Routine and Non-Routine Problem Solving Performance of Pupils

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ABSTRACT

This study determined the performance in solving both routine and non-routine mathematical problems of Grade 4 pupils in relation to selected variables in upland elementary schools in Negros Occidental for school year 2025-2026. The instrument was carefully designed to measure proficiency in solving both routine problems and non-routine problems. The Grade 4 pupils were predominantly female, were mostly 9 years old, and generally fell within the normal nutritional status. The overall performance of Grade 4 pupils in routine problem solving was average and a low level in non-routine problem-solving yielded. The statistical analysis revealed no significant difference in the performance of routine problem solving of male and female groups, age groups, and among different nutritional status. The analysis also revealed no significant difference in the performance of non-routine problem solving of male and female groups, among the age groups, and across nutritional status.

Keywords: Routine and Non-Routine Problem, Problem Solving Performance, Grade 4 Pupils, Descriptive-comparative Research

INTRODUCTION

Mathematical problems are often classified into routine and non-routine categories. Routine problems play a significant role in the education context. They are those that students can solve by applying prior knowledge, rules, and standard procedures. Research indicates that students often struggle to apply domain knowledge in novel situations when instruction focuses heavily on standard procedures (Stephens et al., 2021). While routine problems support procedural fluency, they may not foster deeper problem-solving ability or flexibility. Non-routine problems require students to use unfamiliar reasoning and strategies. Khabour and Al-Zoubi (2022) found that non-routine problem-solving skills predicted teachers' metacognitive habits, highlighting their importance in higher-order thinking.

Mastering problem-solving skills is one of the main objectives in Mathematics. However, achieving proficiency in Mathematics involves a range of intricate abilities that cover various concepts and methods (Tabuyo, 2024). Problem-solving is widely regarded as a fundamental aspect of mathematics education, essential for developing critical thinking and the ability to apply mathematical concepts to real-world situations. This perspective is supported by various studies emphasizing the integration of problem-solving skills throughout the mathematics curriculum (Santos, 2024).

Moreover, additional studies emphasize the importance of investigating younger learners' problem-solving performance. For instance, investigations with Grade 4 learners show that reading comprehension, word-problem solving, and general mathematical performance are linked, thereby underscoring the necessity of focusing research on this age group (Research via Reading Comprehension and Mathematical Performance in Solving Word Problems Among Grade 4 Learners, 2023).

In the Philippines, the launch of the MATATAG Curriculum by the Department of Education (DepEd) reinforces mastery through a spiral progression model: learners revisit topics of increasing complexity, thereby deepening understanding over time (DepEd, 2023). The curriculum places strong emphasis on foundational subjects including Mathematics, Science, Social Studies, and Languages as essential building blocks for lifelong learning (Escuadro, 2023). Furthermore, the MATATAG initiative integrates 21st-century competencies such as critical thinking, collaboration, global citizenship, and problem solving to prepare Filipino learners for evolving global contexts (Philippine Institute for Development Studies [PIDS], 2023).

Accordingly, this study aims to describe the performance of Grade 4 pupils in solving routine and non-routine problems and to investigate how this performance is related to the selected variables.

METHODOLOGY

This study employed a descriptive-comparative research design**,** which was well-suited for providing a comprehensive snapshot of the phenomenon under investigation. Descriptive research was characterized by its focus on systematically describing the features of a specific population or phenomenon as it existed at a given time, without manipulation of variables or causal inference (Sirisilla et al., 2023). In effect, it allowed researchers to organize, tabulate, depict, and summarize data to present a clear profile of the subject matter.

In the context of this study, the descriptive design was used to portray the performance of the subjects. The respondents of the study were Grade 4 pupils enrolled in selected upland public elementary schools within a single district in Negros Occidental during school year 2025–2026. Specifically, pupils' performance in problem-solving tasks was measured and described as it stood at the time of the investigation. Once the current performance levels were established and documented, the researcher formulated and proposed an enhancement program designed to improve the pupils' problem-solving performance.

The subject and respondents of the study were the Grade 4 pupils enrolled in selected upland public elementary schools within a single district in Negros Occidental during school year 2025–2026.

Population and Sampling Size

The total population of the Grade 4 pupils enrolled in selected upland public elementary schools within a single district in Negros Occidental during school year 2025–2026 is 426.

The sample size of the population was computed using the formula by Yamane.

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

Where:

n = sample size for each section

N = total population size

e = margin of error (0.05)

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

$$n = \frac{426}{1 + (426)(0.05)^2}$$

$$n = \frac{426}{1 + (426)\,(0.0025)}$$

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$$n = \frac{426}{1 + 1.065}$$

$$n = \frac{426}{2.065}$$

$$n = 207$$

Out of the 426 Grade 4 pupils, 207 were obtained as a sample size.

Sampling Techniques

In determining the number of respondents in each school, the stratified sampling technique was used using the formula below:

$$n_1 = \frac{N_1(n_t)}{N_t}$$

Where:

n_1 = sample size for each school

N_1 = population of first group

N_t = total population

n_t = total sample size

Table 1. Distribution of the Respondents.

School	Total Population	Sample Size
A	36	17
B	32	16
C	31	15
D	13	6
E	37	18
F	54	26
G	201	98
H	22	11
Total	426	207

The simple random sampling technique using the draw-lots method was employed to identify respondents from each school.

The table above indicates that a larger sample was taken from the school with a higher number of enrolled pupils.

Data Gathering Instrument

In this study, a validated researcher-made questionnaire was employed to assess the mathematical problem-solving performance of Grade 4 pupils. The instrument was carefully designed to measure proficiency in solving both routine problems and non-routine problems, and was structured into two distinct parts. Each part

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consisted of 20 items, with one section focusing on routine problem-solving tasks that evaluate pupils' ability to apply standard mathematical procedures, and the other section addressing non-routine problem-solving tasks that require creative reasoning, logical analysis, and flexible application of mathematical concepts. A table of specifications were made before the construction of the two multiple choice test survey questionnaires. It underwent validation to ensure reliability and fairness, with items reviewed against established content standards and problem-solving frameworks. This dual-part design allowed for a comprehensive evaluation of pupils' mathematical problem-solving performance, capturing both procedural fluency and higher-order thinking skills.

Validity and Reliability of the Research Instrument

This study utilized a researcher-made questionnaire to assess both routine and non-routine problem solving. For validation, two Master Teachers teaching in Mathematics and one Education Program Supervisor in Mathematics served as jurors. The Lawshe validation form was adopted as the validation tool, and the items that were unanimously marked as essential were retained in the final instrument. Each questionnaire obtained a validity index of 1.0 thus, the questionnaires were considered as valid.

To establish reliability, the questionnaire was administered to Grade 4 pupils from one of the elementary schools in Negros Occidental. A reliability test was conducted with selected respondents who were not part of the main sample, using the Test-Retest method. Pearson's r was employed to measure the reliability index, yielding values ($r = 0.877^{**}$, $p = <0.001$) for routine problems and ($r = 0.920^{**}$, $p = <0.001$) for non-routine problems, both of which were statistically significant. Thus, the questionnaire was determined to be reliable.

Data Gathering Procedures

The researcher began the conduct of the study by sending a formal letter of intent to the Schools Division Superintendent and the School Principal, requesting permission to administer the research. The letter contained the objectives of the study, the instruments to be used, and the proposed schedule for data collection. Upon approval, the researcher personally administered the validated survey questionnaires to the respondents of the study. The completed questionnaires were retrieved immediately after administration, carefully checked for completeness, systematically recorded, and assigned identification codes to ensure confidentiality and anonymity. The data were then organized and subjected to appropriate statistical computations and analyses using relevant software tools to ensure accuracy, reliability, and validity in the interpretation of results.

Data Analyses

As soon as all the data were completely tallied, they were submitted to a statistician for statistical treatment and analysis.

For the statement of the problem number 1, which is to determine the profile of the Grade 4 pupils when grouped according to age, sex, and nutritional status, frequency and percentage distribution were used.

$$\% = \frac{f}{N} x\ 100$$

Where:

f - number of respondents

N - total no. of respondents

% - Percentage

For the statement of the problem number 2, which states what is the level of performance of the Grade 4 pupils

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in the routine problems, the mean and standard deviation were used with the formula:

Formula for Mean:

$$\bar{x} = \frac{\Sigma x}{n}$$

Where: $\bar{x}$ = mean of Average

$\sum$ = represents the summation

x = represents scores

n = represents the number of scores

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

Where: SD= Standard Deviation

X= Individual score

$\bar{X}$= Mean

n= Sample Size

The scores in routine mathematical problem-solving were interpreted as follows.

Interval Score	Description	Description
17 - 20	Very High	excellent performance in answering problems that follows standard procedures commonly practiced in classroom lessons
13 - 16	High	satisfactory performance in answering problems that follows standard procedures commonly practiced in classroom lessons
9 - 12	Average	Average performance in answering problems that follows standard procedures commonly practiced in classroom lessons
5 - 8	Low	Poor performance in answering problems that follows standard procedures commonly practiced in classroom lessons
0 - 4	Very Low	Very poor performance in answering problems that follows standard procedures commonly practiced in classroom lessons

For the statement of the problem number 3, which states what is the level of performance of the Grade 4 pupils in non-routine problems, the mean and standard deviation were used.

The scores in non-routine mathematical problem-solving was interpreted as follows.

Interval Score	Description	Description
17 - 20	Very High	excellent performance in answering problems that are unfamiliar and require creative thinking, logical reasoning, and the formulation of new strategies
13 - 16	High	satisfactory performance in answering problems that are unfamiliar and require

		creative thinking, logical reasoning, and the formulation of new strategies
9 - 12	Average	Average performance in answering problems that are unfamiliar and require creative thinking, logical reasoning, and the formulation of new strategies
5 - 8	Low	Poor performance in answering problems that are unfamiliar and require creative thinking, logical reasoning, and the formulation of new strategies
0 - 4	Very Low	Very poor performance in answering problems that are unfamiliar and require creative thinking, logical reasoning, and the formulation of new strategies

For the statement of the problem number 4, which is to determine the significant difference in the performance of the Grade 4 pupils in the routine problems when grouped in terms of their profile, the Kruskal-Wallis H-Test and Mann-Whitney (U) Test were used with the formula:

Formula for Kruskal-Wallis H-Test:

$$H = \frac{12}{n(n+1)} \sum \frac{Ri^2}{n_i} - 3(n+1)$$

Where:

n = Total number of participants

R_i^2 = Total rank for each group

n_i = No. of participants in each group

Formula for Mann-Whitney (U) Test:

$$U_1 = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1$$

$$U_2 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

Where:

n_1 = number of participants for group 1

n_2 = number of participants for group 2

R_1 = Sum of the ranks for group 1

R_2 = Sum of the ranks for group 2

For the statement of the problem number 5, which is to determine whether or not there is a significant difference in the performance of the Grade 4 pupils in the non-routine problems when grouped in terms of their profile, the Kruskal-Wallis H-Test and Mann-Whitney (U) Test were used.

RESULTS AND DISCUSSIONS

Table 2. Frequency and Percentage Distribution of the Respondents According to Profile.

Profile	Category	f	%
Sex			
	Male	78	37.68

	Female	129	62.32
	Total	207	100.00
Age			
	8 years old	48	23.19
	9 years old	142	68.60
	10 years old	14	6.76
	11 years old	3	1.45
	Total	207	100.00
Nutritional Status (BMI)			
	Severely Wasted	2	0.97
	Wasted	24	11.59
	Normal	172	83.09
	Overweight	6	2.90
	Obese	3	1.45
	Total	207	100.00

Table 2 presents the demographic profile of the 207 respondents, including sex, age, and nutritional status. In terms of sex, the predominant group is female, comprising 129 pupils (62.32%), while males account for 78 pupils (37.68%). This distribution reflects a gender imbalance, with female pupils more represented than their male counterparts.

The findings of this study conform with Alegado et al. (2021) who conducted a longitudinal cohort study on Filipino children and found that girls were more likely to remain enrolled and complete primary schooling compared to boys, who were at higher risk of disengagement due to socioeconomic pressures. Additionally, Paqueo and Orbeta (2021), in their PIDS study Gender Equity in Education: Helping the Boys Catch Up, emphasized that Filipino boys are disproportionately affected by dropout rates in elementary school, while girls demonstrate stronger persistence in completing primary education. Galamgam et al. (2021) also analyzed the implementation of the Gender Responsive Basic Education Policy and highlighted that gender disparities remain evident in learner participation, with female pupils often more represented in classrooms.

In terms of age, the largest proportion of respondents are 9 years old, totaling 142 pupils (68.60%). This is followed by 48 pupils (23.19%) aged 8, 14 pupils (6.76%) aged 10, and only three pupils (1.45%) aged 11. This distribution shows that most respondents are concentrated in the middle childhood stage, a critical period for both academic and physical development.

In the Philippine Institute for Development Studies (PIDS) discussion paper of Paqueo and Orbeta (2021), it was found that Grade 4 learners, typically aged 9, represent a significant portion of the primary school population, and this age group is crucial for foundational learning outcomes.

In terms of nutritional status, the majority of pupils fall within the normal BMI category, with 172 pupils (83.09%). Meanwhile, 24 pupils (11.59%) are classified as wasted, six pupils (2.90%) as overweight, three pupils (1.45%) as obese, and two pupils (0.97%) as severely wasted. This distribution implies that most pupils are generally healthy, though a small percentage exhibit signs of malnutrition or overnutrition, indicating the need for targeted health interventions.

The Expanded National Nutrition Survey (ENNS, 2021) supports the results of this study, where the majority of Filipino children aged 5–10 years had normal BMI. However, 19.7% were stunted, 20.8% were underweight, and 14% were overweight. This reflects a dual burden of malnutrition, where most pupils are

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healthy but a notable proportion suffer from undernutrition or overnutrition. While the majority of pupils maintain a healthy BMI, the presence of wasted, severely wasted, overweight, and obese children indicates gaps in nutrition programs and health interventions.

Level of Performance in Routine Problems

Table 3. Level of Performance of the Pupils in Routine Problems.

Level of Performance in Routine Problems	f	Mean	SD	Interpretation
Very High	8	9.54	3.71	Average
High	38			
Average	69			
Low	77			
Very Low	15			
Total	207			

Legend: (17-20)-Very High; (13-16)-High; (9-12)-Average; (5-8)-Low; (0-4)-Very Low

Table 3 shows that the majority of the pupils (f = 77) demonstrate a low level of performance in routine problems, followed by those who performed at the average level (f = 69), and only few (f = 8) reach a very high level. With (M=9.54, SD= 3.71), the results correspond to an overall interpretation of average, indicating that pupils' performance levels vary rather than being tightly clustered around the mean. This also implies that while pupils can demonstrate adequate ability in routine problem solving, a considerable proportion still falls within the low and very low performance categories, highlighting the gaps in procedural fluency. To ensure better performance, foundational mathematical skills must be strengthened.

However, Sturm and Bohndick (2021) found that primary students' modest performance in routine problem solving was shaped not only by procedural knowledge and fluency, but also by their attitudes and beliefs toward mathematics. Learners with positive dispositions and stronger self-belief tended to perform better. Also, Braithwaite and Sprague (2021) emphasized that students' uncertainty about the correctness of their solutions can negatively influence performance. Even when procedural knowledge was sufficient, weak confidence led to hesitation and reduced accuracy, reinforcing why many pupils continue to cluster in the lower categories of achievement.

Level of Performance in Non-Routine Problems

Table 4. Level of Performance of the Pupils in Non-Routine Problems.

Level of Performance in Non-Routine Problems	f	Mean	SD	Interpretation
Very High	2	6.67	3.10	Low
High	9			
Average	33			
Low	118			
Very Low	45			
Total	207			

Legend: (17-20)-Very High; (13-16)-High; (9-12)-Average; (5-8)-Low; (0-4)-Very Low

Table 4 shows that most of the pupils (f = 118) demonstrate a low level of performance, followed by those who shows very low performance (f = 45), and only a small fraction achieved high (f = 9) and very high (f = 2) performance. The results indicate an overall low interpretation (M=6.67, SD= 3.10), highlighting that pupils' performance levels are dispersed rather than concentrated around the mean. This implies that the majority of pupils struggle with higher-order thinking skills and creative problem-solving tasks, indicating that they are more comfortable dealing with routine exercises that rely on memorization or procedural knowledge, but encounter challenges when required to apply concepts in unfamiliar contexts. This aligns with the results of Abdullah and Osman (2022), who found that the performance of Grade 5 students in non-routine problem solving was below average, reflecting limited creativity and difficulty in applying flexible strategies. Their study emphasized that learners relied heavily on routine procedures, which proved insufficient for solving complex problems, so when faced with non-routine tasks, they struggled to generate innovative solutions, resulting in weaker performance outcomes.

Difference in the Performance in Routine Problems when grouped according to Sex

Table 5a. Difference in the Performance in Routine Problems when grouped according to Sex.

Sex	Test Statistics (U)	p-value	Decision for H_o	Interpretation
Male	4962.000	0.868	Failed to Reject H_o	Not Significant
Female				

Table 5a shows the difference in the performance in routine problems between male and female respondents. The Mann–Whitney U test yields a result (T = 4962.000, p = 0.868) where the p-value is greater than the 0.05 level of significance. Thus, the null hypothesis (H_o) is not rejected. Therefore, there is no significant difference in the performance in routine problems of Grade 4 pupils when grouped according to sex. This implies that male and female pupils have similar levels of competency, indicating that gender does not significantly affect their routine problem-solving performance.

These findings align with Ajayan and Panwar (2021), who also reported that sex-based differences were not evident in routine problem-solving and decision-making, emphasizing instead that environmental and instructional factors exert greater influence on pupils' performance.

Dwiyani et al. (2021) further corroborated this result by analyzing gender strategies in mathematics problem solving. While they observed that boys and girls sometimes employed different approaches, such as visual versus systematic strategies, these differences did not translate into significant performance gaps. Their findings highlight that although strategy use may vary, overall competency in routine problem solving remains statistically equivalent across genders.

On the other hand, Savenkov and Gavrilova (2021) add a different view. They found that boys and girls may show differences in routine problem-solving when motivation is considered. Boys performed better when motivated by competition or achievement, while girls were more consistent when motivated by cooperation or teacher approval. This means that gender differences are not due to ability but can appear depending on the type of motivation given.

Difference in the Performance in Routine Problems when grouped according to Age

Table 5b. Difference in the Performance in Routine Problems when grouped according to Age.

Age	Test Statistics (H)	p-value	Decision for H_o	Interpretation
8 years old	6.768	0.080	Failed to Reject H_o	Not Significant
9 years old				
10 years old				
11 years old				

Table 5b shows the difference in the performance in routine problems across different age groups. The Kruskal-Wallis test ($H = 6.768$, $p = 0.080$) reveals that the p-value is greater than the 0.05 level of significance, so the null hypothesis (H_o) is not rejected. Therefore, there is no significant difference in the performance in routine pgroblems of Grade 4 pupils when grouped according to age. This implies that age alone does not strongly influence Grade 4 pupils' ability to handle routine mathematical tasks. Rather, other factors may play a more significant role in shaping their performance.

This result is supported by Ambasa and Tan (2022) who reported that pupils exposed to experiential learning environments performed better in routine problem-solving regardless of age group, emphasizing that teaching approach rather than age created differences in outcomes. Similarly, Sinaga et al. (2023) confirmed that while grade level influenced pupils' understanding of problem-solving concepts, it did not significantly affect their actual results in routine mathematics tasks, reinforcing that comprehension and motivation are stronger predictors of differences in performance than age.

In contrast, the study of Rodríguez-Hernández et al. (2021) observed that younger pupils often struggled with understanding and representing routine mathematical problems, while older pupils performed better due to more advanced language skills. Their findings suggest that routine problem-solving success is not only dependent on mathematical fluency but is also closely linked to age-related cognitive and linguistic development. Likewise, Capone et al. (2021) reported that younger pupils frequently encountered persistent difficulties in solving arithmetic word problems, with only slight improvement as age increased.

Difference in the Performance in Routine Problems when grouped according to Nutritional Status

Table 5c. Difference in Performance in Routine Problems when grouped according to Nutritional Status.

Nutritional Status	Test Statistics (H)	p-value	Decision for H_o	Interpretation
Severely Wasted	4.530	0.339	Failed to Reject H_o	Not Significant
Wasted				
Normal				
Overweight				
Obese				

Table 5c shows the difference in performance in routine problems across different nutritional status. The Kruskal-Wallis test produces ($H = 4.530$, $p = 0.339$) a p-value which is greater than the 0.05 level of significance. Thus, the null hypothesis (H_o) is not rejected. Therefore, there is no significant difference in the performance in routine problems of Grade 4 pupils when grouped according to nutritional status. This means that nutritional status is not a key factor in pupils' ability to solve routine problems. Instead, other aspects may influence how well they perform.

Macarandan and Hussien (2024) support this conclusion in their study at Tagpaco Elementary School, where they found that although a school-based feeding program improved pupils' BMI, there were no significant differences in academic performance across BMI groups, particularly in routine mathematical tasks. Pupils with varying BMI levels performed similarly, indicating that BMI status does not create measurable differences in routine problem-solving ability. Francisco et al. (2025) further highlighted that numeracy skills, rather than BMI, were the strongest predictors of mathematics achievement among elementary pupils, reinforcing the idea that BMI does not significantly influence routine problem-solving ability. Likewise, Lago and Quirap (2022) reported that while school-based feeding programs enhanced pupils' health outcomes, changes in BMI were not consistently linked to improvements in routine academic performance. This shows that even when nutritional interventions are effective in improving BMI, they do not necessarily translate into differences in pupils' ability to solve routine problems.

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Table 6a. Difference in the Performance in Non-Routine Problems when grouped according to Sex.

Sex	Test Statistics (U)	p-value	Decision for H_o	Interpretation
Male	4829.500	0.627	Failed to Reject H_o	Not Significant
Female				

Table 6a presents the results of the Mann–Whitney U test examining differences in the performance in non-routine problems between males and females. The analysis generates (U=4829.500, p=0.627) a p-value which is greater than the 0.05 level of significance, the null hypothesis (H_o) is not rejected. This shows that there is no significant difference in the performance in non-routine between males and females. Thus, sex does not significantly influence the pupils' ability to perform better in non-routine problems, as similar levels of performance.

This aligns with the study of Chavez and Maguate (2023), who analyzed Grade 6 pupils' misconceptions in solving non-routine word problems and found that both boys and girls exhibited similar difficulties, with statistical tests confirming no significant difference in outcomes. Likewise, Vasquez and Garcellano (2021) examined students' problem-solving skills and reported that gender did not significantly affect non-routine problem-solving performance, as both sexes struggled equally with comprehension and strategy application. In a broader context, Sinaga et al. (2023) investigated Indonesian primary pupils and found that gender had no measurable effect on non-routine problem-solving understanding or mathematics learning results.

On the other hand, the study of Nikmaturrohmah et al. (2021) found that boys were generally more flexible in their approach to non-routine problems, often trying out different strategies to reach a solution. In contrast, girls showed stronger accuracy, carefully following procedures and avoiding computational mistakes. Their findings suggest that while age and cognitive maturity help improve outcomes, gender-related tendencies also shape how pupils approach problem-solving tasks. Similarly, Celebioglu (2021) reported that among first graders, boys were more confident in using the "look for a pattern" strategy, actively experimenting and extending patterns to solve problems. Girls, although equally exposed to the method, were more cautious and hesitant in applying it. This highlights that confidence and willingness to take risks play an important role in early non-routine problem-solving, with boys more likely to test strategies and girls more likely to avoid potential errors.

Difference in the Performance in Non-Routine Problems when grouped according to Age

Table 6b. Difference in the Performance in Non-Routine Problems when grouped according to Age.

Age	Test Statistics (H)	p-value	Decision for H_o	Interpretation
8 years old	7.092	0.069	Failed to Reject H_o	Not Significant
9 years old				
10 years old				
11 years old				

Table 6b presents the results of the Kruskal–Wallis test on non-routine problem-solving performance across age groups. The analysis (H = 7.092, p = 0.069) shows that the p-value is above the 0.05 level of significance, so the null hypothesis (H_o) is not rejected. This shows that there is no significant difference in the performance in non-routine problems when grouped according to age. Therefore, age alone is not a strong factor in determining success in non-routine problems, as other factors can affect performance. Age-related maturity is not the main driver of improvement.

This supports the study of Chavez and Maguate (2023), who examined Grade 6 pupils' misconceptions in solving non-routine word problems and found that errors such as misinterpretation and procedural mistakes

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were common across learners, regardless of age. This indicates that age progression does not eliminate difficulties in non-routine tasks. Similarly, Gavaz et al. (2021) conducted a quasi-experimental study with Turkish fifth graders and reported that improvements in non-routine problem-solving were achieved through strategy training, not age differences. Their findings highlight that instructional interventions, rather than chronological age, drive performance gains. Finally, Kaitera and Harmoinen (2022) investigated Finnish fifth graders' use of visual heuristics in non-routine problems and concluded that success depended on exposure to diverse strategies and classroom practices. Their study emphasized that age-related maturity was not a significant factor in performance differences, reinforcing that teaching approaches and problem-solving strategies are more influential than age.

On the other hand, the findings of Celebioglu (2021) found that first graders generally performed poorly in non-routine problem solving, even though some were able to use certain strategies effectively, like the "look for a pattern," which helped a few pupils reach correct answers, but overall achievement remained weak. Younger learners often struggled with understanding the problem, representing it correctly, and persisting when faced with unfamiliar tasks. This shows that while children begin to develop awareness of problem-solving strategies at an early age, their success in non-routine contexts depends heavily on age-related cognitive growth. In other words, maturity plays a crucial role in enabling pupils to move beyond basic strategy use toward more flexible and effective problem-solving approaches.

Difference in the Performance in Non-Routine Problems when grouped according to Nutritional Status

Table 6c. Difference in the Performance in Non-Routine Problems when grouped according to Nutritional Status.

Nutritional Status (BMI)	Test Statistics (H)	p-value	Decision for H_o	Interpretation
Severely Wasted	0.631	0.960	Failed to Reject H_o	Not Significant
Wasted				
Normal				
Overweight				
Obese				

Table 6c presents the results of the Kruskal–Wallis test on non-routine problem-solving performance across nutritional status. The analysis ($H = 0.631$, $p = 0.960$) shows that the p-value is above the 0.05 level of significance, so the null hypothesis (H_o) is not rejected. This shows that there is no significant difference in the performance in non-routine problems when grouped according to nutritional status. Therefore, nutritional status does not affect the success of pupils in performing these problems. Instead, pupils' outcomes are more likely shaped by cognitive and instructional influences.

Coetzee et al. (2021) support this finding through their longitudinal NW-CHILD study in South Africa, which revealed that overweight and obese primary pupils did not perform significantly worse than those of normal weight, with no statistical differences observed across BMI groups in mathematics achievement. This shows that BMI variations do not translate into differences in pupils' ability to solve higher-order problems.

Similarly, Lago and Quirap (2022) found that although school-based feeding programs improved pupils' BMI and overall health, these changes were not consistently linked to differences in academic performance. Their study emphasized that success in non-routine mathematics problems depends more on cognitive development and effective teaching strategies than on nutritional status.

CONCLUSIONS

Based on findings gathered in the study, the following conclusions were drawn:

1. Grade 4 pupils were predominantly female, were mostly 9 years old, and generally fell within the normal nutritional status, indicating overall good health.
2. Grade 4 pupils' performance was steady, with competence in basic skills, but limited in creativity and higher-level thinking.
3. Grade 4 pupils struggled when faced with problems that are unfamiliar, complex, or require creative reasoning rather than straightforward application of learned procedures.
4. Routine problem-solving performance among Grade 4 pupils was relatively consistent across sex, age, and nutritional status. This means that demographic and health-related factors did not appear to create a meaningful impact on pupils' ability to handle routine mathematical tasks.
5. Grade 4 pupils demonstrated comparable performance in non-routine problem solving regardless of sex, age, or nutritional status. This indicates that demographic and health-related characteristics did not significantly shape learners' ability to engage with challenging or unfamiliar mathematical problems.

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