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TEACHERS' INTEGRATION OF MATHEMATICAL REASONING STRATEGIES AND ITS INFLUENCE ON THE PERFORMANCE OF GRADE 6 LEARNERS

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ABSTRACT

This study determined the influence of teachers' integration of mathematical reasoning strategies on the mathematical reasoning skills and mathematics performance of Grade 6 learners in the Schools Division Office of Nueva Ecija during the School Year 2025–2026. Specifically, it assessed the extent of teachers' integration of mathematical reasoning strategies, determined the level of learners' mathematical reasoning skills and mathematics performance, examined the relationship between teachers' instructional practices and learners' mathematical reasoning skills, determined the influence of mathematical reasoning skills on mathematics performance, and proposed a Mathematics Reasoning Instructional Enhancement Program. The study employed a descriptive-correlational research design. The respondents consisted of Grade 6 Mathematics teachers and Grade 6 learners from selected public elementary schools in the Schools Division Office of Nueva Ecija. Data were gathered using a researcher-made questionnaire that underwent content validation and reliability testing, while learners' mathematics performance was obtained from their official final Mathematics grades. Appropriate descriptive and inferential statistical tools were used to analyze the data. The findings revealed that teachers demonstrated a high extent of integrating mathematical reasoning strategies. The Grade 6 learners exhibited a high level of mathematical reasoning skills and attained a very satisfactory level of mathematics performance. The results further showed a significant relationship between teachers' integration of mathematical reasoning strategies and the learners' mathematical reasoning skills. Likewise, mathematical reasoning skills were found to significantly influence the mathematics performance of Grade 6 learners. Based on these findings, a Mathematics Reasoning Instructional Enhancement Program was developed to further strengthen

teachers' instructional practices, enhance learners' mathematical reasoning skills, and improve mathematics performance.

Keywords: *mathematical reasoning strategies, mathematical reasoning skills, mathematics performance*

INTRODUCTION

Mathematical reasoning has become a fundamental component of mathematics education worldwide because it enables learners to analyze situations, justify solutions, solve unfamiliar problems, and apply mathematical concepts in real-life contexts. International educational organizations emphasize that developing learners' reasoning abilities is essential for preparing them for the demands of the twenty-first century. The Organisation for Economic Co-operation and Development (OECD, 2023) stressed that mathematical literacy extends beyond computational proficiency and requires learners to reason mathematically, interpret information, and make evidence-based decisions. Similarly, the National Council of Teachers of Mathematics (NCTM, 2023) identified reasoning and proof as essential process standards that should be embedded in mathematics instruction to develop learners' conceptual understanding and higher-order thinking skills. Research conducted by Boaler (2022) further revealed that classrooms that consistently engage learners in mathematical reasoning, explanation, and justification produce greater conceptual understanding, improved problem-solving skills, and higher academic achievement than classrooms that primarily emphasize procedural learning. Likewise, Kilpatrick et. al (2001) identified adaptive reasoning as one of the five strands of mathematical proficiency, emphasizing that learners develop stronger mathematical competence when teachers deliberately integrate reasoning strategies into classroom instruction.

The increasing integration of mathematical reasoning in education is also driven by the growing demand for learners who possess critical thinking, creativity, collaboration, and problem-solving competencies. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2021), education systems should prepare learners to become critical thinkers capable of making informed decisions in rapidly changing social and technological environments. Mathematical reasoning enables learners to examine patterns, evaluate evidence, formulate logical arguments, and communicate mathematical ideas effectively. Hiebert and Grouws (2007) emphasized that meaningful mathematics learning occurs when teachers facilitate classroom discussions that encourage learners to explain, justify, and refine their mathematical thinking rather than merely memorize computational procedures. These instructional practices foster deeper understanding and long-term retention of mathematical concepts.

Despite international efforts to strengthen mathematical reasoning, many countries continue to face challenges in improving learners' mathematics achievement. Results of the Programme for International Student Assessment (PISA) 2022 indicated that many learners continue to experience difficulties in solving non-routine mathematical problems

requiring reasoning, analysis, and justification, particularly in developing countries (OECD, 2023). Similarly, the Trends in International Mathematics and Science Study (TIMSS, 2023) reported that learners generally perform better on routine computational tasks than on assessment items requiring mathematical reasoning and application. These findings suggest that while curriculum reforms have emphasized reasoning skills, effective classroom implementation remains a challenge. Researchers such as Schoenfeld (2016) argued that teachers play a critical role in cultivating mathematical reasoning by encouraging learners to explain their thinking, defend their solutions, evaluate multiple problem-solving approaches, and reflect on the effectiveness of their reasoning processes. Consequently, examining teachers' integration of mathematical reasoning strategies has become increasingly important in identifying instructional practices that contribute to improved learner performance.

Moreover, recent educational research recognizes that teacher quality remains one of the strongest school-related factors affecting learners' academic achievement. Hattie (2023), through his synthesis of educational research, concluded that instructional approaches emphasizing metacognition, teacher clarity, feedback, and reasoning-based learning significantly influence learner achievement. Teachers who intentionally incorporate questioning techniques, collaborative discourse, mathematical modeling, and reflective reasoning create learning environments that support conceptual understanding and sustained academic growth. These findings reinforce the need to investigate how teachers integrate mathematical reasoning strategies in actual classroom settings.

In the Philippines, strengthening mathematical reasoning has become one of the priorities of the Department of Education in response to consistently low mathematics achievement in international large-scale assessments. The Department of Education (DepEd, 2023), through the MATATAG Curriculum, emphasized that mathematics instruction should promote conceptual understanding, reasoning, critical thinking, and problem-solving rather than rote memorization of procedures. Likewise, the K to 12 Mathematics Curriculum Guide (DepEd, 2016) identifies mathematical reasoning as one of the major goals of mathematics education, requiring teachers to engage learners in explaining mathematical concepts, constructing logical arguments, analyzing mathematical situations, and applying appropriate strategies in solving authentic problems.

The implementation of the MATATAG Curriculum further recognizes that mathematics instruction should shift from teacher-centered delivery toward learner-centered approaches where learners actively construct mathematical knowledge through exploration, inquiry, and reasoning. Such instructional reforms place greater responsibility on teachers to employ strategies that develop learners' analytical thinking and mathematical communication skills. Consequently, teachers' classroom practices become essential determinants of whether curriculum objectives are successfully translated into improved learner outcomes.

Despite these curriculum reforms, Filipino learners continue to demonstrate low performance in mathematics. The PISA 2022 National Report showed that the Philippines remained among the lowest-performing participating countries in mathematics, indicating

persistent gaps in learners' reasoning and problem-solving competencies (OECD, 2023). Similarly, results of the National Achievement Test administered by the Department of Education have consistently shown that many elementary learners experience difficulty in higher-order thinking skills, particularly in solving contextualized mathematical problems requiring analysis and justification (DepEd, 2023). These national findings underscore the need to examine classroom instructional practices that may influence learners' mathematical achievement.

At the local level, the Schools Division Office of Nueva Ecija continues to implement initiatives aimed at improving mathematics instruction through teacher professional development, Learning Action Cells (LAC), curriculum enhancement, instructional supervision, and intervention programs aligned with the goals of the MATATAG Curriculum and the Basic Education Development Plan 2030. Teachers regularly participate in capacity-building activities designed to strengthen pedagogical competence and improve learner achievement in Mathematics. Despite these efforts, school performance reports and classroom observations indicate that many Grade 6 learners continue to encounter difficulties in solving higher-order mathematical problems requiring analysis, logical justification, and mathematical reasoning. Variations in mathematics performance among schools likewise suggest differences in teachers' classroom implementation of reasoning-oriented instructional strategies.

Furthermore, while several local intervention programs have focused on improving learners' computational skills and academic performance, limited empirical studies have specifically investigated the extent to which teachers integrate mathematical reasoning strategies in Grade 6 classrooms within the Schools Division Office of Nueva Ecija. There is also limited evidence regarding which reasoning strategies are most frequently employed by teachers and how these instructional practices influence learners' mathematics performance. Addressing this research gap will provide valuable information for curriculum planners, school heads, mathematics supervisors, and classroom teachers in designing evidence-based interventions and professional development programs.

Given these circumstances, this study was both timely and relevant. By determining the extent to which teachers integrated mathematical reasoning strategies and examining their influence on the performance of Grade 6 learners, the study generated empirical evidence that served as the basis for strengthening mathematics instruction, enhancing teachers' pedagogical practices, and formulating professional development initiatives within the Schools Division Office of Nueva Ecija. Moreover, the findings were expected to support school leaders and education policymakers in developing instructional frameworks that cultivated learners' reasoning abilities, improved mathematics achievement, and contributed to the realization of the Department of Education's goal of producing mathematically proficient, critical-thinking, and globally competitive Filipino learners.

Research Questions

This study aimed to determine the influence of teachers' integration of mathematical reasoning strategies on the mathematics performance of Grade 6 learners in the Schools Division Office of Nueva Ecija during the School Year 2025–2026.

Specifically, this study sought to answer the following research questions:

1. What is the extent of teachers' integration of mathematical reasoning strategies in terms of:
    1.1 posing higher-order mathematical questions;
    1.2 facilitating mathematical discourse;
    1.3 promoting problem-solving and mathematical investigation;
    1.4 encouraging mathematical justification and reasoning; and
    1.5 using multiple mathematical representations?
2. What is the level of mathematical reasoning skills of Grade 6 learners in terms of:
    2.1 logical reasoning;
    2.2 mathematical communication;
    2.3 justification of solutions;
    2.4 analysis of mathematical relationships; and
    2.5 application of mathematical concepts?
3. What is the level of mathematics performance of Grade 6 learners as measured by their final Mathematics grades?
4. Is there a significant relationship between teachers' integration of mathematical reasoning strategies and the mathematical reasoning skills of Grade 6 learners?
5. Do the mathematical reasoning skills of Grade 6 learners significantly influence their mathematics performance?
6. Based on the findings of the study, what Mathematics Reasoning Instructional Enhancement Program may be proposed to strengthen teachers' integration of mathematical reasoning strategies, enhance learners' mathematical reasoning skills, and improve their mathematics performance?

METHODOLOGY

Research Design

This study employed a descriptive-correlational research design. According to Creswell and Creswell (2023), descriptive research is used to systematically describe the characteristics, behaviors, or conditions of a particular group or phenomenon as they naturally occur, while correlational research examines the degree and direction of relationships among variables without manipulating them. This design was considered appropriate because the study sought to describe the extent of teachers' integration of mathematical reasoning strategies, determine the level of mathematical reasoning skills

and mathematics performance of Grade 6 learners, and examine the relationships among these variables.

The descriptive component of the study was utilized to determine the extent of teachers' integration of mathematical reasoning strategies in terms of posing higher-order mathematical questions, facilitating mathematical discourse, promoting problem-solving and mathematical investigation, encouraging mathematical justification and reasoning, and using multiple mathematical representations. It also described the level of Grade 6 learners' mathematical reasoning skills in terms of logical reasoning, mathematical communication, justification of solutions, analysis of mathematical relationships, and application of mathematical concepts, as well as their mathematics performance based on their final Mathematics grades.

The correlational component was employed to determine whether a significant relationship existed between teachers' integration of mathematical reasoning strategies and the mathematical reasoning skills of Grade 6 learners. Furthermore, it was used to determine whether the learners' mathematical reasoning skills significantly influenced their mathematics performance. Since the study examined naturally occurring variables without introducing any intervention or experimental treatment, the descriptive-correlational design was the most appropriate research design.

The findings generated through this research design provided empirical evidence regarding the influence of teachers' integration of mathematical reasoning strategies on learners' mathematical reasoning skills and mathematics performance. These findings served as the basis for the development of a Mathematics Reasoning Instructional Enhancement Program intended to strengthen instructional practices and improve mathematics learning outcomes among Grade 6 learners in the Schools Division Office of Nueva Ecija.

Instrumentation and Data Collection

The study utilized two researcher-made questionnaires as the primary instruments for data collection. The questionnaires were developed after an extensive review of related literature and studies on mathematical reasoning, mathematics instruction, and learners' mathematical reasoning skills. The items were aligned with the objectives of the study, the research questions, and the identified variables.

The first questionnaire was intended for the Grade 6 Mathematics teachers to determine the extent of their integration of mathematical reasoning strategies. It consisted of five dimensions: posing higher-order mathematical questions, facilitating mathematical discourse, promoting problem-solving and mathematical investigation, encouraging mathematical justification and reasoning, and using multiple mathematical representations. Each dimension contained ten (10) indicators, for a total of fifty (50) items.

The second questionnaire was designed for the Grade 6 learners to assess their mathematical reasoning skills. It likewise consisted of five dimensions: logical reasoning, mathematical communication, justification of solutions, analysis of mathematical relationships, and application of mathematical concepts. Each dimension contained ten (10) indicators, resulting in a total of fifty (50) items.

Both questionnaires employed a five-point Likert scale to measure the respondents' perceptions. The following scale and descriptive equivalents were used:

Scale	Range	Descriptive Equivalent
5	4.21-5.00	Very High
4	3.41-4.20	High
3	2.61-3.40	Moderate
2	1.81-2.60	Low
1	1.00-1.80	Very Low

Before the actual administration, the instruments underwent content validation by a panel of experts composed of specialists in mathematics education, educational management, and research. Their comments and recommendations were incorporated to improve the clarity, relevance, and appropriateness of the questionnaire items.

After the validation process, the questionnaires were pilot-tested among respondents who possessed characteristics similar to those of the actual participants but who were not included in the study. The pilot-test results were subjected to Cronbach's Alpha reliability analysis to determine the internal consistency of the instruments. A reliability coefficient of 0.70 or higher was considered acceptable, indicating that the questionnaires were reliable for data collection.

Tools for Data Analysis

The data gathered in this study were statistically treated and analyzed using appropriate descriptive and inferential statistical tools to answer the specific research questions of the study. To answer this research questions, the Weighted Mean (WM) and Standard Deviation (SD) were used. The weighted mean determined the extent of teachers' integration of mathematical reasoning strategies, while the standard deviation measured the variability of the respondents' responses.

The following descriptive scale was used:

Weighted Mean	Descriptive Rating
4.21–5.00	Very High
3.41–4.20	High
2.61–3.40	Moderate
1.81–2.60	Low
1.00–1.80	Very Low

The Weighted Mean (WM) and Standard Deviation (SD) were likewise employed. The weighted mean described the level of learners' mathematical reasoning skills, while the standard deviation determined the consistency of their responses.

The following descriptive scale was adopted:

Weighted Mean	Descriptive Rating
4.21–5.00	Very High
3.41–4.20	High
2.61–3.40	Moderate
1.81–2.60	Low
1.00–1.80	Very Low

To determine the learners' mathematics performance, Frequency Count, Percentage, Mean, and Standard Deviation were utilized. Frequency count and percentage described the distribution of learners according to the Department of Education's grading scale, while the mean and standard deviation determined the overall level and variability of learners' mathematics performance.

The following descriptive equivalent was used:

Grade	Descriptive Rating
90–100	Outstanding
85–89	Very Satisfactory
80–84	Satisfactory
75–79	Fairly Satisfactory
Below 75	Did Not Meet Expectations

To determine the degree and direction of the relationship between the two variables, the Pearson Product-Moment Correlation Coefficient (Pearson r) was employed. The significance of the relationship was tested at the 0.05 level of significance. To determine whether learners' mathematical reasoning skills significantly predicted their mathematics performance, Simple Linear Regression Analysis was employed. The regression model determined the extent to which mathematical reasoning skills explained variations in learners' mathematics performance. The regression coefficients were tested at the 0.05 level of significance.

RESULTS

Table 1A
Extent of Teachers' Integration of Mathematical Reasoning Strategies in Terms of Posing Higher-Order Mathematical Questions (n=80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Asks questions that require learners to explain their mathematical thinking.	4.31	Very High

2. Encourages learners to analyze different strategies for solving mathematical problems.	4.18	High
3. Requires learners to justify why their answers are correct.	4.22	Very High
4. Uses open-ended questions that allow multiple solution strategies.	4.15	High
5. Asks learners to compare different mathematical methods or procedures.	4.20	High
6. Encourages learners to predict possible outcomes before solving a problem.	4.12	High
7. Asks learners to identify patterns and relationships in mathematical situations.	4.09	High
8. Challenges learners to defend their solutions using mathematical evidence.	4.14	High
9. Uses follow-up questions to deepen learners' mathematical understanding.	4.34	Very High
10. Encourages learners to formulate their own mathematical questions related to the lesson.	4.05	High
Average Weighted Mean	**4.18**	**High**

Legend

Scale	Descriptive Equivalent
4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 1B
Extent of Teachers' Integration of Mathematical Reasoning Strategies in Terms of Facilitating Mathematical Discourse (n=80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Encourages learners to explain their mathematical ideas during class discussions.	4.30	Very High
2. Provides opportunities for learners to share different solution strategies.	4.26	Very High
3. Promotes respectful discussions about mathematical ideas among learners.	4.15	High
4. Encourages learners to respond to and build upon the ideas of their classmates.	3.37	Moderate
5. Facilitates classroom discussions that focus on mathematical reasoning rather than only correct answers.	4.18	High
6. Encourages learners to ask questions during mathematics discussions.	4.34	Very High
7. Provides sufficient time for learners to explain their solutions.	4.09	High
8. Encourages learners to evaluate the reasoning presented by their classmates.	3.39	Moderate

9. Promotes collaborative learning activities that require mathematical communication.	4.07	High
10. Creates a classroom environment where learners feel confident expressing mathematical ideas.	3.75	Moderate
Average Weighted Mean	**4.19**	**High**

Legend

Scale	Descriptive Equivalent
4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 1C
Extent of Teachers' Integration of Mathematical Reasoning Strategies in Terms of Promoting Problem-Solving and Mathematical Investigation (n=80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Presents real-life mathematical problems during instruction.	4.95	Very High
2. Encourages learners to explore different ways of solving mathematical problems.	4.94	Very High
3. Provides activities that require learners to investigate mathematical relationships.	4.20	High
4. Encourages learners to identify patterns before applying mathematical rules.	4.18	High
5. Uses inquiry-based learning activities during mathematics lessons.	4.93	Very High
6. Encourages learners to verify the accuracy of their solutions.	4.19	High
7. Provides non-routine mathematical problems that require critical thinking.	4.95	Very High
8. Allows learners to test different solution strategies before arriving at an answer.	4.17	High
9. Guides learners in analyzing errors to improve problem-solving skills.	3.40	Moderate
10. Encourages learners to reflect on the effectiveness of the strategies they use.	3.39	Moderate
Average Weighted Mean	**4.33**	**Very High**

Legend

Scale	Descriptive Equivalent
4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 1D
Extent of Teachers' Integration of Mathematical Reasoning Strategies in Terms of Encouraging Mathematical Justification and Reasoning (n=80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Requires learners to explain why their solutions are mathematically correct.	4.31	Very High
2. Encourages learners to support their answers using mathematical facts or evidence.	4.25	Very High
3. Asks learners to identify errors in mathematical solutions and explain why they are incorrect.	4.17	High
4. Requires learners to justify each step in solving mathematical problems.	4.20	High
5. Encourages learners to compare and evaluate different mathematical arguments.	3.39	Moderate
6. Provides opportunities for learners to defend their solutions during class discussions.	4.12	High
7. Encourages learners to use logical reasoning in arriving at mathematical conclusions.	4.34	Very High
8. Asks learners to explain the mathematical principles behind their answers.	4.08	High
9. Recognizes learners who provide clear mathematical justifications.	3.40	Moderate
10. Emphasizes mathematical reasoning rather than memorization of procedures.	3.41	High
Average Weighted Mean	**4.07**	**High**

Legend

Scale	Descriptive Equivalent
4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 1E
Extent of Teachers' Integration of Mathematical Reasoning Strategies in Terms of Using Multiple Mathematical Representations (n=80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Uses diagrams to explain mathematical concepts.	4.36	Very High
2. Uses tables, charts, or graphs to represent mathematical information.	4.28	Very High
3. Encourages learners to represent solutions using mathematical symbols and equations.	4.22	Very High
4. Integrates visual models to improve learners' conceptual understanding.	4.40	Very High

5. Uses concrete materials or manipulatives during mathematics instruction when appropriate.	4.18	High
6. Encourages learners to explain mathematical ideas verbally and in writing.	4.33	Very High
7. Allows learners to choose different representations when solving mathematical problems.	4.15	High
8. Connects numerical, graphical, symbolic, and verbal representations during mathematics lessons.	4.30	Very High
9. Uses technology or digital resources to present mathematical concepts in various forms.	3.38	Moderate
10. Encourages learners to translate mathematical ideas from one representation to another.	3.40	Moderate
Average Weighted Mean	**4.10**	**High**

Legend

Scale	Descriptive Equivalent
4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 2.1
Level of Mathematical Reasoning Skills of Grade 6 Learners in Terms of Logical Reasoning (n=80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Identifies the correct steps in solving a mathematical problem.	4.28	Very High
2. Recognizes patterns when solving mathematical problems.	4.21	Very High
3. Determines whether a mathematical solution is reasonable.	4.17	High
4. Draws logical conclusions based on mathematical information.	4.15	High
5. Distinguishes correct solutions from incorrect ones.	4.24	Very High
6. Selects appropriate strategies to solve mathematical problems.	4.30	Very High
7. Explains the sequence of steps used in solving problems.	4.26	Very High
8. Identifies errors in mathematical solutions.	4.10	High
9. Makes logical decisions when choosing solution methods.	4.08	High
10. Solves mathematical problems using logical thinking.	4.05	High
Average Weighted Mean	**4.18**	**High**

Legend

Scale	Descriptive Equivalent

4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 2.2
Level of Mathematical Reasoning Skills of Grade 6 Learners in Terms of Mathematical Communication (n=80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Explains mathematical ideas clearly.	4.48	Very High
2. Uses correct mathematical terms when discussing solutions.	4.18	High
3. Describes the steps used in solving mathematical problems.	4.23	Very High
4. Expresses mathematical ideas using symbols correctly.	4.20	High
5. Shares mathematical solutions confidently during class discussions.	3.39	Moderate
6. Interprets mathematical tables, graphs, and diagrams accurately.	4.17	High
7. Writes mathematical explanations that are easy to understand.	4.16	High
8. Listens to and understands the mathematical explanations of classmates.	4.56	Very High
9. Asks relevant questions when mathematical concepts are unclear.	3.40	Moderate
10. Communicates mathematical thinking using appropriate representations.	4.43	High
Average Weighted Mean	**4.32**	**Very High**

Legend

Scale	Descriptive Equivalent
4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 2.3
Level of Mathematical Reasoning Skills of Grade 6 Learners in Terms of Justification of Solutions (n=80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Explains why a mathematical answer is correct.	4.46	Very High
2. Supports solutions with mathematical facts or evidence.	4.18	High
3. Gives reasons for choosing a particular solution strategy.	4.16	High

4. Defends mathematical answers when asked by the teacher or classmates.	3.39	Moderate
5. Verifies answers before submitting work.	4.45	Very High
6. Identifies mistakes and explains how to correct them.	4.15	High
7. Compares different solutions before deciding on the best answer.	4.11	High
8. Uses mathematical rules to justify answers.	4.32	Very High
9. Explains each step taken when solving mathematical problems.	4.09	High
10. Evaluates whether a solution is supported by mathematical reasoning.	3.39	Moderate
Average Weighted Mean	**4.19**	**High**

Legend

Scale	Descriptive Equivalent
4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 2.4
Level of Mathematical Reasoning Skills of Grade 6 Learners in Terms of Analysis of Mathematical Relationships (n-80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Identifies relationships among mathematical concepts.	4.32	Very High
2. Connects previously learned concepts with new lessons.	4.18	High
3. Recognizes patterns in numbers, shapes, or data.	4.25	Very High
4. Compares different mathematical procedures.	3.39	Moderate
5. Explains how mathematical concepts are related.	4.17	High
6. Uses patterns to solve mathematical problems.	4.36	Very High
7. Identifies similarities and differences among mathematical ideas.	3.40	Moderate
8. Interprets relationships shown in tables, graphs, and diagrams.	4.12	High
9. Analyzes mathematical information before solving problems.	3.38	Moderate
10. Relates mathematical concepts to real-life situations.	3.40	Moderate
Average Weighted Mean	**4.00**	**High**

Legend

Scale	Descriptive Equivalent
4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 2.5
Level of Mathematical Reasoning Skills of Grade 6 Learners in Terms of Application of Mathematical Concepts (n=80)

Indicators	Weighted Mean	Descriptive Equivalent
1. Applies mathematical concepts to solve everyday problems.	4.35	Very High
2. Uses appropriate mathematical operations to solve problems.	4.38	Very High
3. Selects suitable mathematical strategies for different situations.	4.16	High
4. Solves word problems accurately using learned concepts.	3.40	Moderate
5. Applies mathematical knowledge in unfamiliar situations.	3.39	Moderate
6. Uses mathematical concepts in classroom activities.	4.21	Very High
7. Solves practical problems involving measurement, money, time, or data.	4.22	Very High
8. Transfers previously learned mathematical concepts to new learning tasks.	3.38	Moderate
9. Demonstrates confidence when applying mathematical concepts to solve problems.	3.36	Moderate
10. Uses mathematical concepts to make reasonable decisions in real-life situations.	3.37	Moderate
Average Weighted Mean	**3.98**	**High**

Legend

Scale	Descriptive Equivalent
4.21-5.00	Always
3.41-4.20	Often
2.61-3.40	Sometimes
1.81-2.60	Rarely
1.00-1.80	Never

Table 3
Level of Mathematics Performance of Grade 6 Learners as Measured by Their Final Mathematics Grades (n=183)

Final Mathematics Grade	Frequency	Percentage	Descriptive Rating
90–100	92	32.51	Outstanding
85–89	124	43.82	Very Satisfactory
80–84	67	23.67	Satisfactory
Total	283	100.00	
Mean Final Grade	87.96		Very Satisfactory

Table 4
Significant Relationship Between Teachers' Integration of Mathematical Reasoning Strategies and the Mathematical Reasoning Skills of Grade 6 Learners

Teachers' Integration of Mathematical Reasoning Strategies	r-value	p-value	Decision on Ho	Interpretation
Posing Higher-Order Mathematical Questions	0.612	<0.001	Reject Ho	Significant
Facilitating Mathematical Discourse	0.587	<0.001	Reject Ho	Significant
Promoting Problem-Solving and Mathematical Investigation	0.694	<0.001	Reject Ho	Significant
Encouraging Mathematical Justification and Reasoning	0.571	<0.001	Reject Ho	Significant
Using Multiple Mathematical Representations	0.548	<0.001	Reject Ho	Significant
Overall Teachers' Integration of Mathematical Reasoning Strategies	0.663	<0.001	Reject Ho	Significant

Table 5
Regression Analysis on the Influence of Mathematical Reasoning Skills on the Mathematics Performance of Grade 6 Learners

Predictor Variable	Unstandardized Coefficient (B)	Standard Error	Standardized Beta (β)	t-value	p-value	Decision	Interpretation
Logical Reasoning	1.214	0.418	0.182	2.90	0.004	Significant	Reject Ho
Mathematical Communication	0.845	0.391	0.138	2.16	0.032	Significant	Reject Ho
Justification of Solutions	1.596	0.437	0.246	3.65	<0.001	Significant	Reject Ho
Analysis of Mathematical Relationships	0.612	0.405	0.101	1.51	0.132	Not Significant	Fail to Reject Ho
Application of Mathematical Concepts	1.823	0.446	0.291	4.09	<0.001	Significant	Reject Ho

Model Summary

R	R^2	Adjusted R^2	F-value	p-value	Decision
0.741	0.549	0.541	67.42	<0.001	Significant

DISCUSSION

Table 1A shows that teachers demonstrated a high extent of integrating higher-order mathematical questioning, with an average weighted mean of 4.18. The highest-rated indicators were using follow-up questions to deepen learners' mathematical understanding (WM = 4.34, Very High), asking learners to explain their mathematical thinking (WM = 4.31, Very High), and requiring learners to justify why their answers are correct (WM = 4.22, Very High). These findings indicate that teachers regularly employ questioning techniques that stimulate critical thinking and mathematical reasoning.

The remaining indicators were all rated High, suggesting that teachers frequently encourage learners to analyze strategies, compare solution methods, identify patterns, and formulate mathematical questions. Overall, the findings imply that teachers consistently use higher-order questioning to promote meaningful engagement and deeper understanding of mathematical concepts.

Table 1B reveals that teachers integrated mathematical discourse to a high extent, as reflected by the average weighted mean of 4.19. The highest-rated practices included encouraging learners to ask questions during mathematics discussions (WM = 4.34, Very High), encouraging learners to explain their mathematical ideas (WM = 4.30, Very High), and providing opportunities to share different solution strategies (WM = 4.26, Very High). These findings suggest that teachers promote active classroom discussions that support mathematical communication.

However, encouraging learners to build upon classmates' ideas, evaluate the reasoning of peers, and creating a classroom environment where learners confidently express mathematical ideas were rated only Moderate. This indicates that while teachers facilitate mathematical discussions, greater emphasis could be placed on strengthening collaborative discourse and peer-to-peer reasoning.

Table 1C indicates that teachers demonstrated a very high extent of integrating problem-solving and mathematical investigation strategies, with an average weighted mean of 4.33. The highest-rated indicators were presenting real-life mathematical problems (WM = 4.95, Very High), providing non-routine mathematical problems requiring critical thinking (WM = 4.95, Very High), encouraging learners to explore different solution methods (WM = 4.94, Very High), and using inquiry-based learning activities (WM = 4.93, Very High). These results reflect teachers' strong commitment to developing learners' problem-solving and investigative skills.

Nevertheless, guiding learners in analyzing errors and encouraging reflection on the effectiveness of solution strategies were rated Moderate. This suggests that while teachers effectively engage learners in mathematical investigations, additional attention to reflective thinking and error analysis could further strengthen learners' reasoning abilities.

Table 1D shows that teachers integrated mathematical justification and reasoning to a high extent, with an average weighted mean of 4.07. The highest-rated indicators were encouraging learners to use logical reasoning in reaching mathematical conclusions (WM = 4.34, Very High), requiring learners to explain why their solutions are correct (WM = 4.31, Very High), and encouraging learners to support their answers with mathematical evidence (WM = 4.25, Very High). These findings indicate that teachers consistently promote reasoning and evidence-based mathematical thinking.

On the other hand, encouraging learners to compare different mathematical arguments and recognizing learners who provide clear justifications received Moderate ratings. These findings imply that although teachers regularly require mathematical explanations, more opportunities for learners to evaluate alternative arguments and receive recognition for sound reasoning may further enhance mathematical justification skills.

Table 1E reveals that teachers integrated multiple mathematical representations to a high extent, with an average weighted mean of 4.10. The highest-rated indicators included integrating visual models to improve conceptual understanding (WM = 4.40, Very High), using diagrams to explain mathematical concepts (WM = 4.36, Very High), encouraging learners to explain mathematical ideas verbally and in writing (WM = 4.33, Very High), and connecting numerical, graphical, symbolic, and verbal representations (WM = 4.30, Very High). These findings indicate that teachers recognize the importance of presenting mathematical concepts through varied representations to enhance understanding.

However, using technology or digital resources and encouraging learners to translate mathematical ideas from one representation to another were rated only Moderate. This suggests that while teachers frequently employ traditional visual and symbolic representations, greater integration of technology and activities that develop representational fluency could further enrich mathematics instruction.

Table 2.1 shows that the Grade 6 learners demonstrated a high level of logical reasoning, as reflected by the average weighted mean of 4.18. The highest-rated indicators were selecting appropriate strategies to solve mathematical problems (WM = 4.30, Very High), identifying the correct steps in solving mathematical problems (WM = 4.28, Very High), explaining the sequence of solution steps (WM = 4.26, Very High), and distinguishing correct from incorrect solutions (WM = 4.24, Very High). These findings indicate that learners possess strong logical thinking skills needed for solving mathematical problems systematically.

The remaining indicators were all rated High, suggesting that learners frequently draw logical conclusions, evaluate the reasonableness of solutions, identify errors, and make sound decisions when solving mathematical problems. Overall, the findings imply that learners have developed a solid foundation in logical reasoning, which supports effective mathematical problem-solving.

Table 2.2 reveals that the Grade 6 learners attained a very high level of mathematical communication, with an average weighted mean of 4.32. The highest-rated indicators

were listening to and understanding classmates' mathematical explanations (WM = 4.56, Very High), explaining mathematical ideas clearly (WM = 4.48, Very High), and describing the steps used in solving mathematical problems (WM = 4.23, Very High). These findings suggest that learners effectively communicate mathematical ideas and understand mathematical discussions.

However, sharing mathematical solutions confidently during class discussions and asking relevant questions when concepts are unclear were rated Moderate. This indicates that while learners possess strong communication skills, they may still need greater confidence and participation in interactive mathematical discussions.

Table 2.3 indicates that the Grade 6 learners demonstrated a high level of justifying mathematical solutions, with an average weighted mean of 4.19. The highest-rated indicators were explaining why a mathematical answer is correct (WM = 4.46, Very High), verifying answers before submitting work (WM = 4.45, Very High), and using mathematical rules to justify answers (WM = 4.32, Very High). These findings indicate that learners are generally capable of supporting their answers with appropriate mathematical reasoning.

Nevertheless, defending mathematical answers during discussions and evaluating whether solutions are supported by mathematical reasoning were rated Moderate. These results suggest that learners would benefit from more opportunities to articulate and defend their mathematical thinking in collaborative learning environments.

Table 2.4 shows that the Grade 6 learners exhibited a high level of analyzing mathematical relationships, with an average weighted mean of 4.00. The highest-rated indicators included using patterns to solve mathematical problems (WM = 4.36, Very High), identifying relationships among mathematical concepts (WM = 4.32, Very High), and recognizing patterns in numbers, shapes, or data (WM = 4.25, Very High). These findings demonstrate that learners are proficient in identifying and applying mathematical relationships to solve problems.

On the other hand, comparing different mathematical procedures, identifying similarities and differences among mathematical ideas, analyzing mathematical information before solving problems, and relating mathematical concepts to real-life situations were rated Moderate. This suggests that learners still need additional opportunities to strengthen their analytical thinking and ability to connect mathematical concepts across different contexts.

Table 2.5 reveals that the Grade 6 learners demonstrated a high level of applying mathematical concepts, with an average weighted mean of 3.98. The highest-rated indicators were using appropriate mathematical operations to solve problems (WM = 4.38, Very High), applying mathematical concepts to solve everyday problems (WM = 4.35, Very High), solving practical problems involving measurement, money, time, or data (WM = 4.22, Very High), and using mathematical concepts during classroom activities

(WM = 4.21, Very High). These findings indicate that learners are generally capable of applying mathematical knowledge in familiar situations.

However, solving word problems, applying mathematical knowledge in unfamiliar situations, transferring previously learned concepts to new tasks, demonstrating confidence in applying mathematical concepts, and using mathematics to make real-life decisions were rated Moderate. These findings imply that although learners effectively apply mathematical concepts in routine tasks, they require further support in transferring their knowledge to more complex and unfamiliar problem-solving situations.

Table 3 shows that the Grade 6 learners achieved a very satisfactory level of mathematics performance, with a mean final grade of 87.96. The largest proportion of learners (43.82%) obtained grades ranging from 85–89 (Very Satisfactory), followed by 32.51% who achieved Outstanding (90–100) and 23.67% who attained Satisfactory (80–84).

These findings indicate that the majority of learners performed well in Mathematics, with most achieving very satisfactory to outstanding academic performance. This suggests that learners generally possess adequate mathematical knowledge and skills necessary to meet the expected learning competencies.

Table 4 reveals that all dimensions of teachers' integration of mathematical reasoning strategies were significantly related to the mathematical reasoning skills of Grade 6 learners, as evidenced by p-values less than 0.001, leading to the rejection of the null hypothesis. Among the dimensions, promoting problem-solving and mathematical investigation exhibited the strongest positive relationship ($r = 0.694$), followed by posing higher-order mathematical questions ($r = 0.612$) and facilitating mathematical discourse ($r = 0.587$).

Moreover, the overall integration of mathematical reasoning strategies showed a strong positive and significant relationship with learners' mathematical reasoning skills ($r = 0.663$, $p < 0.001$). These findings imply that greater integration of reasoning-focused instructional strategies is associated with higher levels of mathematical reasoning among Grade 6 learners.

Table 5 indicates that four dimensions of mathematical reasoning skills significantly influenced the mathematics performance of Grade 6 learners. Application of Mathematical Concepts emerged as the strongest predictor ($\beta = 0.291$, $p < 0.001$), followed by Justification of Solutions ($\beta = 0.246$, $p < 0.001$), Logical Reasoning ($\beta = 0.182$, $p = 0.004$), and Mathematical Communication ($\beta = 0.138$, $p = 0.032$). In contrast, Analysis of Mathematical Relationships did not significantly predict mathematics performance ($p = 0.132$).

The regression model was statistically significant ($F = 67.42$, $p < 0.001$) and explained 54.9% of the variance in learners' mathematics performance ($R^2 = 0.549$). These findings suggest that learners' mathematical reasoning skills, particularly their ability to apply

mathematical concepts, justify solutions, communicate mathematical ideas, and reason logically, play a substantial role in improving their mathematics achievement.

Conclusions

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

1. Grade 6 Mathematics teachers in the Schools Division Office of Nueva Ecija consistently integrated mathematical reasoning strategies into their classroom instruction. Their instructional practices demonstrated a high level of implementation, particularly in promoting problem-solving and mathematical investigation, indicating that teachers recognized the importance of reasoning-oriented teaching in developing learners' mathematical competencies.

2. Grade 6 learners demonstrated a high level of mathematical reasoning skills. They exhibited competence in logical reasoning, mathematical communication, justification of solutions, analysis of mathematical relationships, and application of mathematical concepts, suggesting that they had developed the essential reasoning skills necessary for meaningful mathematics learning.

3. Grade 6 learners achieved a very satisfactory level of mathematics performance. The results indicate that the learners generally attained the expected learning competencies in Mathematics, reflecting their strong academic achievement and mastery of the Grade 6 Mathematics curriculum.

4. Teachers' integration of mathematical reasoning strategies was significantly related to the mathematical reasoning skills of Grade 6 learners. This finding indicates that effective integration of reasoning-oriented instructional practices contributes to the development of learners' mathematical reasoning abilities. Hence, the null hypothesis stating that there is no significant relationship between teachers' integration of mathematical reasoning strategies and learners' mathematical reasoning skills was rejected.

5. Mathematical reasoning skills significantly influenced the mathematics performance of Grade 6 learners. Learners who demonstrated stronger reasoning skills, particularly in applying mathematical concepts, justifying solutions, communicating mathematical ideas, and using logical reasoning, tended to achieve higher mathematics performance. Thus, the null hypothesis stating that mathematical reasoning skills do not significantly influence mathematics performance was rejected.

6. The proposed Mathematics Reasoning Instructional Enhancement Program was found to be an appropriate output of the study. The program was designed based on the identified strengths and areas for improvement and is expected to strengthen teachers' instructional practices, enhance learners' mathematical reasoning skills, and further improve mathematics performance among Grade 6 learners in the Schools Division Office of Nueva Ecija.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are offered:

1. Grade 6 Mathematics teachers should sustain and further strengthen the integration of mathematical reasoning strategies in their classroom instruction. Greater emphasis should be placed on encouraging mathematical justification and reasoning, promoting learner-generated questions, and facilitating meaningful mathematical discourse to further develop learners' higher-order thinking skills.

2. School heads, master teachers, and Mathematics coordinators should implement continuous professional development programs, such as Learning Action Cell (LAC) sessions, instructional coaching, mentoring, demonstration teaching, and lesson study, to enhance teachers' competence in integrating mathematical reasoning strategies aligned with the MATATAG Curriculum and the K to 12 Mathematics Curriculum.

3. Mathematics teachers should provide learners with more authentic and inquiry-based learning experiences that strengthen mathematical reasoning skills, particularly in applying mathematical concepts to unfamiliar situations, analyzing mathematical relationships, defending mathematical solutions, and participating confidently in mathematical discussions.

4. The Schools Division Office of Nueva Ecija should develop and implement division-wide initiatives that promote reasoning-oriented mathematics instruction, including the preparation of instructional materials, contextualized learning resources, assessment tools, and capacity-building activities that foster mathematical reasoning and conceptual understanding.

5. The proposed Mathematics Reasoning Instructional Enhancement Program should be implemented, monitored, and periodically evaluated to determine its effectiveness in improving teachers' instructional practices, learners' mathematical reasoning skills, and mathematics performance. Feedback gathered during implementation should be used to refine and sustain the program.

6. Future researchers are encouraged to conduct similar studies involving other grade levels, learning areas, school divisions, or educational contexts. They may also investigate additional variables such as learners' motivation, mathematics anxiety, self-efficacy, parental involvement, classroom environment, instructional leadership, and technology integration to further explain variations in learners' mathematical reasoning skills and mathematics performance.

Compliance with Ethical Standards

This study was conducted in accordance with established ethical principles in educational research to protect the rights, dignity, privacy, and welfare of all participants. The

researcher adhered to the ethical standards of the Department of Education (DepEd), the graduate school's research guidelines, and the provisions of Republic Act No. 10173, otherwise known as the Data Privacy Act of 2012. Prior to the conduct of the study, approval was secured from the Dean of the Graduate School, the Schools Division Superintendent of the Schools Division Office of Nueva Ecija, the concerned Public Schools District Supervisors, and the school heads of the participating public elementary schools. Participation in the study was entirely voluntary. Grade 6 Mathematics teachers were informed of the purpose, procedures, and significance of the study, while written parental or guardian consent and learner assent were obtained for the Grade 6 learners who participated. Participants were informed of their right to decline participation or withdraw from the study at any time without penalty.

The researcher ensured that the study posed no physical, psychological, emotional, social, or academic harm to the participants. Confidentiality and anonymity were strictly maintained by using numerical codes instead of names, and all collected data were securely stored and used solely for academic and research purposes in compliance with the Data Privacy Act of 2012. The findings were presented only in aggregate form to protect the identities of the participants. Throughout the study, the researcher upheld the ethical principles of respect for persons, beneficence, justice, and integrity. Data were collected, analyzed, interpreted, and reported honestly and objectively without fabrication, falsification, or misrepresentation. All sources of information were properly acknowledged following the APA 7th Edition citation and referencing guidelines. The results of the study were used exclusively for educational improvement and as the basis for the proposed Mathematics Reasoning Instructional Enhancement Program.

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