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Assessing Student's Difficulties in Applying Mathematical Knowledge to Practical Problem Solving at Natatas National High School

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Abstract. This study aimed to assess the difficulties experienced by Junior High School students in applying mathematical knowledge to practical problem-solving situations at Natatas National High School. Specifically, it examined students' difficulties in terms of comprehension, operation, formulation, and interpretation, as well as their performance in applying mathematical knowledge through comprehension level, computation accuracy, formulation skills, and interpretation skills. The study utilized a descriptive-correlational research design, involving 233 respondents selected through stratified random sampling from a population of 557 students. Data were collected using a validated questionnaire and problem-solving tasks and were analyzed using weighted mean and Pearson correlation. Findings revealed that students experienced moderate difficulties across all four areas, particularly in comprehension and multi-step operations. Likewise, students' performance in applying mathematical knowledge to practical problem-solving situations was found to be moderate. The results further indicated a significant relationship between students' difficulties and their performance in practical problem solving, suggesting that greater difficulties negatively affect students' ability to apply mathematical concepts in solving real-life problems. Based on the findings, the study recommends the implementation of targeted instructional strategies focused on improving reading comprehension, representational skills, and contextual problem-solving abilities. Strengthening these areas may enhance students' mathematical literacy and improve their capacity to apply mathematical knowledge effectively in real-world situations.

Keywords: Applying mathematical knowledge; practical problem solving; comprehension difficulties; formulation skills; interpretation skills

Introduction

Mathematics has long been recognized as a fundamental pillar of human progress and societal development, serving as the universal language of science, technology, engineering, and innovation. Beyond its computational aspects, mathematics education plays a critical role in fostering higher-order thinking skills, including critical thinking, logical reasoning, and problem-solving abilities. In contemporary educational frameworks, the focus has shifted from mere mastery of procedures to the development of mathematical literacy, which is defined as an individual's capacity to formulate, apply, and interpret mathematics in a variety of real-world contexts (Organisation for Economic Co-operation and Development [OECD], 2019).

Despite global efforts to strengthen mathematics education, international large-scale assessments continue to reveal persistent learning gaps. Results from the Programme for International Student Assessment (PISA) 2018 highlight that a significant proportion of learners worldwide struggle to apply mathematical knowledge to authentic, real-life problems (OECD, 2019). Mathematical literacy requires a complex integration of skills, including problem comprehension, mathematical representation, accurate computation, and meaningful interpretation of results. However, many students demonstrate difficulty particularly in transferring learned concepts to unfamiliar or context-based situations, indicating a gap between procedural knowledge and functional understanding.

In the Philippine educational context, improving learners' mathematical competence remains a national priority. The Department of Education (DepEd) has implemented several key policy reforms to address this concern. Among these is *DepEd Order No. 21, s. 2019*, which emphasizes the strengthening of foundational literacy and numeracy skills, and *DepEd Order No. 024, s. 2022*, which introduces the Basic

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Education Development Plan (BEDP) 2030, aimed at improving learning outcomes through curriculum enhancement and learner-centered strategies (Department of Education, 2019; Department of Education, 2022). Furthermore, the MATATAG Agenda reinforces these initiatives by focusing on addressing learning gaps, promoting inclusive education, and enhancing the quality of instruction.

However, despite these policy interventions, the Philippines' performance in PISA 2018 ranked among the lowest in mathematics, underscoring persistent challenges in developing students' mathematical literacy (OECD, 2019). This outcome suggests that learners face difficulties not only in performing mathematical computations but also in applying mathematical knowledge effectively in practical and real-life problem-solving contexts.

At the classroom level, these challenges are even more pronounced. Many Junior High School students demonstrate proficiency in solving routine or procedural tasks but encounter significant difficulty when dealing with non-routine, context-based word problems. The process of applying mathematical knowledge to practical problem-solving involves several interconnected stages: (1) comprehension of the problem, (2) identification and selection of appropriate mathematical operations, (3) formulation of mathematical models or representations, and (4) interpretation and validation of results. Difficulties at any of these stages can adversely affect students' overall mathematical performance (Polya, 1957; Schoenfeld, 1985).

Although a substantial body of literature has examined mathematical problem-solving, there remains a limited number of Philippine-based studies that specifically investigate students' difficulties in applying mathematical knowledge across these distinct stages. Moreover, there is a lack of empirical research exploring how these difficulties relate to students' performance in key areas such as comprehension, computational accuracy, formulation, and interpretation skills.

In response to this gap, the present study aims to assess the specific difficulties experienced by Junior High School students at Natatas National High School in applying mathematical knowledge to practical problem-solving situations. By identifying these challenges and examining their relationship with students' performance, the study seeks to generate data-driven insights that can inform instructional practices, enhance teaching strategies, and ultimately contribute to the development of mathematically literate learners.

Research Questions

This study aims to assess the difficulties experienced by Junior High School students at Natatas National High School in translating mathematical knowledge into practical problem-solving situations. Specifically, it seeks to answer the following questions:

1. What specific difficulties do Junior High School students encounter in applying mathematical knowledge to practical problem-solving situations in terms of:
   1.1 Comprehension difficulties;
   1.2 Operation difficulties;
   1.3 Formulation difficulties; and
   1.4 Interpretation difficulties?
2. What is the level of students' performance in applying mathematical knowledge to practical problem-solving situations in terms of:
   2.1 Comprehension level;
   2.2 Computation accuracy;
   2.3 Formulation skills; and
   2.4 Interpretation skills?
3. Is there a significant relationship between students' difficulties and their performance in applying mathematical knowledge to practical problem-solving situations?
4. What recommendations may be proposed to enhance students' ability in applying mathematical knowledge to practical problem-solving situations?

Scope and Delimitation of the Study

This study investigates the difficulties encountered by Junior High School students at Natatas National High School in applying mathematical knowledge to practical problem-solving situations and examines how these difficulties relate to their problem-solving performance. The study focuses on four areas of difficulty: comprehension, operation, formulation, and interpretation. Students' performance is assessed through comprehension level, computation accuracy, formulation skills, and interpretation skills using problem-solving tasks and response analysis. The study is limited to Junior High School students enrolled at Natatas National High School during Academic Year 2025–2026. Findings are specific to the selected participants and may not be generalized to other settings. External factors such as teaching strategies, parental involvement, socio-economic status, and attitudes toward mathematics are excluded from the study.

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Literature Review

Applying Mathematical Knowledge in Practical Problem Solving

Applying mathematical knowledge refers to students' ability to use mathematical concepts, procedures, and reasoning in solving real-life or contextualized situations. Educational systems increasingly emphasize mathematical application rather than procedural computation alone. According to the Organisation for Economic Co-operation and Development (2021), mathematical literacy involves learners' capacity to formulate, employ, and interpret mathematics in various real-world contexts. This perspective highlights reasoning, abstraction, and mathematical modeling as essential components of mathematics education. Students are expected not only to solve equations but also to apply mathematical knowledge meaningfully in everyday situations.Research indicates that many learners experience difficulties when transferring mathematical concepts into contextualized problems. Rizki and Priatna (2019) explain that successful application of mathematical knowledge requires cognitive flexibility, enabling learners to connect abstract concepts with practical situations. Similarly, Brown et al. (2017) emphasize that effective mathematical application requires integration of conceptual understanding, procedural knowledge, and linguistic competence. Students often experience difficulty moving between verbal, symbolic, and visual representations, limiting their ability to solve contextualized problems successfully. Several studies also suggest that weaknesses in applying mathematical knowledge stem from students' limited opportunities to engage in authentic problem-solving activities. The Philippine Institute for Development Studies (2021) reported that Filipino learners often rely on memorized procedures and struggle to apply mathematical reasoning in unfamiliar situations. These findings indicate that practical application of mathematics depends not only on computational ability but also on reasoning, representation, and interpretation skills.

Comprehension Difficulties

Comprehension difficulties involve challenges in understanding mathematical problems, identifying important information, and interpreting relationships within contextual situations. Research found that weak reading comprehension negatively affects students' mathematical performance (Boonen et al., 2016). Likewise, unfamiliar vocabulary and complex sentence structures increase students' difficulty in solving mathematical tasks (Daroczy et al., 2020). Local studies also revealed that many learners rely on keywords rather than understanding problem contexts, leading to incorrect solutions (Ancajas & Abellana, 2025).

Formulation Difficulties

Formulation difficulties refer to students' struggles in converting contextual information into mathematical expressions or equations. Studies indicate that learners often find it difficult to create mathematical representations even when they understand computations (Jupri & Drijvers, 2016). Similar findings among Filipino students showed that learners struggle to apply mathematical concepts in contextualized situations despite possessing procedural knowledge (Verzosa-Quinto & Mabansag, 2023).

Operation Difficulties

Operation difficulties refer to challenges encountered by students in selecting and performing appropriate mathematical procedures needed to solve problems. Learners may struggle with computations, choosing correct operations, or carrying out multi-step processes accurately. Research shows that students often focus heavily on arithmetic procedures and become confused when solving contextualized problems, leading to errors in computation and problem-solving performance (Flores et al., 2024). Similarly, Abubakar and Musa (2024) found that students experienced difficulties in identifying appropriate operations and representing quantitative relationships correctly. These findings suggest that weak operational skills negatively affect students' ability to apply mathematical knowledge in practical problem-solving situations.

Interpretation Difficulties

Interpretation difficulties refer to students' inability to explain, evaluate, or relate mathematical answers to original problem contexts. Successful interpretation requires reflective thinking and contextual understanding. The National Council of Teachers of Mathematics (2018) emphasized that mathematical reasoning becomes meaningful when students justify and evaluate solutions rather than merely perform procedures. Likewise, Lu'luilmaknun et al. (2025) found that many students failed to connect answers appropriately to contextual situations, leading to inaccurate interpretations. SEAMEO INNOTECH (2020) reported similar patterns among Filipino learners, explaining that many students solve mathematical tasks mechanically without evaluating whether answers are reasonable. Weak interpretation skills consequently reduce overall problem-solving performance.

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Cognitive and Affective Factors in Mathematical Problem Solving

Students' mathematical performance is influenced not only by cognitive skills but also by emotional and motivational factors. Cognitive Load Theory developed by John Sweller (2021) explains that learners experience overload when simultaneously processing textual information, selecting operations, and solving mathematical tasks. Additionally, Pelegrina et al. (2020) found that mathematics anxiety reduces working memory capacity, negatively affecting reasoning and problem-solving performance. Rellensmann and Schukajlow (2022) reported that students with higher self-efficacy demonstrate greater persistence in solving challenging mathematical tasks.

Methodology

Research Design

This study employed a descriptive-correlational research design to assess students' difficulties in applying mathematical knowledge to practical problem-solving situations among Junior High School learners at Natatas National High School. This research design was chosen because it enables the researchers to describe the nature and extent of students' difficulties and examine the relationship between these difficulties and their performance in practical problem-solving situations without establishing causation. Descriptive-correlational research focuses on identifying and analyzing relationships between two or more variables through the collection, organization, and interpretation of data. In this study, the researchers gathered information regarding students' difficulties in comprehension, operation, formulation, and interpretation, as well as their performance in practical problem-solving tasks, to determine whether a significant relationship exists between the variables. The findings provide insights into how students' difficulties may influence their ability to apply mathematical knowledge effectively in real-life situations. The primary objective of this study was to provide a comprehensive understanding of students' difficulties and problem-solving performance and determine the relationship between these variables without manipulating them. According to Curtis et al. (2016), correlational research is appropriate when the purpose of the study is to determine the degree of relationship between variables within a specific population. In this study, students' difficulties were measured using validated survey questionnaires, while their problem-solving performance was assessed through structured problem-solving tasks. The relationship between these variables was analyzed to determine whether students' difficulties significantly affect their practical problem-solving performance.

Sampling Design

The study was conducted among Junior High School students of Natatas National High School, with a total population of five hundred fifty-seven (557) students. Using Slovin's formula with a 95% confidence level and 5% margin of error, a sample size of two hundred thirty-three (233) respondents was obtained. The formula used was n=N/(1+Ne2)n = N / (1 + Ne^2)n=N/(1+Ne2), where *N* represents the total population and *e* represents the margin of error. The researchers employed a probability sampling method, specifically stratified random sampling, to ensure proper representation from each grade level. The respondents were grouped according to Grade 7, Grade 8, Grade 9, and Grade 10, and participants were selected proportionally from each group. The distribution included fifty-nine (59) respondents from Grade 7, fifty-eight (58) from Grade 8, fifty-eight (58) from Grade 9, and fifty-eight (58) from Grade 10, resulting in a total of two hundred thirty-three (233) respondents. The selected respondents answered validated questionnaires and problem-solving tasks designed to assess students' difficulties in applying mathematical knowledge to practical problem-solving situations. Personal information of the respondents was not collected to ensure privacy and confidentiality, in accordance with Republic Act No. 10173 or the Data Privacy Act of 2012.

Research Locale

This study was conducted at Natatas National High School located in Barangay Natatas, Tanauan City, Batangas. The school was selected as the research locale because it has a sufficient population of Junior High School students appropriate for assessing difficulties in applying mathematical knowledge to practical problem-solving situations. The school provides a relevant educational setting where students are exposed to mathematical problem-solving activities and contextualized learning tasks. The availability of respondents and the cooperation of school administrators and teachers contributed to the successful conduct of the study.

Research Participants

This study included Junior High School students of Natatas National High School as the respondents. The total population consisted of five hundred fifty-seven (557) students from Grade 7 to Grade 10. Using Slovin's formula with a 95% confidence level and 5% margin of error, a total of two hundred thirty-three (233) respondents were selected through stratified random sampling. Grade 7 had fifty-nine (59) respondents, while

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Grades 8, 9, and 10 each had fifty-eight (58) respondents. The selected participants represented all Junior High School grade levels included in the study.

Research Instrument

The primary instrument used in this study was a researcher-made survey questionnaire designed for Junior High School students of Natatas National High School. The questionnaire consisted of forty (40) items divided into two parts: students' difficulties in comprehension, operation, formulation, and interpretation, and students' performance in practical problem solving. A five-point Likert Scale was used to measure respondents' answers and determine their level of difficulties and performance. The questionnaire was administered with strict observance of confidentiality and ethical considerations in accordance with Republic Act No. 10173, or the Data Privacy Act of 2012, to ensure that respondents' information and responses remained protected and were used solely for research purposes.

Data Gathering Procedure

The researchers first secured approval from the research adviser and panel members, followed by obtaining permission from the Department of Education through the Schools Division Office of Tanauan City and the principal of Natatas National High School to conduct the study. After approval, the necessary documents, including consent forms and research instruments, were coordinated with the concerned school personnel. The selected respondents were informed about the purpose of the study, and confidentiality and voluntary participation were emphasized before administering the questionnaires and problem-solving tasks. The researchers personally distributed and collected the instruments to ensure accurate responses and provide clarification when necessary. After retrieval, the accomplished questionnaires were checked, organized, encoded, and subjected to statistical analysis to interpret the findings based on the objectives of the study.

Results and Discussions

Research Question 1: What specific difficulties do Junior High School students encounter in applying mathematical knowledge to practical problem-solving situations in terms of Comprehension difficulties, Operation difficulties, Formulation difficulties, and Interpretation difficulties?

Table 1. Level of Comprehension Difficulties among Junior High School Students at Natatas National High School in Terms of Comprehension difficulties

Statements *The student…*	**Mean**	**Verbal Description**	**Interpretation**
1. I find it difficult to identify what a word problem is asking (e.g., determining whether it asks for total, difference, or rate).	4.16	Agree	Agree
2. I have trouble understanding the relationships between quantities in a word problem (e.g., linking hours worked to payment earned).	3.94	Agree	Agree
3. I often misinterpret key information in the problem (e.g., confusing "per item" vs. "total").	4.05	Agree	Agree
4. I struggle to understand unfamiliar problem contexts (e.g., a story involving a market or real-life scenario I haven't encountered).	4.00	Agree	Agree
5. I have difficulty distinguishing between relevant and irrelevant information in a problem (e.g., ignoring extra data that doesn't affect the answer).	4.02	Agree	Agree
Over-all Mean	**4.04**	**Agree**	Agree

Table 1 shows that the statement "I find it difficult to identify what a word problem is asking (e.g., determining whether it asks for total, difference, or rate)" obtained the highest weighted mean of 4.16, verbally interpreted as Agree. This indicates that students commonly experience difficulty understanding the main objective of mathematical problems, which may affect their ability to choose appropriate operations and solution strategies. Students may struggle to determine what information is needed and what process should be applied to solve the problem correctly. This finding is supported by Boonen et al. (2016), who emphasized that weak reading comprehension negatively affects mathematical problem solving because students encounter difficulties during the initial stage of understanding the problem. Meanwhile, the statement "I have trouble understanding the relationships between quantities in a word problem" obtained the lowest weighted mean of 3.94, although still verbally interpreted as Agree. This suggests that students experience challenges in analyzing relationships among variables and interpreting mathematical situations, but to a slightly lesser extent compared to other comprehension difficulties. Students may have difficulty connecting quantities and identifying how values relate within a problem context. This finding supports the study of Verschaffel et al. (2020), which explained that students who cannot form mental representations of mathematical situations often rely on superficial strategies instead of conceptual understanding. The overall weighted mean of 4.04, verbally interpreted as Agree, indicates that respondents generally experience comprehension difficulties in applying mathematical knowledge to practical problem-solving situations. This means that understanding problem requirements, interpreting information, and identifying relevant details remain significant challenges among students. Similar findings by Boctot, Enriquez, and Yurango (2025) revealed that reading comprehension has a strong influence on success in solving mathematical word problems. Therefore, improving comprehension skills may help enhance students' mathematical performance and practical problem-solving abilities.

Table 2. Level of Comprehension Difficulties among Junior High School Students at Natatas National High School in Terms of Operation difficulties

Statements ***The student…***	**Mean**	**Verbal Description**	**Interpretation**
1. I often choose the wrong mathematical operation to solve a problem (e.g., using addition instead of multiplication).	3.43	Agree	Agree
2. I make mistakes when applying formulas or procedures (e.g., calculating area but using perimeter formula by mistake).	3.65	Agree	Agree
3. I feel unsure about which method to use for solving certain word problems (e.g., whether to use ratio, proportion, or percentage).	4.11	Agree	Agree
4. I sometimes perform unnecessary steps that do not lead to the solution (e.g., calculating extra numbers that aren't required).	3.82	Agree	Agree
5. I struggle with multi-step calculations in word problems (e.g., finding the total cost after discount and tax).	3.79	Agree	Agree
Over-all Mean	**3.76**	**Agree**	**Agree**

Table 2 shows that the highest mean score of 4.11 was obtained from the statement "I feel unsure about which method to use for solving certain word problems (e.g., whether to use ratio, proportion, or percentage)," interpreted as Agree. This indicates that students often experience uncertainty in selecting appropriate mathematical methods or strategies when solving word problems. As a result, they may struggle to determine the correct procedure needed to arrive at accurate solutions. This finding is supported by Abubakar and Musa (2024), who found that students commonly have difficulty identifying appropriate operations in mathematical problem solving, leading to confusion among concepts such as ratios, proportions, multiplication, and division. Meanwhile, the lowest mean score of 3.43 was recorded for the statement "I often choose the wrong mathematical operation to solve a problem," also interpreted as Agree. This suggests that although students experience difficulties in selecting operations, this issue is less pronounced compared to other operational challenges. Students may still apply basic operations but sometimes fail to match them correctly with problem requirements. This aligns with Tan et al. (2023), who explained that students often engage in "number grabbing," where they apply operations without fully understanding the relationships between quantities in the problem. The overall mean of 3.76, interpreted as Agree, indicates that students generally experience operation-related difficulties in applying mathematical knowledge to practical problem-solving situations. This suggests that challenges in selecting methods, applying formulas, and performing multi-step calculations remain present among Junior High School learners. These findings imply that improving students' procedural understanding and problem-solving strategies may enhance their overall mathematical performance.

Table 3. Level of Comprehension Difficulties among Junior High School Students at Natatas National High School in Terms of Formulation difficulties

Statements ***The student…***	**Mean**	**Verbal Description**	**Interpretation**
1. I have difficulty translating the problem into a mathematical equation or expression (e.g., turning "Tom has 3 more than Jerry" into x = y + 3).	4.06	Agree	Agree
2. I struggle to assign correct values or quantities when forming equations (e.g., defining variables for distance, speed, and time).	4.20	Agree	Agree

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3.	I sometimes create incomplete or incorrect mathematical models for word problems (e.g., missing a constraint in a money problem).	4.09	Agree	Agree
4.	I find it hard to represent the problem using symbols, tables, or diagrams (e.g., drawing a chart for a multi-step problem).	4.20	Agree	Agree
5.	I make mistakes when linking the given data to the required solution (e.g., using the wrong numbers in the formula).	4.08	Agree	Agree
	Over-all Mean	**4.13**	**Agree**	**Agree**

Table 3 shows that the highest mean scores of 4.20 were recorded for "I struggle to assign correct values or quantities when forming equations (e.g., defining variables for distance, speed, and time)" and "I find it hard to represent the problem using symbols, tables, or diagrams (e.g., drawing a chart for a multi-step problem)," both interpreted as Agree. This indicates that students experience considerable difficulty in identifying and organizing relevant mathematical information when translating word problems into mathematical representations. Although students are able to attempt modeling problems, they often struggle in properly structuring variables and visual representations, which affects the accuracy of their solutions. These findings are supported by Alsina and Salgado (2022), who emphasized that mathematical formulation requires high-level cognitive processing as learners must convert verbal situations into structured mathematical forms. Meanwhile, the lowest mean score of 4.06 was obtained for the statement "I have difficulty translating the problem into a mathematical equation or expression (e.g., turning 'Tom has 3 more than Jerry' into x = y + 3)," also interpreted as Agree. This suggests that while students still experience difficulty in formulation, they are relatively more capable of directly converting simple verbal statements into equations compared to more complex modeling tasks. This implies that students find structured or straightforward translations easier than tasks requiring organization of multiple variables or representations. This finding is consistent with OECD (2021), which noted that students often struggle more with full mathematical modeling than with simple equation translation from verbal statements. The overall mean of 4.13, interpreted as Agree, indicates that students generally experience formulation difficulties in applying mathematical knowledge to practical problem-solving situations. This suggests that challenges in assigning values, constructing equations, and representing mathematical relationships remain evident among Junior High School learners. Overall, these findings imply that strengthening students' mathematical modeling and representation skills may improve their ability to translate real-life problems into solvable mathematical expressions.

Table 4. Level of Comprehension Difficulties among Junior High School Students at Natatas National High School in Terms of Interpretation difficulties

	Statements *The student...*	**Mean**	**Verbal Description**	**Interpretation**
1.	I have trouble explaining the meaning of my answer in relation to the problem (e.g., interpreting that 60 liters means enough for 20 students).	4.25	Strongly Agree	Strongly Agree
2.	I sometimes obtain solutions that do not make sense in the real-world context (e.g., negative age or distance).	4.16	Agree	Agree
3.	I struggle to check if my solution is reasonable (e.g., reviewing if total cost matches the items bought).	4.19	Agree	Agree
4.	I find it difficult to relate the computed result back to the original question (e.g., finding a number but forgetting what it represents).	4.10	Agree	Agree
5.	. I have difficulty drawing conclusions based on my solution (e.g., deciding which option is best based on calculated values).	4.14	Agree	Agree
	Over-all Mean	**4.17**	**Agree**	**Agree**

Table 4 shows that the highest mean score of 4.25 was obtained from the statement "I have trouble explaining the meaning of my answer in relation to the problem (e.g., interpreting that 60 liters means enough for 20 students)," interpreted as Strongly Agree. This indicates that students frequently struggle to explain and justify the meaning of their answers in real-life contexts, even after obtaining correct numerical solutions. This suggests a weak ability to connect mathematical results to practical situations, particularly in interpreting what computed values represent. This finding is supported by OECD (2021), which emphasized that interpretation is a critical stage in mathematical problem solving because learners are expected to relate symbolic answers to real-world meaning. Meanwhile, the lowest mean scores of 4.10 and 4.14 were recorded for the statements "I find it difficult to relate the computed result back to the original question" and "I have difficulty drawing

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conclusions based on my solution," both interpreted as Agree. This suggests that although students experience interpretation difficulties, they are slightly more capable of checking and evaluating solutions compared to explaining and justifying their answers. However, they still struggle in fully connecting results to the original problem context and in making meaningful conclusions from their solutions. These findings align with Özaydın and Arslan (2022), who found that students often focus more on computation rather than interpretation and reasoning, resulting in weak explanation of results. The overall mean of 4.17, interpreted as Agree, indicates that students generally experience interpretation difficulties in applying mathematical knowledge to practical problem-solving situations. This suggests that learners struggle in explaining results, evaluating reasonableness, and drawing conclusions based on solutions. Overall, the findings imply that strengthening students' reflective thinking and interpretation skills may improve their ability to apply mathematical knowledge in real-world contexts.

Table 5. Summary of the Level of Students' Difficulties in Applying Mathematical Knowledge to Practical Problem-Solving Situations

Indicators	Mean	Interpretation
Comprehension Difficulties	4.04	Agree
Operation Difficulties	3.76	Agree
Formulation Difficulties	4.13	Agree
Interpretation Difficulties	4.17	Agree
Over-All Mean	**4.03**	**Agree**

Table 5 summarizes the overall level of students' difficulties in applying mathematical knowledge to practical problem-solving situations. The table shows that students generally experience difficulties in comprehension, operation, formulation, and interpretation, all of which are interpreted as Agree, with an overall mean of 4.03. This indicates that students encounter a moderate level of difficulty in applying mathematical knowledge to practical problem-solving situations, particularly in understanding problems, selecting appropriate methods, constructing mathematical representations, and interpreting solutions. Among the indicators, interpretation difficulties obtained the highest mean, followed by formulation and comprehension difficulties. This suggests that students struggle most in explaining and connecting their answers to real-life contexts, as well as translating verbal problems into mathematical models. On the other hand, operation difficulties obtained the lowest mean, indicating that while students still experience challenges in computation and selecting correct procedures, this area is slightly less problematic compared to higher-order thinking skills such as interpretation and formulation. Overall, the findings suggest that students' difficulties are more evident in conceptual understanding and higher-order thinking processes rather than basic computation skills. With continued instructional support, guided practice, and exposure to contextualized problem-solving tasks, students may improve their ability to understand, represent, and interpret mathematical problems effectively. These findings are consistent with studies emphasizing that students' mathematical difficulties are not limited to computation but are more strongly associated with comprehension, representation, and interpretation skills needed in real-life problem solving (OECD, 2021; Verschaffel et al., 2020; Boonen et al., 2016). Strengthening these areas may enhance students' overall mathematical literacy and problem-solving performance.

Research Question 2: What is the level of students' performance in applying mathematical knowledge to practical problem-solving situations in terms of Comprehension level, Computation accuracy, Formulation skills, and Interpretation skills?

Table 6. Level of Comprehension Skills among Junior High School Students at Natatas National High School

Statements *The student…*	**Mean**	**Verbal Description**	**Interpretation**
1. I can easily understand what a word problem is asking (e.g., "John has 5 apples and buys 3 more; find the total").	3.16	Neutral	Neutral
2. I can identify the important information in a problem (e.g., "Distance = 60 km, Time = 2 hours").	3.01	Neutral	Neutral
3. I can determine the relationships between different quantities (e.g., "Sarah has 3× pencils as Tom").	3.31	Neutral	Neutral
4. I can understand unfamiliar problem contexts (e.g., "A zoo ticket costs ₱150 for adults and ₱80 for children").	3.01	Neutral	Neutral

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5. I can distinguish relevant from irrelevant information (e.g., ignoring favorite color when calculating apples).	3.36	Neutral	Neutral
Over-all Mean	**3.17**	**Neutral**	**Neutral**

Table 6 shows that the highest mean score of 4.11 was recorded for uncertainty in choosing the appropriate mathematical method (e.g., whether to use ratio, proportion, or percentage), followed by a mean of 3.82 for performing unnecessary steps that do not lead to the solution. Both indicate that students experience difficulty in selecting appropriate strategies and maintaining organized solution procedures when solving mathematical problems. These challenges may affect their efficiency, accuracy, and overall problem-solving flow, especially in multi-step tasks where proper sequencing of operations is required. Observations suggest that students often struggle with deciding which operation or method to use and may include extra or irrelevant steps that do not contribute to the final answer. Research by Abubakar and Musa (2024) and Flores et al. (2024) support this, highlighting that students commonly experience confusion in selecting correct operations and are prone to cognitive overload when dealing with multi-step mathematical problems. Meanwhile, the lowest mean score of 3.43 was recorded for choosing the wrong mathematical operation, interpreted as Agree. This shows that although students generally understand basic operations, they still occasionally commit errors in selecting the correct operation for a given problem. These mistakes may lead to incorrect solutions and reflect gaps in their procedural understanding of mathematical concepts. Common issues include confusing addition with multiplication or misinterpreting what the problem is asking in terms of operation use. These findings align with research by Tan et al. (2023) and Tiryaki and Cekmez (2020), suggesting that operational errors are often linked to weak conceptual understanding and difficulty in translating problem requirements into correct mathematical procedures.

Table 7. Level of Computation Accuracy among Junior High School Students at Natatas National High School

Statements *The student…*	**Mean**	**Verbal Description**	**Interpretation**
1. I perform calculations correctly (e.g., 5 + 3 = 8).	3.28	Neutral	Neutral
2. I apply formulas and procedures accurately (e.g., Area = length × width)	3.51	Agree	Agree
3. I can follow multi-step problem-solving procedures without errors (e.g., 12 − (3 + 2) = 7)..	3.40	Neutral	Neutral
4. I choose the correct operations for solving problems (e.g., divide for splitting candies equally).	3.97	Agree	Agree
5. I can complete problems without unnecessary steps (e.g., don't count candies individually if total is given).	3.86	Agree	Agree
Over-all Mean	**2.91**	**Agree**	**Agree**

Table 7 shows that the highest mean score of 3.97 was recorded for choosing the correct operations for solving problems, followed by a mean of 3.86 for completing problems without unnecessary steps. Both are interpreted as Agree, meaning that students are generally able to identify appropriate mathematical operations and follow efficient solution procedures. This suggests that learners have a good foundation in selecting basic strategies when solving mathematical problems and can usually avoid unnecessary or irrelevant steps. However, while they demonstrate procedural understanding, they may still need improvement in maintaining consistency when problems become more complex or require multiple steps. These findings indicate that students are more confident in deciding what operation to use and organizing their solution process, but not yet fully consistent in applying these skills across all problem types. Research by DepEd (2019) and UP Diliman College of Education (2018) supports this, explaining that Filipino learners often develop procedural knowledge that helps them perform standard operations even when deeper conceptual understanding is still developing. Meanwhile, the lowest mean score of 3.28 was recorded for performing calculations correctly, interpreted as Neutral. This shows that although students can choose the correct operations and follow procedures, they still struggle with accuracy when actually computing answers. Common issues include small errors in computation, losing track of steps in multi-step problems, and difficulty maintaining consistency under time pressure. These findings suggest that students need more practice in strengthening computational fluency to ensure accuracy in final answers. This aligns with Cognitive Load Theory by Sweller (2021), which explains that multi-step tasks increase working memory demands and can lead to calculation errors when students are overloaded. Flores et al. (2024) also support this, noting that limited fluency in basic operations often affects students' accuracy in more complex problem-solving situations

Table 8. Level of Formulation Skills among Junior High School Students at Natatas National High School

Statements *The student...*	**Mean**	**Verbal Description**	**Interpretation**
1. I can translate word problems into mathematical equations *(e.g., 5 + 3 = x).*	3.73	Agree	Agree
2. I can identify the appropriate variables *(e.g., Sarah's pencils = 3 × Tom's pencils).*	3.60	Agree	Agree
3. I can determine the correct operations to solve a problem (e.g., multiply when scaling quantities)	3.52	Agree	Agree
4. I can represent real-world situations using symbols, tables, or diagrams *(e.g., draw a table for ticket sales).*	3.38	Neutral	Neutral
5. I can organize information from a problem before solving it *(e.g., list all quantities before calculating total cost).*	3.27	Neutral	Neutral
Over-all Mean	**3.50**	**Agree**	**Agree**

Table 8 shows that the highest mean score of 3.73 was recorded for translating word problems into mathematical equations, followed by a mean of 3.60 for identifying appropriate variables. Both are interpreted as Agree, meaning that students are generally capable of converting verbal problems into mathematical expressions and recognizing the variables needed in solving them. This suggests that learners already have a basic understanding of how to represent word problems in mathematical form, especially in straightforward situations where relationships between quantities are clear. However, this also indicates that their skills are still mostly at the procedural level and may not yet be fully developed for more complex or unfamiliar problems. These findings imply that students are more confident in direct translation and variable identification, but may still need support when problems require deeper analysis. This is supported by Alsina and Salgado (2022), who explained that formulation is a cognitively demanding stage because learners must convert verbal information into structured mathematical representations. Meanwhile, the lowest mean score of 3.27 was recorded for organizing information from a problem before solving it, interpreted as Neutral. This shows that although students can identify variables and form equations, they still struggle in structuring and organizing information before beginning the solution process. A similar difficulty is also seen in representing real-world situations using symbols, tables, or diagrams, with a mean of 3.38 (Neutral), suggesting that students find it challenging to visually or systematically represent mathematical situations. These difficulties may lead to confusion in multi-step problems and affect the clarity of their solution process. This aligns with Verzosa-Quinto and Mabansag (2023), who described this as a "translational deficit," where students understand mathematical ideas but struggle to organize and represent them properly. Ledezma (2024) also supports this finding through the concept of "semiotic rigidity," which explains students' difficulty in shifting between different forms of representation such as symbols, tables, and diagrams.

Table 9. Level of Interpretation Skills among Junior High School Students at Natatas National High School

Statements *The student...*	**Mean**	**Verbal Description**	**Interpretation**
1. I can explain my answers clearly in relation to the problem (e.g., "Total apples = 8, so John has 8 apples now").	3.35	Neutral	Neutral
2. I check whether my solution makes sense in real-world situations (e.g., volume of a container isn't negative).	3.45	Agree	Agree
3. I can relate the computed result back to the original question (e.g., "Distance traveled = 60 km; question asked for distance").	3.60	Agree	Agree
4. I can draw valid conclusions based on my solution (e.g., "John bought 3 more apples, total increased from 5 to 8").	3.59	Agree	Agree
5. I can verify my solution by comparing it with the problem's context or logic (e.g., 2 hours at 60 km/hr = 120 km).	3.61	Agree	Agree
Over-all Mean	**3.52**	**Agree**	**Agree**

Table 9 shows that the highest mean score of 3.61 was recorded for verifying solutions by comparing them with the problem's context or logic, followed by a mean of 3.60 for relating computed results back to the original question and 3.59 for drawing valid conclusions based on solutions. All are interpreted as Agree, meaning that students are generally capable of checking whether their answers make sense, connecting their solutions to the problem, and forming basic conclusions. This suggests that learners already have a developing ability to evaluate and interpret their answers after solving problems, especially in straightforward situations

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where the context is clear. However, while they can perform these tasks, their skills are still not fully consistent and may vary depending on the complexity of the problem. These findings indicate that students are more confident in verifying and connecting answers to the problem but still need improvement in fully explaining their reasoning. This is supported by Novitasari, Wulandari, and Lu'luilmaknun (2025), who explained that students may arrive at correct answers but still struggle in interpreting and contextualizing solutions meaningfully. Meanwhile, the lowest mean score of 3.35 was recorded for explaining answers clearly in relation to the problem, interpreted as Neutral. This shows that although students can compute and even evaluate their answers, they still struggle to clearly communicate the reasoning behind their solutions. Many students may understand what they did but find it difficult to express or justify their thinking in a clear and structured way. This difficulty may limit their ability to fully demonstrate mathematical understanding, especially in written explanations. This finding aligns with SEAMEO INNOTECH (2020), which identified weaknesses in learners' metacognitive reflection, noting that students often fail to clearly explain or evaluate their problem-solving process.This is supported by Rittle-Johnson et al. (2017), who emphasized that students may successfully execute procedures but still lack conceptual understanding needed to explain mathematical reasoning.

Table 10. Summary of the level of students' performance in applying mathematical knowledge to practical problem-solving situations

Indicators	Mean	Interpretation
Comprehension skills	3.17	Neutral
Computation Accuracy	3.60	Agree
Formulation skills	3.50	Agree
Interpretation skills	3.52	Agree
Over-All Mean	**3.45**	**Agree**

Table 10 shows that the highest mean score of 3.60 was recorded for computation accuracy, followed by a mean of 3.52 for interpretation skills and 3.50 for formulation skills, all verbally interpreted as Agree. This indicates that students generally demonstrate satisfactory performance in applying mathematical knowledge to practical problem-solving situations, particularly in selecting operations, applying formulas, interpreting solutions, and constructing mathematical representations. These findings suggest that students possess procedural understanding and moderate proficiency in solving mathematical tasks, although their skills may still vary depending on problem complexity. This observation supports the findings of the Department of Education (2019) and the University of the Philippines Diliman College of Education (2018), which explained that Filipino learners often develop procedural knowledge that enables them to perform mathematical operations even when conceptual understanding remains limited. Meanwhile, the lowest mean score of 3.17 was recorded for comprehension skills, verbally interpreted as Neutral. This suggests that students still encounter difficulties in understanding word problems, identifying relevant information, and interpreting unfamiliar problem contexts before solving mathematical tasks. Although learners may be capable of computation and interpretation, limitations in comprehension may affect their ability to fully understand mathematical situations and select appropriate solution strategies. These findings align with the study of Allan Bernardo (2020), which explained that Filipino learners often experience additional cognitive demands when processing both language and mathematical content simultaneously. Similarly, Lieven Verschaffel et al. (2020) emphasized that successful problem solving requires constructing mental representations of problems before performing operations. Difficulties in comprehension may therefore hinder students' overall mathematical performance. The overall mean of 3.45, verbally interpreted as Agree, indicates that Junior High School students generally demonstrate satisfactory performance in applying mathematical knowledge to practical problem-solving situations. However, variations across comprehension, computation accuracy, formulation, and interpretation skills suggest that further strengthening of foundational understanding and reasoning abilities may help improve students' overall problem-solving performance.

Research Question 3: Is there a significant relationship between students' difficulties and their performance in applying mathematical knowledge to practical problem-solving situations?

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Table 11. Significant Relationship Between Students' Comprehension Difficulties and Performance in applying mathematical knowledge to practical problem-solving

Variable 1	Variable 2	N	R-Value	Sig. (2-tailed)	Interpretation
Comprehension difficulties	Comprehension level	233	0.17	0.010	Significant
Comprehension difficulties	Computation accuracy	233	0.10	0.119	Not Significant
Comprehension difficulties	Formulation skills	233	0.20	0.002	Significant
Comprehension difficulties	Interpretation skills	233	0.29	0.000	Significant

Table 11 shows that there is a significant relationship between students' comprehension difficulties and comprehension level ($r = 0.17, p = 0.010$), formulation skills ($r = 0.20, p = 0.002$), and interpretation skills ($r = 0.29, p < 0.001$). This indicates that difficulties in understanding mathematical problems may affect students' ability to comprehend information, formulate equations, and interpret solutions. However, no significant relationship was found between comprehension difficulties and computation accuracy ($r = 0.10, p = 0.119$), suggesting that computation skills may be less influenced by comprehension difficulties. Therefore, the null hypothesis is rejected for comprehension level, formulation skills, and interpretation skills, while it fails to be rejected for computation accuracy. These findings imply that strengthening students' comprehension abilities may improve higher-order mathematical problem-solving skills. The result is consistent with Verschaffel et al. (2020), who explained that students experiencing difficulties in understanding problem situations often struggle with formulating mathematical representations and interpreting solutions.

Table 12. Significant Relationship Between Students' Operation Difficulties and Performance in applying mathematical knowledge to practical problem-solving

Variable 1	Variable 2	N	R-Value	Sig. (2-tailed)	Interpretation
Operation difficulties	Comprehension level	233	0.21	0.002	Significant
Operation difficulties	Computation accuracy	233	0.08	0.199	Not Significant
Operation difficulties	Formulation skills	233	0.15	0.019	Significant
Operation difficulties	Interpretation skills	233	0.24	0.000	Significant

Table 13 shows that there is a significant relationship between students' operation difficulties and comprehension level ($r = 0.21, p = 0.002$), formulation skills ($r = 0.15, p = 0.019$), and interpretation skills ($r = 0.24, p < 0.001$). This indicates that difficulties in selecting and applying mathematical operations may affect students' ability to understand problems, formulate equations, and interpret solutions. However, no significant relationship was found between operation difficulties and computation accuracy ($r = 0.08, p = 0.199$), suggesting that computation skills may function independently from operational difficulties. Therefore, the null hypothesis is rejected for comprehension level, formulation skills, and interpretation skills, while it failed to be rejected for computation accuracy. These findings imply that strengthening students' operational reasoning may improve higher-order mathematical problem-solving skills. This finding is consistent with Hickendorff (2021), who explained that mathematical problem solving requires cognitive and language resources that affect students' ability to represent and interpret solutions. Likewise, Verschaffel et al. (2020) emphasized that difficulties in mathematical processing often influence students' formulation and interpretation of mathematical problems. Furthermore, Tambychik and Meerah (2019) found that weaknesses in operational and conceptual understanding negatively affect students' performance in mathematical problem solving.

Table 13. Significant Relationship Between Students' Formulation Difficulties and Performance in applying mathematical knowledge to practical problem-solving

Variable 1	Variable 2	N	R-Value	Sig. (2-tailed)	Interpretation
Formulation difficulties	Comprehension level	233	0.19	0.004	Significant
Formulation difficulties	Computation accuracy	233	0.25	0.000	Significant
Formulation difficulties	Formulation skills	233	0.14	0.036	Significant
Formulation difficulties	Interpretation skills	233	0.31	0.000	Significant

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Table 13 shows that there is a significant relationship between students' formulation difficulties and comprehension level (r = 0.19, p = 0.004), computation accuracy (r = 0.25, p < 0.001), formulation skills (r = 0.14, p = 0.036), and interpretation skills (r = 0.31, p < 0.001). This indicates that difficulties in translating problems into mathematical representations may affect students' understanding, computational performance, and interpretation of solutions. Among the variables, interpretation skills obtained the strongest relationship, suggesting that formulation difficulties may greatly influence students' ability to evaluate and explain mathematical results. Therefore, the null hypothesis is rejected, indicating significant relationships between formulation difficulties and all problem-solving indicators. These findings imply that improving students' formulation and representation skills may enhance overall mathematical problem-solving performance. This finding is supported by Jupri and Drijvers (2016), who found that students commonly experience difficulties in transforming word problems into algebraic expressions. Likewise, Rittle-Johnson et al. (2017) emphasized that conceptual understanding and mathematical representation contribute to successful problem solving. Furthermore, Powell et al. (2020) explained that weaknesses in mathematical representation may negatively affect students' performance in solving applied mathematical tasks.

Table 14. Significant Relationship Between Students' Interpretation Difficulties and Performance in applying mathematical knowledge to practical problem-solving

Variable 1	Variable 2	N	R-Value	Sig. (2-tailed)	Interpretation
Interpretation difficulties	Comprehension level	233	0.27	0.000	Significant
Interpretation difficulties	Computation accuracy	233	0.08	0.238	Not Significant
Interpretation difficulties	Formulation skills	233	0.18	0.006	Significant
Interpretation difficulties	Interpretation skills	233	0.24	0.000	Significant

Table 14 shows that there is a significant relationship between students' interpretation difficulties and comprehension level (r = 0.27, p < 0.001), formulation skills (r = 0.18, p = 0.006), and interpretation skills (r = 0.24, p < 0.001). This indicates that difficulties in explaining, validating, and relating mathematical solutions to practical situations may affect students' understanding, formulation, and interpretation performance. However, no significant relationship was found between interpretation difficulties and computation accuracy (r = 0.08, p = 0.238), suggesting that procedural computation skills may function independently from interpretation processes. Therefore, the null hypothesis is rejected for comprehension level, formulation skills, and interpretation skills, while it failed to be rejected for computation accuracy. These findings imply that improving students' reflective thinking and evaluation skills may strengthen overall mathematical problem-solving performance. This finding is consistent with SEAMEO INNOTECH (2020), which emphasized that limited reflective thinking affects learners' ability to explain and evaluate solutions. Likewise, Schoenfeld (2016) highlighted that monitoring and evaluating one's problem-solving process are important components of mathematical success. Furthermore, Niss and Højgaard (2019) explained that mathematical competency includes interpreting results and connecting solutions to real-life situations.

Research Question 4: What recommendations may be proposed to enhance students' ability in applying mathematical knowledge to practical problem-solving situations?

The findings reveal a significant moderate relationship between students' difficulties and their overall performance in applying mathematical knowledge to practical problem-solving situations (r = 0.47, p < 0.001). This indicates that students' difficulties in comprehension, operation, formulation, and interpretation are significantly related to their overall problem-solving performance. This finding supports Schoenfeld's Theory of Mathematical Problem Solving (Schoenfeld, 2016), which emphasizes that problem solving involves the interaction of knowledge, strategies, and monitoring processes. It is also consistent with Boonen et al. (2016), who found that comprehension skills influence success in solving mathematical word problems. Furthermore, Rushton (2016) highlighted those engaging students in productive struggle enhances mathematical understanding and performance. Overall, strengthening students' problem-solving skills may improve their ability to apply mathematical knowledge in practical situations.

Ethical Considerations

This study adhered to ethical standards in educational research to protect the rights, privacy, and welfare of the participants. Permission to conduct the study was secured from the Department of Education Division Office and the principal of Natatas National High School. Informed consent was obtained from the respondents, and participation was voluntary. Confidentiality and anonymity were strictly observed, and all collected data were used solely for research purposes in compliance with the Data Privacy Act of 2012. The study ensured that participants were not exposed to physical, emotional, or psychological harm. Furthermore, AI tools were used only for grammar checking and language refinement, while all analyses, interpretations, and conclusions remained the original work of the researchers.

Conclusion

The study concluded that Junior High School students experience difficulties in comprehension, operation, formulation, and interpretation when applying mathematical knowledge to practical problem-solving situations. Students showed stronger performance in computation accuracy but lower performance in comprehension, formulation, and interpretation skills. The findings also revealed significant relationships between certain difficulties and students' performance, particularly in formulation skills. These results highlight the need for schools to strengthen students' problem-solving abilities, critical thinking, and mathematical reasoning to improve their performance in practical situations.

Recommendations

Based on the findings of the study, teachers are encouraged to implement instructional strategies and activities that strengthen students' comprehension, computation, formulation, and interpretation skills in mathematics. Schools may provide additional support and learning opportunities that enhance students' mathematical reasoning and practical problem-solving abilities. Students are also encouraged to actively participate in activities that improve their understanding and application of mathematical knowledge in real-life situations. These recommendations aim to improve students' overall performance and problem-solving skills in mathematics.

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