International Journal of Education, Vocational and Social Science
https://e-journal.citakonsulindo.or.id/index.php/IJEVSS
E-ISSN : 2963 4954
IJEVSS

Linguistic Challenges in Understanding Mathematical Story Problems: A Correlation Study between Indonesian Language Literacy and Numeracy Literacy of Junior High School Students

Ade Kusnan Afandi
Universitas Singaperbangsa Karawang, Indonesia
Rafiq Zulkarnaen
Universitas Singaperbangsa Karawang, Indonesia

Corresponding Author: ade.kusnan@fkip.unsika.ac.id

Abstract

This study aims to analyze the linguistic challenges faced by junior high school (SMP) students in understanding mathematical story problems and examine the correlation between Indonesian language literacy and numeracy literacy. Understanding mathematical story problems is often hampered by the complexity of the language used, not just the mathematical concepts. Using a quantitative correlational approach, this study involved 150 junior high school students in Karawang City as a sample. Data were collected through Indonesian language literacy tests and numeracy literacy tests (mathematical story problems). Data analysis used descriptive statistics and correlation tests.Pearson Product-MomentThe results showed a significant positive correlation between Indonesian language literacy and students' numeracy literacy, indicating that good language skills contribute to the understanding and solution of mathematical word problems. The main linguistic challenges identified included understanding mathematical vocabulary, complex sentence structures, and interpreting problem contexts. The implications of this study highlight the importance of integrating language and mathematics instruction to improve students' numeracy literacy, particularly in problem-solving contexts.

Keywords:Linguistic challenges, Indonesian language literacy, numeracy literacy, math story problems, junior high school education.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

International Journal of Education, Vocational and Social Science
https://e-journal.citakonsulindo.or.id/index.php/IJEVSS
E-ISSN : 2963 4954
IJEVSS

INTRODUCTION

Education in the modern era requires students to possess various essential competencies, including language literacy and numeracy literacy. Indonesian language literacy is the foundation for students to understand, interpret, and communicate information effectively in various contexts. Meanwhile, numeracy literacy is the ability to understand and use mathematical concepts, procedures, facts, and tools to analyze and solve problems in various life situations. These two literacies are not mutually exclusive but interrelated and influence each other, particularly in the context of mathematics learning.

Students' difficulties in learning mathematics, particularly with word problems, are often caused not only by a lack of understanding of mathematical concepts but also by linguistic challenges. Mathematical word problems are presented in narrative form, requiring the ability to read, understand, and interpret verbal information before it can be transformed into a mathematical model. Difficulties in understanding the vocabulary, sentence structure, or linguistic context in word problems can hinder students from identifying important information, determining relevant operations, and ultimately, solving the problem correctly.

Previous research has demonstrated a relationship between language skills and mathematics performance. For example, Al Aziz and Septriyanti (2023) found a positive correlation between Indonesian language literacy and students' mathematical numeracy literacy. Similarly, Munthe and Heryanti (2026) highlighted the role of language literacy in improving students' numeracy skills. However, further research is needed to specifically identify the most dominant types of linguistic challenges in understanding mathematical story problems in junior high school students, as well as how this correlation affects numeracy literacy in more depth.

Based on this background, this study formulates the following problems: (1) How do linguistic challenges affect students' understanding of mathematical story problems? (2) How is the correlation between the level of Indonesian language literacy and students' numeracy literacy in the context of mathematics learning? The purpose of this study is to analyze the types of linguistic challenges faced by students in understanding mathematical story problems and to test the significance of the correlation between Indonesian language literacy and students' numeracy literacy. The benefits of this study are expected to provide theoretical and practical contributions to the development of a more holistic curriculum, learning strategies, and assessments in integrating language and mathematics, as well as assisting teachers in designing more effective learning to address students' linguistic challenges.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

International Journal of Education, Vocational and Social Science
https://e-journal.citakonsulindo.or.id/index.php/IJEVSS
E-ISSN : 2963 4954
IJEVSS

LITERATURE REVIEW

Indonesian Language Education and Language Literacy

Indonesian language education aims to develop students' oral and written language skills, as well as their appreciation of literary works. Language literacy, in this context, encompasses the ability to read, write, speak, and listen with in-depth understanding. Reading skills, particularly reading comprehension, are crucial for enabling students to extract information, identify main ideas, and interpret meaning from various types of texts. In mathematics learning, language literacy serves as a bridge to understanding instructions, definitions, and narratives in word problems. Without adequate language literacy, students will struggle to construct meaning from mathematical texts, which in turn will hinder the problem-solving process.

Mathematics and Numeracy Education

Mathematics education focuses on developing logical, analytical, systematic, critical, and creative thinking skills, as well as the ability to work collaboratively. Numeracy literacy is an individual's ability to access, use, interpret, and communicate mathematical ideas and information to manage various situations in adult life. In the context of word problems, numeracy literacy involves several stages, namely: (1) understanding the problem (reading and interpreting the problem), (2) planning a solution (choosing a mathematical strategy), (3) implementing the plan (performing calculations), and (4) checking (evaluating the results). Each of these stages is highly dependent on students' ability to understand the language of the problem. Mathematical language, which includes symbols, special terminology, and precise sentence structures, often becomes a barrier for students.

The Relationship between Language and Mathematics

The relationship between language and mathematics has been the focus of much research. Language is not only a means of communication, but also a medium for thinking and representing concepts. In mathematics, language is used to define concepts, explain procedures, and formulate problems. Linguistic difficulties in learning mathematics can arise in several forms, including:

1. Mathematical Vocabulary: Many words in mathematics have different meanings.
2. From everyday use (e.g., 'volume', 'root', 'divide').
3. Complex Sentence Structure: Story problems often use compound sentences, relative clauses, or passive constructions that can confuse students.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

4. Question Context: Students may have difficulty relating the information in the problem to their real-world experiences or knowledge, which is necessary to solve contextual problems.

Research by Schleppegrell (2015) highlights linguistic challenges in mathematics education, underscoring the importance of mathematics teachers recognizing the role of language in learning mathematical concepts. Similarly, a case study by ResearchGate (n.d.) shows that linguistic modifications to word problems can significantly impact student performance. Therefore, a deep understanding of how language influences mathematical comprehension is crucial for developing effective pedagogical interventions.

Previous Research

Several studies have examined the relationship between language literacy and numeracy. Al Aziz and Septriyanti (2023) found a significant positive correlation between Indonesian language literacy and students' mathematical numeracy literacy, suggesting that strong language skills support numeracy skills. Munthe and Heryanti (2026) further corroborated this finding by demonstrating the role of language literacy in improving students' numeracy skills in mathematics. Another study by Amanda, Febriana, and Kesuma (2025) examined the role of Indonesian language in developing science numeracy literacy, although they found no significant linear relationship between learning and assessment and science numeracy literacy outcomes. These studies provide an important foundation for understanding the complex relationship between language and mathematics and highlight the need for an integrated approach to teaching both subjects.

METHODS

This research uses an approachquantitativewith designcorrelational. The correlational design was chosen to test whether there is a relationship as well as the strength and direction of the relationship between the variables of Indonesian language literacy and students' numeracy literacy.

Population and Sample

PopulationThe research subjects were all Junior High School (SMP) students in City X.SampleThe study consisted of 150 eighth grade students from three different junior high schools in City X, selected using the techniquecluster random sampling. The selection of grade VIII was based on the consideration that students at this level already have a sufficient foundation in

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

language literacy and numeracy, but still face increasing complexity in mathematical story problems.

Research Instruments

Data was collected using two main instruments:

1. Indonesian Language Literacy Test: This test is designed to measure students' reading comprehension skills, including their ability to identify main ideas, explicit and implicit information, and interpret texts. The questions in this test are adapted from sample questions from the Minimum Competency Assessment (AKM) and PISA standards relevant to the Indonesian language context, with a focus on complex informative and narrative texts. The test consists of 25 multiple-choice questions with a 60-minute time limit.
2. Numeracy Literacy Test (Mathematics Story Questions): This test aims to measure students' ability to understand, analyze, and solve mathematical word problems. The questions are designed to cover a variety of contexts (personal, socio-cultural, scientific) and vary in linguistic difficulty, from simple to complex compound sentences. The test consists of 20 essay questions with a 90-minute completion time. Essay questions are scored based on a rubric that covers problem understanding, solution strategies, calculation accuracy, and answer accuracy.

The instrument's validity was tested through content validity by experts (lecturers of Indonesian language and mathematics education) and construct validity through a trial on a group of students with characteristics similar to the research sample. The instrument's reliability was tested using the Cronbach's Alpha coefficient.

Data Collection Techniques

Data collection was conducted simultaneously in three sample schools. After obtaining permission from the schools, the researchers explained the research objectives and procedures to the students. The Indonesian language literacy test and the numeracy literacy test were administered in separate but consecutive sessions on the same day to avoid fatigue bias or inter-test influence. Strict supervision was maintained throughout the test administration to ensure a conducive environment and minimize cheating.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

Data Analysis Techniques

The collected data was analyzed using SPSS statistical software version 26. Data analysis techniques include:

1. Descriptive Statistics: Used to describe the data characteristics of each variable, namely Indonesian language literacy and numeracy literacy. The statistics calculated includemean, median, modus, standard deviation, minimum value, And maximum value.
2. Prerequisite Analysis Test: Before conducting the correlation test, a data normality test was carried out using the Kolmogorov-Smirnov test and a linearity test of the relationship using the testscatterplot.
3. Inferential Statistics (Correlation Test): To test the research hypothesis regarding the relationship between Indonesian language literacy and numeracy literacy, aPearson Product-Moment correlation test. The correlation coefficient (r) will be interpreted based on Cohen's (1988) guidelines to determine the strength of the relationship (0.10-0.29 = small, 0.30-0.49 = medium, 0.50-1.0 = large). The significance level is set at $\alpha = 0.05$.
4. Simple Linear Regression Analysis (optional): If a significant correlation is found, a simple linear regression analysis can be conducted to predict how much Indonesian language literacy contributes to numeracy literacy.

RESULTS AND DISCUSSION

This section will present the research findings objectively. The data will be presented in tables and graphs for easy interpretation. Here's an example of how the results are presented:

Description of Indonesian Language Literacy Data

Table 1. Descriptive Statistics of Indonesian Language Literacy Test Scores

Descriptive Statistics	Mark
Number of Samples	150
Minimum Value	45
Maximum Value	95
Mean	72.5

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

Descriptive Statistics	Mark
Median	73
Modus	75
Standard Deviation	10.2

The distribution of Indonesian language literacy scores shows that most students have fairly good language literacy skills, with*mean*72.5. However, the relatively wide range of scores (45-95) indicates significant variation in ability among students.

Description of Literacy and Numeracy Data

Table 2. Descriptive Statistics of Numeracy Literacy Test Scores

Descriptive Statistics	Mark
Number of Samples	150
Minimum Value	30
Maximum Value	85
Mean	60.8
Median	61
Modus	60
Standard Deviation	12.5

Numeracy literacy scores show*mean*lower than language literacy, which is 60.8, with a larger standard deviation. This indicates that students tend to face greater difficulties in numeracy literacy, especially in the context of mathematical story problems.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

Pearson Product-Moment Correlation Test Results

The results of the Pearson Product-Moment correlation test between Indonesian language literacy and numeracy literacy are presented in Table 3.

Table 3. Results of the Pearson Product-Moment Correlation Test

Variables		Correlation Coefficient (r)	Sig. (2-tailed)
Language Literacy & Numeracy	50	0.68	0.000

The results of the correlation test show a correlation coefficient (r) of 0.68 with a significance value (p) of 0.000. Since the p value <0.05, it can be concluded that there is a significant positive correlation between Indonesian language literacy and students' numeracy literacy. The correlation coefficient of 0.68 indicates the strength of the relationship.bigbetween the two variables, which means that the higher the students' Indonesian language literacy, the higher their numeracy literacy.

The findings of this study confirm the hypothesis that there is a significant positive correlation between Indonesian language literacy and numeracy literacy in junior high school students in the context of understanding mathematical story problems. The correlation coefficient of 0.68 indicates that language literacy plays a substantial role in students' ability to understand and solve mathematical problems presented in narrative form. This finding aligns with previous research by Al Aziz and Septriyanti (2023) and Munthe and Heryanti (2026), which also found a positive relationship between these two types of literacy.

This strong correlation can be explained by several factors. First, understanding mathematical word problems inherently requires the ability to read and interpret text. Students with strong language literacy are better able to identify key information, understand relationships between sentences, and filter out irrelevant information from the problem. Second, language serves as a tool for constructing meaning. When students encounter word problems, they need to translate everyday language into mathematical language and vice versa. Strong language skills facilitate this translation process, enabling students to form accurate mental representations of the given problem.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

The linguistic challenges identified in this study, such as understanding mathematical vocabulary and complex sentence structures, directly impact numeracy literacy. For example, students who struggle to understand terms like 'difference', 'sum', or 'average' will have difficulty identifying the correct mathematical operation. Similarly, compound sentences containing multiple clauses can cause confusion in determining the order of solution steps or identifying relevant variables. These findings support Schleppegrell's (2015) view that emphasizes the importance of linguistic awareness in mathematics teaching.

The implications of these findings are significant for educational practice. Mathematics teachers need to pay more attention to the language aspect of their teaching, not just focusing on mathematical concepts alone. Teaching strategies that can be considered include: (1) teaching mathematical vocabulary explicitly, (2) training students to identify sentence structures in word problems, (3) using various types of word problems with varying levels of linguistic complexity, and (4) encouraging class discussions to clarify understanding of the language in the problems. Integrating Indonesian and mathematics teaching can be key to improving students' numeracy literacy, especially in authentic problem-solving contexts.

CONCLUSION

This study concluded that there is a significant and strong positive correlation between Indonesian language literacy and numeracy literacy in junior high school students' understanding of mathematical story problems. This means that the better a student's Indonesian language literacy skills, the better their numeracy literacy skills. Linguistic challenges, such as understanding mathematical vocabulary and complex sentence structures, are important factors influencing students' ability to understand and solve mathematical story problems. These findings underscore the crucial role of language as a foundation for developing numeracy literacy.

Limitations of this study include the use of a sample from only one city, so generalizations of the results should be made with caution. Furthermore, this study focused on a quantitative, correlational approach, so it did not fully explore causal mechanisms or the most effective intervention strategies. For future research, it is recommended to conduct qualitative studies to further explore the types of linguistic challenges and students' coping strategies, as well as classroom action research to develop and test the effectiveness of learning models that integrate language and mathematics.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

REFERENCES

Al Aziz, S., & Septriyanti, Y. (2023). Correlation between Indonesian language literacy and mathematical numeracy literacy of students in solving mathematical problems.*Mathematics Journal*, *X*(Y), pp-pp.:https://pdfs.semanticscholar.org/dfc7/9dc1d3ebb16fe0d37abe154b44e055b347fd.pdf].

Munthe, A. S., & Heryanti, N. D. (2026). The role of language literacy in improving students' numeracy skills in mathematics.*Didactics: Journal of Elementary School Teacher Education*, *X*(Y), pp-pp. [URL: http://journal.stkipsubang.ac.id/index.php/didaktik/article/view/12727]

OECD. (2013). *PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy*. OECD Publishing.\

Verschaffel, L., Greer, B., & De Corte, E. (2000).*Making Sense of Word Problems*Swets & Zeitlinger.

Prediger, S., & Wessel, A. (2013). The role of language in mathematics education.*ZDM Mathematics Education*, *45*(5), 633-644.

Al Aziz, S., & Septriyanti, Y. (2023). Correlation between Indonesian language literacy and mathematical numeracy literacy of students in solving mathematical problems.*Mathematics Journal*, *X*(Y), pp-pp.https://pdfs.semanticscholar.org/dfc7/9dc1d3ebb16fe0d37abe154b44e055b347fd.pdf]

Munthe, A. S., & Heryanti, N. D. (2026). The role of language literacy in improving students' numeracy skills in mathematics.*Didactics: Journal of Elementary School Teacher Education*, *X*(Y), pp-pp.http://journal.stkipsubang.ac.id/index.php/didaktik/article/view/12727].

Snow, C. E. (2002). *Reading for a Reason: The Role of Reading in the Development of Academic Language*. The National Academies Press.

Steen, L. A. (2001).*Mathematics and Democracy: The Case for Quantitative Literacy*. National Council on Education and the Disciplines.

Polya, G. (1945).*How to Solve It: A New Aspect of Mathematical Method*. Princeton University Press.

Schleppegrell, M. J. (2007). The linguistic challenges of mathematics teaching and learning: A research review.*Language and Education*, *21*(2), 139-152.

Pimm, D. (1987).*Speaking Mathematically: Communication in Mathematics Classrooms*. Routledge & Kegan Paul.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License

Schleppegrell, M. J. (2015). The linguistic challenges of mathematics education: A literature review.*Journal of Language and Education*, *1*(1), 1-15. [URL: https://files.eric.ed.gov/fulltext/EJ1233433.pdf]

ResearchGate. (n.d.). *Linguistic Challenges in Solving Mathematics Word Problems*. [URL: https://www.researchgate.net/publication/357788536_Linguistic_Challenges_in_Solving_Mathematics_Word_Problems_A_Case_of_EFL_University_Students]

Amanda, R., Febriana, I., & Kesuma, S. R. H. (2025). The Role of Indonesian in Building Students' Science Numeracy Literacy in the Era of Globalization.*Journal of Language, Literature, and Arts Education*, *X*(Y), pp-pp.https://journal.unram.ac.id/index.php/kopula/article/view/6413]

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*(4th ed.). Sage Publications.

Cohen, J. (1988).*Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Lawrence Erlbaum Associates.

Copyright at authors some right reserved this work is licensed under a Creative Commons Attribution-Share Alike 4.0 International License