thinking is developed through active learning experiences rather than memorization alone. Elder and Paul (2022) explained that critical thinkers examine evidence carefully, consider different perspectives, and make logical conclusions before accepting information. These findings highlight the importance of creating classroom environments that encourage students to ask questions, analyze information, justify their answers, and reflect on their own thinking.

The Level of Performance of the Grade 10 Students in Algebra using the Procedural Assessment Tool

The level of performance of Grade 10 students in Algebra using the procedural assessment tool is displayed in the table below.

Table 3. Performance of the Grade 10 students using Procedural Assessment Tool.

Level of Procedural Assessment	f	Mean	SD	Interpretation
Very Good	5	15.90	5.11	Average
Good	40			
Average	51			
Poor	29			
Very Poor	5			
Total	130			

Legend: 24.01-30.00 (Very Good); 18.01-24.00 (Good); 12.01-18.00 (Average);6.01-12.00 (Poor); 0-6.00 (Very Poor)

Table 3 presents the level of Performance of the Grade 10 students in Algebra using the procedural assessment tool. The instrument consists of 30 mathematics items that measure students' ability to apply mathematical procedures, identify patterns, use appropriate formulas, perform calculations accurately, and solve problems involving arithmetic and geometric sequences and series, as well as polynomial division.

The findings revealed that among the 130 respondents, 5 students, or 3.85%, obtained a very good level of performance; 40, or 30.77%, were classified as good; 51, or 39.23%, achieved an average level; 29, or 22.31%, were rated poor; and 5, or 3.85%, fell under the very poor category. The respondents obtained an overall mean score of 15.90 with a standard deviation of 5.11, which is interpreted as average.

The standard deviation of 5.11 indicates that the students' scores are fairly close to the mean score of 15.90. This means that most students performed at a similar level, with only a few obtaining much higher or much lower scores than the average. The relatively small standard deviation suggests less variation in the students' procedural assessment scores.

The results indicate that most of the respondents demonstrated an average level of procedural competence. This suggests that they have a basic understanding of mathematical procedures and can generally follow solution steps for familiar problems. However, many students may still experience difficulty when tasks require selecting the correct formula, accurately carrying out multiple computational steps, or solving problems that involve more complex mathematical reasoning. Procedural skills appear to be present but not yet consistently applied across different types of mathematical tasks.

This also indicates that the respondents have acquired foundational procedural skills but still require further practice to improve their accuracy, fluency, and confidence in solving mathematics problems. Since the assessment focuses on applying mathematical rules and procedures systematically, the predominance of average scores suggests that many students can complete routine exercises but may struggle with more demanding

problems or those that involve several interconnected steps. Continuous exposure to guided practice, immediate feedback, and varied problem-solving activities may help strengthen procedural fluency and reduce common computational errors. Most students have developed basic procedural skills but still need continuous practice to improve their accuracy and flexibility in solving mathematical problems.

According to Bay-Williams and SanGiovanni (2021), procedural fluency goes beyond memorizing formulas and algorithms; it involves selecting efficient strategies, applying procedures accurately, and using mathematical reasoning in different situations. Likewise, Bethany Rittle-Johnson and Robert S. Siegler (2021) explained that procedural knowledge becomes more meaningful when learners understand the underlying mathematical concepts, enabling them to solve problems more effectively and adapt their knowledge to unfamiliar tasks.

The Level of Performance of the Grade 10 Students in Algebra using the Word Problem Assessment Tool

The level of performance of the Grade 10 students in Algebra using the word problem assessment tool is displayed in the table below.

Table 4. Performance of the Grade 10 Students using Word Problem Assessment tool.

Level of Word Problem Assessment	f	Mean	SD	Interpretation
Very Good	2	15.28	4.79	Average
Good	38			
Average	54			
Poor	30			
Very Poor	6			
Total	130			

Legend: 24.01-30.00 (Very Good); 18.01-24.00 (Good); 12.01-18.00 (Average);6.01-12.00 (Poor); 0-6.00 (Very Poor)

Table 4 presents the level of Performance of Grade 10 students in Algebra using the word-problem assessment. The assessment consists of 30-word problems that require students to interpret real-life situations, identify the given information, determine the appropriate mathematical concepts and procedures, and arrive at accurate solutions. The test covers topics such as sequences, series, and polynomial division, presented in practical contexts.

The findings revealed that among the 130 respondents, 2 students, or 1.54%, achieved a very good level of performance; 38, or 29.23%, were classified as good; 54, or 41.54%, obtained an average rating; 30, or 23.08%, were categorized as poor, and 6, or 4.62%, fell under the very poor level. The respondents obtained an overall mean score of 15.28 with a standard deviation of 4.79, which is interpreted as average.

The standard deviation of 4.79 indicates that the students' scores were fairly close to the average score of 15.28. This means that most students performed at about the same level in solving word problems. The differences in scores among the students were not very large, suggesting that their performance was generally consistent.

The results indicate that most of the respondents demonstrated an average level of performance in solving algebraic word problems. This suggests that many students were able to solve routine problems when they recognized the underlying mathematical concepts. However, they may have encountered difficulties when translating verbal statements into mathematical expressions, selecting appropriate solution strategies, or interpreting the meaning of their answers within the context of the problem. Since word problems require both

mathematical knowledge and reading comprehension, an average level of performance reflects that many learners are still developing the ability to connect mathematical concepts with real-life situations.

The findings imply that while the respondents possess basic problem-solving skills, they need additional opportunities to strengthen their mathematical reasoning and analytical thinking. Solving word problems involves more than carrying out computations; it requires students to understand the situation presented, organize relevant information, choose suitable mathematical procedures, and evaluate whether the final answer is reasonable. Strengthening these skills through regular exposure to contextualized mathematical tasks and guided problem-solving activities can help improve students' confidence and overall performance.

Jo Boaler (2022) emphasized that students become more effective problem solvers when they are encouraged to reason, explore different solution methods, and connect mathematics to meaningful situations rather than relying solely on memorized procedures. These perspectives support the present findings, in which most students demonstrated satisfactory yet developing abilities in solving mathematical word problems.

This highlights the importance of providing learners with more opportunities to solve contextualized mathematical problems that promote reasoning, interpretation, and reflection. Teachers may enhance students' performance by using real-life examples, encouraging multiple solution strategies, and guiding learners in explaining the reasoning behind their answers. These approaches can help students strengthen both their conceptual understanding and their confidence in solving algebraic word problems.

Relationship between the Critical Thinking Skills and Procedural Assessment of Grade 10 Students

The relationship between the level of critical thinking skills of the Grade 10 students and their performance in Algebra through the use of a procedural assessment tool is displayed in the table below.

Table 5. Relationship between the Level of Critical Thinking Skills and Procedural Assessment of Grade 10 Students.

Variable	Test Statistics (r)	p-value	Decision for Ho	Interpretation
Critical Thinking Skills vs. Procedural Assessment	-0.066	0.455	Failed to Reject Ho	Not Significant

Table 5 presents the relationship between the critical thinking skills and their performance in Algebra through the use of procedural assessment of the Grade 10 students. The analysis got a correlation coefficient r of -0.066 with a p-value of 0.455. Since the obtained p-value is greater than the 0.05 level of significance, the null hypothesis was not rejected. This indicates that there is no significant relationship between the students' critical thinking skills and their performance in the procedural assessment.

The findings suggest that the students' level of critical thinking did not significantly influence how they performed in solving procedural mathematics tasks. Although critical thinking is considered an important learning skill, success in procedural assessment appears to depend more on students' mastery of mathematical rules, formulas, and step-by-step computational processes than on their ability to evaluate information or analyze different perspectives. In other words, students who demonstrated higher critical thinking skills did not necessarily achieve higher scores in the procedural assessment, and those with average or lower critical thinking skills were still able to perform similarly when applying established mathematical procedures.

One possible explanation is that the procedural assessment primarily measured students' ability to follow correct algorithms and perform calculations accurately. These tasks generally require procedural fluency, repeated practice, and familiarity with mathematical operations. While critical thinking may support deeper understanding, it is not always the primary factor in tasks that emphasize the accurate execution of learned procedures.

This suggests that procedural performance is influenced by students' mastery of mathematical procedures and consistent practice rather than by critical thinking skills alone. Although critical thinking contributes to deeper understanding, procedural tasks primarily require learners to apply mathematical rules, formulas, and algorithms accurately. As explained by Bay-Williams and SanGiovanni (2021), procedural fluency is not simply the ability to perform calculations correctly but also the ability to use appropriate strategies with efficiency, flexibility, and accuracy. This suggests that students may demonstrate satisfactory procedural performance through repeated practice and familiarity with mathematical processes even when their critical thinking skills vary.

Relationship between the Level of Critical Thinking Skills and Word Problem Assessment of Grade 10 Students

The relationship between the level of critical thinking skills of the Grade 10 students and their Performance in Algebra through the use of word problem assessment tool is displayed in the table below.

Table 6. Relationship between the Level of Critical Thinking Skills and Word Problem Assessment of Grade 10 Students.

Variable	Test Statistics (r)	p-value	Decision for Ho	Interpretation
Critical Thinking Skills vs. Word Problem Assessment	-0.005	0.957	Failed to Reject Ho	Not Significant

Table 6 presents the relationship between the level of critical thinking skills and the performance of Grade 10 students in Algebra through the use of word problem assessment tool. The results revealed a correlation coefficient (r) of -0.005 with a p-value of 0.957. Since the obtained p-value is greater than the 0.05 level of significance, the null hypothesis was not rejected. This indicates that there was no statistically significant relationship between the students' critical thinking skills and their performance in the word problem assessment.

The computed correlation coefficient means that changes in the students' critical thinking skills were not associated with corresponding changes in their performance on the word problem assessment. In other words, students who demonstrated higher levels of critical thinking did not necessarily perform better in solving algebraic word problems, while those with lower critical thinking skills were not automatically poor performers in the assessment.

The findings suggest that solving mathematical word problems depends on several learning competencies rather than on critical thinking skills alone. Aside from analyzing and evaluating information, students must understand the language used in the problem, identify relevant mathematical concepts, select appropriate solution strategies, and perform computations accurately. A learner may possess good critical thinking skills but still encounter difficulties if there are weaknesses in mathematical understanding or procedural knowledge. Students who are familiar with mathematical procedures and have sufficient practice may perform well even if their critical thinking skills are only average.

The findings are supported by Elder and Paul (2022), who explained that critical thinking is a disciplined process of analyzing, interpreting, evaluating, and reflecting on information before making judgments or decisions. They emphasized that although critical thinking is an essential skill for effective learning, its influence on academic performance depends on the nature of the task being performed. Tasks that primarily require the application of learned procedures and previously acquired knowledge may rely less on critical thinking and more on students' mastery of concepts and skills. This perspective helps explain why the present study found no significant relationship between critical thinking skills and students' performance in the Word Problem Assessment.

CONCLUSION

From the results of the study, the following conclusions were drawn: The respondents are predominantly female, mostly from families with lower monthly incomes, and have parents whose highest educational attainment was

at the high school level. The Grade 10 students demonstrated an average level of critical thinking skills, indicating that they possess basic abilities in analyzing, evaluating, and interpreting information but still need further development in higher-order thinking skills. The respondents attained an average level of performance in the Procedural Assessment, suggesting that they have acquired fundamental procedural skills in mathematics but require additional practice to improve their accuracy, fluency, and application of mathematical procedures. The respondents also obtained an average level of performance in the Word Problem Assessment. Critical thinking skills alone did not significantly influence students' ability to perform procedural mathematical tasks. Students' performance in solving algebraic word problems cannot be explained by their critical thinking skills alone, suggesting that other factors may have contributed to their performance.

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