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Examining the Relationship Between Reading Comprehension and Word Problem-Solving Skills Among Grade 10 Students

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Abstract
Aim: This study examined the relationship between reading comprehension and word problem-solving skills among Grade 10 students at Saint Francis of Assisi College - Las Piñas Campus, emphasizing its significance in academic achievement and instructional development.
Methodology: A correlational quantitative design was employed, using a non-probability sampling method with 55 Grade 10 students. Data were collected through standardized assessments measuring reading comprehension and problem-solving abilities. The analysis utilized the general weighted mean and Pearson R correlation to determine relationships between the variables.
Results: Reading comprehension levels were predominantly "Satisfactory" (49.09%) or "Fair" (38.18%), while problem-solving skills showed a greater distribution in the "Fair" (34.55%) and "Poor" (27.27%) categories. A low positive correlation (R-value = 0.35, p = 0.008) was found between reading comprehension and problem-solving skills, suggesting that while higher reading comprehension correlates with improved problem-solving, other contributing factors exist.
Conclusion: A modest positive correlation exists between reading comprehension and word problem-solving skills. The findings highlight the need for comprehensive educational strategies integrating both areas to foster well-rounded academic development. Further research should explore additional factors influencing problem-solving proficiency to refine instructional methods.

Keywords: *Reading Comprehension, Word Problem-Solving Skills, Grade 10 Students, Academic Achievement, Educational Strategies*

INTRODUCTION

Reading comprehension is a cognitive activity that enables readers to critically interpret and analyze text for deeper understanding (Hermanudin et al., 2019). Gusnetti et al. (2019, as cited in Fitriani & Komala, 2024) emphasize that proficiency in reading is a specialized skill, while Kusumawanti and Bharati (2018) highlight that reading comprehension represents the highest level of English proficiency. It plays a crucial role in learning, supporting academic tasks such as writing, speaking, and studying.

Gilakjani and Sabouri (2016) stress the importance of reading strategies in enhancing students' ability to interpret and retain information. Strong reading comprehension skills contribute to language development, broader world knowledge, and the ability to grasp complex concepts (Escar, 2022). Wilhelm (2018, as cited in Caraig & Quimbo, 2022) notes that comprehension involves paraphrasing meaning and applying it to real life, with personal connections indicating deeper understanding.

The significance of reading comprehension is evident in international assessments. In 2018, the Program for International Student Assessment (PISA) ranked the Philippines lowest in reading comprehension with a score of 340. The 2022 PISA results continued to show Filipino students struggling in this area (OECD, 2022), underscoring the need for educational interventions.

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Reading comprehension also influences mathematical problem-solving, particularly in word problems that require interpreting textual information before performing calculations. Wigfield et al. (2016) argue that motivation to read plays a key role in comprehension, impacting students' engagement with math problems. Haag et al. (2013) found that students with higher language proficiency—both monolingual and multilingual—tend to outperform those with lower proficiency, particularly in cognitively demanding subjects like mathematics.

Mathematical word problems (MWPs) integrate language and mathematical reasoning, requiring students to extract relevant information and apply mathematical concepts (Wang et al., 2016). Fang (2012) attributes the difficulty of MWPs to the multisemiotic nature of mathematics, which includes text, numbers, symbols, and visual aids. Powell et al. (2019) highlight that explicit instruction in word-problem language comprehension improves students' ability to identify key information and problem types, aiding in overall problem-solving success.

Recent research has underscored the importance of reading comprehension skills in the context of problem-solving in mathematics. For instance, Vukovic and Lesaux (2019) found that proficient reading skills are fundamental for understanding the language and structure of word problems, which can pose unique challenges to students. Their study indicated that students with higher levels of reading comprehension were significantly more adept at identifying relevant information in word problems, leading to improved problem-solving outcomes.

Building on this foundation, several studies conducted in the last few years have explored the cognitive processes involved in reading comprehension and mathematical problem-solving. For example, Zhang et al. (2022) examined how cognitive load affects students' abilities to extract necessary information from text-based problems, suggesting that reading strategies directly correlate with mathematical success. This highlights the evolving nature of these skills as students progress to higher grade levels, where the complexity of text and problem-solving increases.

Moreover, a study by Dunst et al. (2023) explored how diverse learning environments influence the development of these skills among Grade 10 students. They found that students from varied backgrounds exhibited different strategies when approaching word problems, often reliant on their reading comprehension strategies, which were shaped by their prior educational experiences. This research emphasizes the necessity to consider individual student backgrounds in understanding the relationship between reading and mathematical problem-solving.

The trajectory of cognitive skills, particularly reading and problem-solving, has been shown to evolve significantly as students advance through grades. According to a synthesis of recent literature by Chen et al. (2022), as students enter higher grades, the expectations for independent reading and higher-order thinking skills increase, which may enhance their abilities to comprehend complex texts and tackle challenging word problems.

Problem-solving is central to mathematics education, helping students develop logical reasoning and structured thinking (Khasana et al., 2018). However, traditional teaching methods often emphasize procedural knowledge over conceptual understanding. Effective instruction should foster students' ability to comprehend, model, and solve mathematical problems independently. Emanuel et al. (2020) assert that mathematics learning is synonymous with logical reasoning, as students engage in mental activities to establish relationships between known concepts and new information.

Despite existing studies on the correlation between reading comprehension and mathematical problem-solving, research has primarily focused on younger students, leaving a gap in understanding how these skills develop in higher grade levels. Investigating Grade 10 students is crucial to addressing this gap, as their cognitive abilities and learning challenges differ from those of younger learners. This study aims to explore the relationship between reading comprehension and word problem-solving skills among Grade 10 students, contributing to the literature on cognitive skill development and its impact on academic performance.

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Objectives

This study determined the relationship between Reading Comprehension and Word Problem-Solving Skills among Grade 10 students.

Specifically, it sought to answer the following research questions:

1. What is the level of reading comprehension of the respondents?
2. What is the level of word problem-solving skills of the students?
3. Is there a statistically significant relationship between students' reading comprehension scores and their word problem-solving performance?

Hypotheses

Given the stated research problem, the following hypotheses were tested on 0.05 level of significance:

Ho: There is no significant relationship between students' reading comprehension and word problem-solving skills.

Ha: There is a significant relationship between students' reading comprehension and word problem-solving skills.

Theoretical Framework

The research study is anchored to multiple theoretical frameworks to better understand the relationship between reading comprehension and mathematical problem-solving.

First, the Schema Theory of Reading Comprehension, proposed by David Rumelhart (1980), explained how individuals interpreted text using pre-existing knowledge, known as schemas. These schemas helped readers predict, interpret, and integrate new information, which was crucial when solving mathematical word problems. This theory was relevant as it highlighted how students activated and applied schemas in both reading and mathematics, affecting their ability to solve problems effectively (Seymour, 2023). According to Qin (2020), schemas enabled individuals to infer implicit or unknown information by utilizing internal connections among schema variables, playing a significant role in comprehension and problem-solving.

Additionally, Cognitive Load Theory (Sweller, 1988) provided insight into the processing complexity involved in solving word problems. This theory suggested that students' working memory capacity could be overwhelmed when deciphering complex texts, leading to difficulties in problem-solving. By understanding how cognitive load affected students' ability to extract relevant information, educators could design instructional strategies that reduced unnecessary cognitive burden, enhancing learning outcomes.

Furthermore, Constructivist Learning Theory (Piaget, 1952; Vygotsky, 1978) emphasized meaning-making and the active role of learners in constructing knowledge. In the context of this study, students engaged with word problems by integrating new mathematical concepts with prior reading comprehension skills. Vygotsky's notion of the Zone of Proximal Development (ZPD) was particularly relevant, as it highlighted how guided learning could help bridge the gap between what students could do independently and what they could achieve with assistance.

By integrating these theories, the study aimed to provide a comprehensive understanding of how students' existing knowledge in both reading and mathematics influenced their problem-solving abilities.

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Conceptual Framework

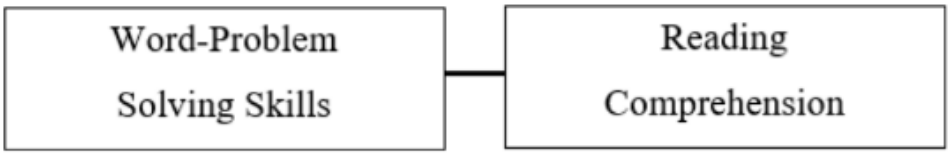

Figure 1. The Conceptual Framework of the Study

Figure 1 depicts the interplay between word-problem solving skills and reading comprehension. It implies that the skill in solving word problems might be dependent on the student having a certain level of reading proficiency. Word problems require students to think about the content of the text, be able to discern the relevant information, interpret the nature of the mathematical operation required and apply appropriate problem-solving strategies.

Thus, the need for appropriately decoding and interpreting a word problem comes into play, which is accomplished through reading comprehension, enabling students to engage in more effective problem-solving. This framework demonstrates the interdependence between literacy and mathematical skills, emphasizing the need for both competencies in academic success.

METHODS

Research Design

This study aimed to examine the relationship between reading comprehension and word-problem-solving skills among Grade 10 students. To achieve this, the researchers employed a correlational quantitative research design, which statistically analyzed relationships between two or more variables without manipulating them. This method sought to identify and measure the degree of correlation between variables (Bhandari, 2023).

Using a quantitative approach, the researchers gathered relevant data on the relationship between reading comprehension and problem-solving skills. Through questionnaires and surveys, data were collected from a sizable sample of students in the private education sector, providing a comprehensive understanding of the correlation between these skills.

Population and Sampling

This study employed census sampling, which included the entire population of Grade 10 students at Saint Francis of Assisi College - Las Piñas Campus during the 2023-2024 school year. Census sampling is appropriate when the population size is small (i.e., less than or equal to 100), ensuring that all eligible members are included in the study (Decasa, 2018). A total of 55 respondents participated, providing a comprehensive and in-depth understanding of the topic.

Instrument

A research instrument was utilized to facilitate data collection. Specifically, the researchers adapted and modified test questionnaires to comprehensively measure reading comprehension and word-problem-solving skills.

To assess reading comprehension, the study used the Philippine Informal Reading Inventory (PHIL-IRI) Reading Screening Test for Grade 10. The first part of the questionnaire included excerpts from "The Lottery Ticket" by Anton Chekhov, the TED Talk "How Language Shapes the Way We Think," and "War" by Luigi Pirandello. These reading materials were selected based on their alignment with the Schema Theory of Reading Comprehension, as

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they required students to activate prior knowledge and integrate new information. The reading materials contained 15 multiple-choice questions, which were interpreted using the Schema Theory framework.

The second part of the questionnaire aimed to measure respondents' word-problem-solving skills. This section consisted of 15 multiple-choice word problems, serving as an objective assessment tool (Mercer University, 2019). The respondents' problem-solving skills were interpreted using a Likert scale adapted from the study of Alcantara and Bacsa (2017).

By employing these research instruments, the study ensured a structured and systematic assessment of the correlation between reading comprehension and problem-solving skills among Grade 10 students.

Likert Scale Interpretation

Score	Statistical Limit	Description	Interpretation
13 – 15	4.50 - 5.00	Outstanding	Very High
10 – 12	3.50 - 4.49	Very Satisfactory	High
7 – 9	2.50 - 3.49	Satisfactory	Moderate
4 – 6	1.50 - 2.49	Fair	Low
1 – 3	1.00 - 1.49	Poor	Very low

Data Collection

In this study, the researchers gathered essential data to examine the impact of reading comprehension on the mathematical word problem-solving skills of Grade 10 students. A questionnaire was used as the primary data collection instrument, administered to the target respondents.

Before collecting data, the researchers secured approval from the school principal and obtained informed consent from students and their parents. Upon receiving approval, the questionnaires were distributed through a room-to-room process at Saint Francis of Assisi College in March 2024.

Once completed questionnaires were collected, the researchers compiled, tabulated, and analyzed the data using appropriate statistical procedures with the assistance of a statistician. All collected data were treated with confidentiality, ensuring that respondents' personal information remained secure and was not shared without proper authorization.

Treatment of Data

The information gathered was thoroughly analyzed to determine the relationship between reading comprehension and word-problem-solving skills among Grade 10 students. The researchers utilized the following statistical tools to evaluate and interpret the collected data:

1. **General Weighted Mean** was used to determine the level of reading comprehension and word-problem-solving skills among the Grade 10 students.Formula:

$$W = \frac{\sum_{i=1}^{n} w_i X_i}{\sum_{i=1}^{n} w_i}$$

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Where:
WM = Weighted mean
Σ fx = Sum of the products of the frequency with weights
N = Sample size

2. **Pearson's r Correlation** was used to determine if there was a significant relationship between reading comprehension and word-problem-solving skills among Grade 10 students. The rationale for using Pearson's r was based on its effectiveness in measuring linear relationships between two continuous variables. Before applying this statistical test, assumptions such as linearity and normality were checked to ensure the validity of the results.

Formula:

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

Where:

r = Pearson correlation coefficient
x = First variable (reading comprehension scores)
y = Second variable (problem-solving scores)
n = Number of respondents

Ethical Considarations

The researchers strictly adhered to all ethical regulations governing research throughout the study. To ensure data security and prevent privacy breaches, all collected data were securely stored. Participation in the study was entirely voluntary, and respondents were never pressured to continue. Informed consent was obtained from all participants, and for minors, parental consent was also required.

Participants' safety was a top priority throughout the research process. All personal data were kept confidential and protected in compliance with Republic Act No. 10173, also known as the Data Privacy Act of 2012. Furthermore, the study was conducted with honesty, transparency, accountability, and reliability. No exaggeration or misleading information was included, ensuring the study's goals and objectives remained clear to readers.

To uphold ethical standards, the dignity and well-being of participants were always prioritized. Finally, to protect participants' privacy, all collected data will be permanently disposed of six months after the study's completion.

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RESULTS and DISCUSSION

This chapter presents the results and discussions of the study on the relationship between English language competence and mathematical word problem-solving skills among Grade 10 students.

1. **What is the level of reading comprehension of the respondents?**
   The table below shows the level of reading comprehension of the students.

Table 1
The Level of Reading Comprehension of the Students

Score	Frequency	Percentage
Outstanding (13-15)	0	0%
Very Satisfactory (10-12)	1	1.82%
Satisfactory (7-9)	27	49.09%
Fair (4-6)	21	38.18%
Poor (1-3)	6	10.91%
TOTAL	**55**	**100%**

Table 1 presents the students' reading comprehension levels based on an aptitude test. The majority of students (27 or 49.09%) fall under the "Satisfactory" category. This is followed by 21 students (38.18%) classified as having a "Fair" level of reading comprehension. Additionally, six students (10.91%) are categorized as having a "Poor" level of reading comprehension. A small percentage (1.82%) of students achieved a "Very Satisfactory" level, while none (0%) attained an "Outstanding" level.

The data indicate that nearly half of the students scored in the "Satisfactory" range, suggesting that they have a reasonable ability to comprehend texts. However, they may still struggle with more complex reading skills, such as vocabulary expansion, inference-making, and critical analysis. This finding aligns with Bria (2018), who reported that eighth graders demonstrated good reading comprehension, supporting the prevalence of satisfactory scores. Bria emphasized the importance of vocabulary and grammar knowledge in improving reading comprehension. Similarly, Nurhayati (2023) found that most seventh graders scored at a "Satisfactory" level, highlighting the need to enhance reading habits by selecting appropriate resources and creating enjoyable reading periods. The study also recommended that students familiarize themselves with challenging words and sentence structures to deepen their comprehension. Additionally, Paz (2018) found that seventh graders predominantly achieved a "Satisfactory" rating, suggesting that while this level reflects a foundational understanding of reading, it should be further developed to enhance learning outcomes.

The "Fair" level of reading comprehension accounts for a significant 38.18% of students. This finding is supported by Fernandez (2021), who revealed that 42% of respondents in his study also demonstrated a fair level of reading comprehension, particularly in critical evaluation. This suggests that while students can understand texts, they require further support in grasping main ideas, identifying key details, making inferences, and summarizing content effectively. Similarly, Manggasang and Belasoto (2021) found that Grade 11 students' evaluative reading skills were at a fair level, indicating difficulties in making judgments while reading.

Furthermore, the results show that 10.91% of students fall under the "Poor" category, while only 1.82% attained a "Very Satisfactory" rating, and none achieved an "Outstanding" level. These findings indicate that most students scored at or below the satisfactory level, highlighting the need for targeted interventions to strengthen reading comprehension skills. Addressing these gaps through vocabulary development, critical reading strategies, and structured reading activities will help improve students' overall comprehension abilities. By incorporating insights from

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Schema Theory, these interventions can be designed to activate students' prior knowledge, fostering deeper engagement with texts and enhancing comprehension outcomes.

2. What is the level of word problem-solving skills of the students?

Table 2 shows the level of word problem-solving skills of the students.

Table 2
The Level of Word Problem-Solving Skills of the Students

Score	Frequency	Percentage
Outstanding (13-15)	1	1.82%
Very Satisfactory (10-12)	8	14.55%
Satisfactory (7-9)	12	21.82%
Fair (4-6)	19	34.55%
Poor (1-3)	15	27.27%
TOTAL	**55**	**100%**

Table 2 presents the level of students' word problem-solving skills. The majority of students fall within the "Fair" category, with a frequency of 19 (34.55%), indicating a low level of proficiency in solving word problems. This is followed by 15 students (27.27%) categorized as "Poor," 12 students (21.82%) as "Satisfactory," 8 students (14.55%) as "Very Satisfactory," and only 1 student (1.82%) as "Outstanding."

The ability to analyze and solve word problems is crucial for assessing students' overall mathematical proficiency. A substantial portion of students (34.55%) fall into the "Fair" category, aligning with previous studies that highlight challenges in word problem-solving proficiency. For instance, Smith and Jones (2018) observed similar trends, reporting that a significant number of students struggle with word problems. Likewise, Brown et al. (2016) emphasized that difficulties in solving word problems remain prevalent among students, as reflected in the 34.55% demonstrating low proficiency in this study.

Furthermore, Johnson et al. (2020) found that students often struggle with understanding the language and context of word problems, which hinders their analytical and problem-solving abilities. This finding reinforces the current study's results, where a large proportion of students are categorized as having fair or low proficiency. Similarly, research by Garcia and Patel (2019) suggests that inadequate exposure to real-world problem-solving scenarios in the classroom contributes to students' struggles. These findings underscore the importance of integrating practical, context-based learning experiences to enhance mathematical proficiency, particularly in word problem-solving.

Additionally, 27.27% of students are classified as "Poor," indicating a significant portion of the population faces challenges in mastering word problem-solving skills. Addressing these deficiencies requires targeted interventions and instructional approaches aimed at improving students' mathematical proficiency (Garcia & Martinez, 2020). Moreover, with only 1.82% of students classified as "Outstanding," there is a potential gap in adequately challenging and supporting high-achieving students in this domain. Further research is needed to explore effective strategies for addressing the needs of this subgroup (Wang & Chen, 2015).

Overall, the distribution of students' word problem-solving skills highlights the need for targeted efforts to enhance mathematical proficiency and address the diverse learning needs of students. Implementing structured interventions, contextualized learning, and differentiated instructional strategies will be essential in bridging these gaps and fostering stronger problem-solving abilities in students.

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3. Is there a significant relationship between students' reading comprehension and word problem-solving skills?

Table 3 shows the significant relationship between students' reading comprehension and word problem-solving skills.

Table 3
The Relationship between Students' Reading Comprehension and Word Problem-Solving Skills

Variable	Mean	r-value	P-value	Interpretation	Decision
Reading Comprehension	6.22	.35	.008	Low Positive Correlation, Strong Evidence Against H_0	**REJECT H_0**
Word Problem Solving	5.87				

The data presented in Table 3 reveals the correlation between students' reading comprehension levels and their word-problem solving skills. In this analysis, the mean score for reading comprehension is 6.22, while the mean score for word-problem solving skills is 5.87. The statistical results indicate that the computed p-value of 0.008 is below the conventional threshold of 0.05, signifying statistical significance. Consequently, the **NULL HYPOTHESIS IS REJECTED.**

Moreover, the correlation between reading comprehension and word-problem solving skills is positive. The computed r-value of 0.35 suggests a low positive correlation between the two variables. This indicates that as reading comprehension improves, word-problem solving skills also tend to improve, though the relationship is weak. Despite the low correlation, the statistical significance suggests a meaningful connection between these skills.

The findings of this study align with Can's (2020) research, which identifies reading comprehension as a predictor of logical reasoning and word-problem solving. Can (2020) emphasizes the importance of linguistic skills, such as reading comprehension, in developing both logical and mathematical thinking. Furthermore, Can (2020) asserts that reading comprehension helps students accurately interpret word problems, facilitating logical reasoning. Without strong reading comprehension skills, students may struggle to fully understand the scope of a word problem, regardless of their logical abilities.

Similarly, Vukovic et al. (2013) state that as students become more adept at interpreting complex texts, they are better equipped to handle the linguistic challenges posed by word problems. This suggests that reading comprehension is not just a supportive skill but a foundational one that directly influences how students analyze and solve word problems. Additionally, Jala (2020) found that students with strong reading comprehension skills tend to perform better academically and exhibit enhanced problem-solving abilities.

In conclusion, the combined insights from previous studies and the current findings suggest that improving students' reading comprehension can enhance their analytical and word-problem solving skills. This underscores the need for educational strategies that integrate reading comprehension development with logical reasoning and problem-solving instruction. Fostering these interconnected skills can empower students to navigate both academic challenges and real-world problems more effectively.

Conclusions

The study's findings indicate that the majority of students' reading comprehension levels fall within the "Satisfactory" range, with significant portions categorized as "Fair" and "Poor." While many students demonstrate a reasonable ability to comprehend text, the data highlights a pressing need for targeted interventions to enhance their reading skills. These findings align with the observations of Bria (2018), Nurhayati (2023), and Paz (2018), which emphasize the importance of vocabulary development, appropriate reading strategies, and continuous practice in improving comprehension abilities.

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Similarly, the analysis of students' word problem-solving skills reveals that most fall within the "Fair" category, indicating considerable challenges in this area. This result supports previous research by Smith and Jones (2018) and Brown et al. (2016), which identified language complexity and limited exposure to real-world problem-solving as significant barriers to student success. The findings underscore the need for practical learning experiences and targeted instructional strategies to support mathematical proficiency.

Furthermore, correlation analysis demonstrates a statistically significant but low positive relationship between reading comprehension and word problem-solving skills among Grade 10 students. While the correlation is not strong, it suggests that improvements in reading comprehension can contribute to enhanced problem-solving abilities. This conclusion aligns with the findings of Can (2020), Vukovic et al. (2013), and Jala (2020), which highlight the role of reading proficiency in students' ability to interpret and solve word problems effectively.

Recommendations

Based on the study's findings, the following recommendations are proposed:

1. **Encouraging Self-Monitoring -** Students should practice self-monitoring strategies to enhance their critical analysis of word problems. This approach requires more than just reading the text; it involves a thorough understanding of the context and problem structure.

2. **Implementing Targeted Reading Interventions -** Given the substantial number of students in the "Fair" and "Satisfactory" categories, targeted interventions should be introduced to strengthen reading comprehension. These interventions may include vocabulary-building exercises, grammar reinforcement, and activities designed to promote deeper engagement with texts.

3. **Supporting Students in Lower Proficiency Categories -** Personalized learning plans, additional practice sessions, and remedial instruction should be developed for students who fall within the "Poor" and "Fair" categories in both reading comprehension and word problem-solving skills.

4. **Integrating Language Arts and Mathematics -** Educators and policymakers should design curricula that interconnect reading comprehension with mathematical problem-solving to create a more holistic educational experience.

5. **Providing Teacher Training** - Schools should invest in professional development programs to equip teachers with effective instructional techniques that integrate language and mathematics.

6. **Exploring Future Research Directions** - Future studies should examine the effects of metacognition, self-monitoring, and schema-based instruction on students' problem-solving skills in mathematical word problems. Experimental research could assess the effectiveness of these strategies in enhancing student performance.

   Researchers should also explore linguistic structures in problem-solving, cultural influences on mathematical reasoning, and innovative teaching methodologies. A comparative analysis across different student demographics or qualitative insights into students' thought processes could further enrich the findings.

   Moving beyond correlation studies, future research should investigate causative factors that impact both reading comprehension and mathematical problem-solving skills, ensuring that the findings contribute meaningfully to both theory and educational practice.

By implementing these recommendations, educators and policymakers can work towards improving students' reading comprehension and mathematical problem-solving skills, ultimately fostering greater academic success.

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