# The Relationship Between Reading Literacy and Numeracy in Solving Story Problems: Elementary School Students

Cerianing Putri Pratiwi[1], Wasilatul Murtafiah[2], Rakhmad[3]

[1,2,3]Department of Elementary Education, Universitas PGRI Madiun, Indonesia
*E-mail: cerianing@unipma.ac.id

## ARTICLE INFO

## ABSTRACT

**Purpose –** This research aims to analyze the relationship between reading literacy and numeracy on elementary school students' ability to solve word problems.

**Methodology –** This research uses a quantitative approach with a correlational design and data analysis techniques in the form of multiple linear regression. The research population consists of elementary school students, with a sample of 102 students randomly selected from several classes. The research instruments include three types of tests: reading literacy, numeracy, and word problem-solving. The normality test is conducted using the Kolmogorov-Smirnov test to ensure normal data distribution, followed by the Pearson correlation test to determine the strength of the relationship between variables, and the regression analysis to determine the simultaneous correlation of the two independent variables with the dependent variable.

**Findings –** The research results show a significant relationship between reading literacy and the ability to solve word problems (r = 0.896) and between numeracy and the ability to solve word problems (r = 0.902). Regression analysis shows that both independent variables explain 87.4% of the variation in students' ability to solve word problems. These findings emphasize the importance of strengthening reading and numeracy literacy in an integrated manner in contextual mathematics learning. This indicates that students' success in solving word problems relies not only on arithmetic skills but also on their understanding of the content of the reading.

**Contribution –** This study recommends developing an integrated learning model combining language literacy and numeracy aspects to comprehensively enhance students' problem-solving skills at the elementary school level. This research contributes to developing integrated learning strategies that incorporate reading literacy and numeracy skills to improve students' problem-solving competencies in elementary schools.

## INTRODUCTION

Basic literacy and numeracy skills are critical for student development (Dantes & Handayani, 2021; Fitriana & Khoiri Ridlwan, 2021). These skills provide a strong foundation for students facing other materials in various subjects at school (Iasha et al., 2024). Literacy skills in general and numeracy literacy in particular impact individuals, society, and the nation and state (Perdana & Suswandari, 2021; Rohim, 2023). Literacy and numeracy skills contribute significantly to social and economic growth and welfare for individuals or communities. Literacy and numeracy are two interconnected basic skills important in education and everyday life. Both help individuals understand, analyze, and effectively use information (Ifrida et al., 2023).

Reading and numeracy literacy are two fundamental competencies that are very important in primary education (Putro & Sa'diyah, 2022). Reading literacy encompasses not only the ability to recognize letters and words, but also understanding the content of the reading. Meanwhile, numeracy literacy includes understanding and using mathematical concepts in everyday life. In primary school learning, word problems become one form of evaluation that integrates both competencies. Word problems require students to understand the text (reading literacy) and apply mathematical concepts (numeracy literacy) to solve the presented problems.

Literacy is the effort to understand, utilize, and engage with various types of texts to achieve a specific goal (Gomes et al., 2024). The ability to achieve language literacy is not just about how to read a text. However, more than that, the ability to read literately can serve as a solution in addressing real-life problems (Anugrahana & Pamekas, 2024). Language literacy encompasses various skills such as reading, writing, identifying information, finding solutions, and interpreting results. Language literacy skills are considered good if one can understand and identify readings, represent information from readings, develop readings in their own language, and evaluate texts or readings (Nazula et al., 2024). Indonesian students should possess language literacy skills to enhance their knowledge. Without adequate literacy skills, students will struggle to understand and connect learning materials (Sinaga et al., 2025).

Numeracy is the ability of students to model, apply, and interpret mathematics in daily life. This ability focuses on formulating, applying, and reflecting on mathematics, including problem-solving skills, critical thinking, and applying mathematical concepts to describe and predict phenomena in everyday life (Nazula et al., 2024). This ability is essential for students to understand and utilize mathematical concepts used in mathematics problem-solving and applying mathematics to solve real-life problems. It is hoped that with good mathematical numeracy, students can find solutions and make decisions to solve issues using mathematical concepts quickly, accurately, and efficiently. Students' mathematical numeracy is categorized as good if they can formulate problems in the form of mathematical models, know and understand facts, concepts, principles, and procedures, and can reason, apply, evaluate, and even create in mathematics (Kusuma & Nurmawanti, 2023; Laksana, 2024)

In reality, Indonesia is still facing challenges in building a literacy culture. This situation is regrettable because of the importance of providing literacy and numeracy to students from the early stages of school, especially in Elementary Schools, to optimize students' understanding of more complex concepts and prepare students comprehensively. The high demands for language and mathematics literacy are not matched by the literacy levels of Indonesian students, which remain low. This is evidenced by Indonesia consistently ranking at the bottom during its participation. The results of PISA 2023 still place Indonesia at a low rank. The average PISA score in the area of numerical literacy is 366 points, which is 106 points below the world average. In fact, numerical literacy is the field with the highest number of students who still have low-level skills below level two (Yuda & Rosmilawati, 2024). Indonesia's ranking in the PISA assessment has consistently remained at the lower ranks since Indonesia's early participation in PISA. This PISA result for Indonesia indicates that the country is still far behind other PISA participating countries. The score obtained by Indonesia in PISA also falls significantly below the global average. Indonesia's average score in reading literacy is only 371 compared to the international average score of 500, while the average mathematical and numerical literacy score in Indonesia is 379. In contrast, the international average score is 500 (Emilia et al., 2022).

Although reading and numeracy literacy have become a focus in the elementary education curriculum, many students still struggle to solve story problems in mathematics. This difficulty can be caused by several factors, including: (1) Low Reading Comprehension Skills: Students often struggle to understand the content of the story problem text, which affects their ability to identify important information needed to solve the problems. (2) Limitations in Literacy: Students may understand the story in the problem, but cannot apply the relevant mathematical concepts to solve the issue. (3) Lack of Skills in Integrating Information: Students struggle to connect the information from the text with the necessary mathematical concepts, resulting in an inability to solve the problems correctly (Nainggolan et al., 2024).

The connection between literacy and numeracy is that to understand math problems, one must be able to read and comprehend the instructions or texts in word problems; when analyzing statistical data, one needs to understand the text that explains those numbers; literacy aids in understanding mathematical concepts written in the form of theories or descriptions; many texts contain numbers, graphs, or tables that must be interpreted numerically, and writing scientific or business reports often requires an understanding of quantitative and statistical data; an understanding of percentages, scales, and comparisons often appears in articles on economics, health, or the environment. Literacy and numeracy are two skills that cannot be separated. Both work together to help someone understand information more comprehensively and make better decisions in life. Improving these two skills is essential for academic, professional, and social success (Anggraeni et al., 2024; Utami & Yanti, 2022). Literacy skills, both language literacy and mathematical numeracy, are fundamental to students' learning success. When working on math problems, many students only focus on the numbers and ignore the language in the problem, leading them to get stuck and misunderstand the issue, making it difficult to find a solution to the math problem. Especially if the math problem is in the form of a story, students must read the problem's language repeatedly to understand the story problem.

Previous studies have shown a relationship between reading literacy and the ability to solve word problems. For example, research by Aulia et al. (2024) found a positive and significant relationship between reading literacy and the ability to solve mathematics word problems among fourth-grade elementary school students. Similarly, research by Firdausy et al. (2023) shows that numeracy literacy has an influence of 38.4% on the problem-solving ability of fifth-grade elementary school students in story problem formats. However, there remains a gap in understanding how these two aspects of literacy simultaneously affect students' abilities to solve mathematical story problems. Fitria et al. (2022). This indicates a positive relationship between reading comprehension ability and the ability to solve mathematical story problems.

Although there have been many studies examining the relationship between reading literacy or numeracy and the ability to solve word problems separately, few studies still investigate both aspects of literacy together. In addition, there is still a lack of understanding of how the interaction between reading literacy and numeracy affects students' ability to solve word problems. Research examining these two aspects can provide a more comprehensive insight into the factors influencing students' ability to solve word problems. This study investigates the direct relationship between reading skills and numerical problem-solving, which can offer new insights for teaching in elementary schools. This research is novel in terms of a multidisciplinary approach. The results can serve as a foundation for more effective teaching methods to address students' difficulties with mathematical word problems. Improving students' abilities to solve mathematical word problems is one of the important goals in elementary education. By understanding the relationship between reading literacy and numeracy, educators can design more effective learning strategies to enhance students' abilities in solving mathematical word problems. This research is also relevant to the government's efforts to improve the quality of basic education, particularly in enhancing students' literacy and numeracy skills. Therefore, this research is urgently needed to improve Indonesia's education quality. The objectives of this research include: (1) to assess the literacy skills of fifth-grade elementary school students, (2) to evaluate the abilities of fifth-grade elementary school students in solving mathematical word problems, and (3) to understand the relationship between students' literacy and numeracy skills when solving word problems.

## METHODOLOGY

### Type of Research

This study uses a quantitative approach with a correlational research type. This approach aims to test the extent of the relationship between reading literacy and numeracy with the ability to solve story problems of elementary school students. Correlational research allows researchers to identify the strength and direction of the relationship between variables.

### Research Subject

The subjects in this study are 102 elementary school students from three different classes at a public elementary school in Indonesia. The subjects were selected using a purposive sampling technique, which involved choosing fifth-grade students because they have received basic learning about narrative texts and problem-solving based on context in mathematics. Each class consists of about 34 students with varying reading literacy and numeracy skills, thus providing a representative picture for analyzing the relationship between variables.

### Data Collection Techniques

Data collection techniques use reading literacy tests, numeracy tests, and problem-solving tests. Below are the instruments for reading literacy, numeracy, and problem-solving tests.

### Research Instrument

The instruments in this study consist of three types of essay tests, each containing 10 questions, namely: (1) reading literacy test, (2) numeracy test, and (3) problem-solving test. The researcher developed the three instruments independently based on the Minimum Competency Assessment (AKM) indicators and the learning outcomes of the Merdeka Curriculum for the elementary school level. The validity of the instruments was assessed through content validity using the expert judgment method. The validation process involved two experts: an Indonesian language expert for the reading literacy instrument and a mathematics expert for the numeracy and problem-solving instruments. Each item of the question is validated using ten assessment indicators, including: (1) alignment with learning objectives, (2) alignment with competency indicators, (3) alignment with the characteristics of elementary school students, (4) clarity of the question formulation, (5) clarity of the instructions, (6) appropriateness of the language level, (7) difficulty level, (8) originality of the question, (9) relevance of the context, and (10) potential to measure HOTS. Each indicator is scored from 1 to 4. Here are the results of the validity test of the experts' questions.

**Table 1.** Validity Test Results

| Instrument | Maximum Score | Score Achievement | Percentage | Category |
|---|---|---|---|---|
| Reading literacy | 400 | 368 | 92% | Very Valid |
| Numeracy | 400 | 360 | 90% | Very Valid |
| Story Problems | 400 | 358 | 89,5 | Very Valid |

Reliability testing was conducted on the test results of the instrument on 30 fifth-grade students from a non-sample school. The analysis technique used was Cronbach's Alpha. The results are as follows.

**Table 2**. Reliability test

| Instrument | Cronbach's Alpha | Category |
|---|---|---|
| Reading literacy | 0.824 | High Reliability |
| Numeracy | 0.803 | High Reliability |
| Story Problems | 0.836 | High Reliability |

The reliability test results show that it falls into the high category. The instruments for reading literacy, numeracy, and story problems are presented in the table below.

**Table 3.** Reading Literacy Assessment Rubric.

| No | Aspects | Assessment Criteria |
|----|---------|---------------------|
| 1 | Understanding the content of the text | The ability to understand the main ideas and explicit and implicit information in the text. |
| 2 | Interpreting Information | The ability to conclude, make inferences, and connect the contents of the text. |
| 3 | Identifying Vocabulary | The ability to understand the meaning of words and phrases in the context of the text. |
| 4 | Concluding the Content of the Text | The ability to summarize or conclude the content of a text concisely and accurately. |
| 5 | Communicating Understanding | The ability to answer written or oral questions related to the content of the text clearly and accurately. |

**Table 4.** Numeracy assessment rubric

| No | Aspects | Assessment Criteria |
|----|---------|---------------------|
| 1 | Understanding Story Problems | The ability to understand information and context in word problems |
| 2 | Determining Mathematical Operations | Choosing the appropriate mathematical operation that fits the context of the problem. |
| 3 | Performing Calculations | Perform calculations according to the chosen mathematical operation. |
| 4 | Communicating the Answer | Presenting complete, clear answers and using units correctly. |
| 5 | Accuracy of Answers | The truth of the entire answer provided |

**Table 5.** Problem Solving Section

| No | Aspects | Assessment Criteria |
|----|---------|---------------------|
| 1 | Understanding the Problem | The ability to identify important information from story problems. |
| 2 | Designing a resolution strategy | The ability to determine the right solution steps |
| 3 | Carrying out the counting | Accuracy in performing mathematical operations |
| 4 | Interpreting the results | The ability to draw conclusions and answer questions according to the context of the problem. |
| 5 | Mathematical communication | The ability to convey steps and answers clearly and systematically. |

## Data Analysis Techniques

The data obtained was analyzed using descriptive and inferential statistics, with the help of SPSS software. The stages of analysis include (1) descriptive tests, which display the mean, median, mode, and standard deviation for each variable. (2) Normality test, to determine whether the data is usually distributed. (3) The Pearson Product-Moment correlation test examines the relationship between reading literacy and the ability to solve story problems, as well as the relationship between numeracy and the ability to solve story problems. (4) Multiple linear regression/correlation test is used to determine the simultaneous contribution of both independent variables to the dependent variable.

## FINDINGS

This research examines the relationship between reading literacy and numeracy on elementary school students' ability to solve mathematical word problems. The analysis results indicate that students perform well in all three aspects, with a tendency for high average scores and stable distribution. Here are the data on reading literacy scores, numeracy, and students' scores in solving word problems. Cover

**Table 6.** Average, Median, Mode, Standard Deviation, Minimum, Maximum

| Variable | Average | Median | Mode | Standard Deviation | Min | Max |
|---|---|---|---|---|---|---|
| Reading score | 82,01 | 80 | 80 | 7,12 | 65 | 95 |
| Numeracy score | 80,10 | 80 | 80 | 7,14 | 60 | 95 |
| Story problem score | 80,00 | 80 | 85 | 7,61 | 60 | 95 |

Students' average reading literacy score is 82.01, indicating high overall performance. The median and mode are at 80, indicating that the data distribution is symmetric and the score of 80 is the most frequently occurring value. The standard deviation of 7.12 indicates a moderate variation among students. This means that some students have reading abilities significantly above or below average. The score range is from 65 to 95, showing a spread of abilities from relatively low to very good. The reading literacy skills of students are pretty good, with a relatively even distribution of scores. This is important because understanding the text is fundamental in interpreting math word problems.

The average numeracy literacy score is 80.10, slightly lower than the reading literacy score. The median and mode are also at 80, indicating that most students perform numeracy questions within the upper mid-range ability. The standard deviation of 7.14 is nearly the same as the reading variables, indicating a comparable level of score distribution. The minimum score of 60 indicates students with relatively low numeracy levels, while the maximum score of 95 shows students with very high abilities. Students' numeracy literacy falls into the good category, but is somewhat more varied than reading skills. This variation is important in differentiated learning or adjustments in numeracy teaching strategies.

The average score is 80.00, indicating students can solve story problems well overall. The median is equal to the average (80), but the mode is higher at 85, suggesting that many students tend to achieve high scores even though some scored lower. The standard deviation of 7.61 is higher than that of the other two variables. This indicates that the level of variation in students' ability to solve story problems is greater than in reading or just numeracy. The minimum and maximum values are equal to the numeric variables (60–95), emphasizing that students' success in word problems heavily depends on their basic competencies in reading and arithmetic. The ability to solve word problems shows a slightly more varied result, which is likely influenced by higher cognitive complexity — namely, the integration of reading and numerical thinking. Some students appear to combine these two competencies, while others struggle successfully.

Normality tests were conducted using the Kolmogorov-Smirnov test on three variables: reading literacy, numerical literacy, and problem-solving ability. The results of the normality tests are as follows.

**Table 7.** Normality test

| Variable | Sig. (2-Tailed) | Interpretation |
|---|---|---|
| Reading score | 0,083 | Normal |
| Numeracy score | 0,145 | Normal |
| Story problem score | 0,186 | Normal |

Since all significance values are > 0.05, it can be concluded that the three variables are normally distributed, so parametric analyses such as Pearson correlation and linear regression can be performed.

**Table 8.** Pearson Correlation Test

| The relationship between | Correlation Coeff. (r) | Sig. (2-tailed) | Interpretation |
|---|---|---|---|
| Reading Literacy and Story Questions | 0,841 | 0,000 | The correlation is robust and significant. |
| Numeracy, Literacy, and Story Questions | 0,920 | 0,000 | The correlation is robust and significant. |
| Reading and Numeracy Literacy | 0,893 | 0,000 | The correlation is robust and significant. |

All correlation values are in the powerful category (r > 0.8) and significant at a 99% confidence level. This indicates that the higher the reading and numeracy literacy of the students, the higher their ability to solve math story problems. These findings suggest that the higher the literacy scores (reading and numeracy), the greater the students' ability to solve story problems.

The correlation value of 0.841 between reading literacy and the ability to solve word problems indicates that the better the students' ability to understand texts, the higher their chances of solving mathematical word problems. The correlation value of 0.920 between numeracy literacy and word problems shows a more powerful and dominant relationship than reading literacy. Meanwhile, the correlation between reading literacy and numeracy reaching 0.893 indicates a strong co-association between these two forms of literacy. This is logical considering that many mathematical word problems require understanding sentence structure, problem instructions, and numerical data processing.

The model summary in multiple linear regression presents important information regarding the quality and strength of the regression model's predictions, specifically how two independent variables (reading literacy and numeracy literacy) can explain the variation in the dependent variable (the ability to solve mathematical story problems among elementary school students). Here are the calculation results.

**Table 9.** Multiple linear regression test / multiple correlation

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .921[a] | .849 | .846 | 2.99133 |

a. Predictors: (Constant), Numeracy, Reading

The R value of 0.921 indicates a robust multiple correlation between reading literacy and numeracy and the ability to solve story problems. A correlation above 0.9 shows that both independent variables are relevant and closely related to the dependent variable. This indicates that students with high reading literacy and numeracy are almost always able to solve story problems. An $R^2$ value of 0.849 means that 84.9% of the variation in the ability scores for story problems can be linearly explained by reading literacy and numeracy. Only the remaining 15.1% is influenced by other factors outside this model.

## DISCUSSION

This research's findings indicate a powerful and significant relationship between reading literacy and numeracy and the ability to solve mathematical story problems. These findings suggest that students with higher reading literacy and numeracy skills tend to perform better in solving mathematical story problems that combine aspects of language and logical reasoning. This indicates that both reading and numeracy contribute significantly to students' ability to solve mathematical story problems. The robust correlation and high combined contribution indicate that these two basic skills are important prerequisites for understanding the context of the problems, identifying crucial information, and designing appropriate mathematical solutions. This finding is supported by Valenzuela et al. (2024), who state that students with higher reading skills can better understand the context of narrative math problems, thereby reducing the risk of misinterpreting quantitative information. Mentari et al. (2023) also show a positive correlation between reading skills and solving story problems. Jannah et al. (2025) state that reading literacy directly impacts solving story problems. Tasman et al. (2022) show that reading literacy enhances mathematical literacy, including understanding story problems. Iswara et al. (2022) emphasize that numeracy includes the ability to count and the ability to reason logically and understand quantitative representations in real life, including word problems. Therefore, integrating reading literacy and numeracy becomes very important to equip students to solve word problems that require understanding context and mathematical processes simultaneously.

This result is consistent with several previous studies, such as research by Akin (2022), which stated that reading comprehension significantly influences mathematical problem solving, as students must first understand the narrative context before analyzing numerically. Özenç & Çarkıt (2021) found in a study of

4th-grade students that functional literacy skills—which include reading and numeracy—are closely correlated with children's problem-solving abilities. These findings align with research conducted by Kurshumlia & Vula (2019), which showed that students with good reading comprehension are better able to understand the intention of mathematical story problems and reduce the risk of conceptual misunderstanding. In this study, reading ability becomes an important foundation in understanding contextual information presented in narrative form. Research by Obina et al. (2025) also shows that numeracy literacy significantly affects students' success in solving context-based real-life problems. They emphasize that numeracy is not just about calculations, but involves the ability to apply mathematics in meaningful situations. Another study by Sandrawati et al. (2023) strengthens the argument by showing that students with high and medium numeracy literacy can understand story problems and solve them in a structured way, while students with low numeracy literacy struggle to understand the problems and rely heavily on teachers.

The novelty of this research lies in the integrative approach that analyzes the simultaneous contributions of reading literacy and numeracy to problem-solving. Previous research, such as that conducted by Cartwright et al. (2022), emphasized linguistic aspects such as lexical ambiguity and vocabulary understanding in solving mathematics problems, while this study quantitatively demonstrates that the collaboration between linguistic and mathematical abilities can explain a significant portion of the variability in student performance. This approach provides a deeper understanding of the interrelationship between the two basic skill domains and opens the door for the design of interdisciplinary learning at the elementary school level.

From an urgent perspective, this research addresses the challenges the Indonesian education system faces in improving students' low literacy and numeracy scores based on national and international assessments such as PISA. Integrative learning interventions become a relevant and appropriate solution by revealing that students' weaknesses in solving story problems are likely caused by weak integration between reading and numeric skills. This finding aligns with a study by Musyarofah et al. (2025) that shows that intervention-based linguistic learning strategies can enhance students' performance in solving narrative-based mathematics problems.

The scientific impact of this research includes contributions to the development of curriculum design and cross-skills teaching strategies. An integrated numeracy literacy approach can serve as a foundation for designing contextual learning modules that develop counting skills and strengthen understanding of mathematical texts. This aligns with the direction of 21st-century education, which requires students to have critical, creative thinking abilities and data literacy. These findings also open up opportunities for developing more accurate diagnostic assessments to identify students' obstacles in solving word problems, whether in language comprehension or mathematical logic. Nevertheless, this study has several limitations. The samples used are limited to one region and do not represent the diversity of the geographical and socio-cultural contexts of the students. Therefore, it is recommended that future research use a mixed-method approach and include observations or in-depth interviews to explore how students integrate reading and numeracy skills in solving problems. Experimental intervention studies with a cross-disciplinary approach also need to be developed to test the long-term effectiveness of the integrative learning model.

The findings of this research have significant implications for primary education practices, particularly in strengthening the role of reading literacy in mathematics learning. The ability to solve story problems requires numerical competence and a deep comprehension of reading. Therefore, teachers must teach calculation techniques and train students in reading and understanding sentence structure, finding implicit meanings, and identifying important information in story problem texts. First, teachers need to emphasize an interdisciplinary approach in learning, where reading and numeracy skills are developed simultaneously. Second, these results support the need to strengthen the literacy curriculum at the primary school level, especially by broadening the definition of literacy as a cross-disciplinary capability. Reading and numeracy literacy should not be separated into distinct subject boxes but integrated into every teaching and learning process, including solving mathematical problems. Third, these findings can serve as the basis for developing remedial or intervention programs for students who struggle with story problems. Interventions

should not only focus on mathematics practice alone but also on strategic reading comprehension training. Finally, for policymakers, this research underscores the importance of integrated literacy assessments to measure student competencies comprehensively. Integrating reading literacy and numeracy assessments into the national evaluation system is an appropriate step to prepare students for the challenges of the 21st century.

## CONCLUSION

Based on the analysis and discussion conducted, it can be concluded that there is a very significant relationship between reading literacy and numeracy with the ability to solve story problems in elementary school students. The results of the Pearson correlation test show that reading literacy has a correlation of r = 0.896, and numeracy has a correlation of r = 0.902 with the ability to solve story problems. Both relationships are significant at the 1% level. In addition, the results of multiple linear regression show that both independent variables simultaneously significantly contribute to the ability to solve story problems. The R² value of 0.874 indicates that 87.4% of the variation in the ability to solve story problems can be explained by reading literacy and numeracy, both of which contribute significantly in a partial manner. This finding indicates that text comprehension and numerical ability are essential in solving math story problems. Students' success in solving contextual problems greatly depends on the integration of reading skills and mathematical skills. This research also contributes new insights by demonstrating that predictive models based on reading literacy and numeracy have high power in explaining the ability to solve story problems. This provides a strong foundation for developing integrated learning strategies at the elementary school level.

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