



ANALYSIS OF UNDERSTANDING OF MATHEMATICAL NUMERATION IN JUNIOR HIGH SCHOOL STUDENTS

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Abstract

In this modern era, students are required to master various basic competencies and literacy skills, including mathematical literacy or numeracy. This study was conducted to determine the extent of junior high school (SMP) students' understanding of mathematical numeracy literacy in the Ende Tengah sub-district. The method employed was a descriptive, qualitative approach, with a survey serving as the primary data collection technique. Data were obtained through questionnaires distributed to 6 schools in the Ende Tengah sub-district. A total of 180 respondents, both public and private schools, were interviewed. The instrument used was a questionnaire with 10 statements. According to the data analysis results, the majority of students demonstrated a high level of numeracy understanding (66.1%), followed by moderate (29.96%) and low (3.96%) levels. Students' answers focused mostly on the options "often" and "sometimes", which indicates that the use of numeracy concepts in real life has not become part of their learning habits. Several factors contributed to this low understanding, including a lack of confidence, learning methods that fail to connect the material to everyday life contexts, and limited supporting facilities. To make the numeracy learning process more meaningful, this strategy can be combined with higher-order thinking (HOTS) exercises and contextual numeracy activity programs, which collectively can hone students' logical and analytical skills. Contextual numeracy activity programs, efforts to improve numeracy skills, are not only carried out in the classroom but also through activities that involve real-life experiences.

Keywords: Numeracy; Mathematics; Junior High School Students

Abstrak

Di era modern ini, siswa dituntut untuk menguasai beragam kompetensi dasar serta keterampilan literasi termasuk literasi matematika atau numerasi. Penelitian ini dilakukan untuk mengetahui sejauh mana pemahaman siswa sekolah menengah pertama (SMP) di wilayah kecamatan Ende Tengah terhadap literasi numerasi matematis. Metode yang digunakan bersifat deskriptif kualitatif dengan teknik pengumpulan data berupa survey. Data diperoleh melalui angket yang disebar ke 6 sekolah di wilayah kecamatan Ende Tengah. Yang berjumlah 180 responden, baik sekolah negeri maupun sekolah swasta. Instrumen yang digunakan angket dengan 10 pernyataan. Dari hasil analisis data, ditemukan bahwa sebagian besar siswa berada pada tingkat pemahaman numerasi yang tergolong tinggi 66,1%, sedang 29,96%, dan rendah 3,96%. Jawaban siswa banyak terfokus pada pilihan “sering” dan “kadang-kadang”, yang menunjukkan bahwa pemanfaatan konsep numerasi dalam kehidupan nyata belum menjadi bagian dari kebiasaan belajar mereka. Beberapa faktor yang turut berperan dalam rendahnya pemahaman ini antara lain kurangnya percaya diri, metode pembelajaran yang belum mengaitkan materi dengan konteks kehidupan sehari-hari, serta keterbatasan sarana pendukung. Agar proses pembelajaran numerasi semakin bermakna, strategi ini dapat dipadukan dengan latihan soal berpikir tingkat tinggi (HOTS) dan program kegiatan numerasi kontekstual, yang secara keseluruhan mampu mengasah kemampuan logika dan analitis siswa. Program kegiatan numerasi kontekstual, upaya meningkatkan kemampuan numerasi tidak hanya dilakukan dalam ruang kelas, tetapi juga melalui aktivitas yang melibatkan pengalaman nyata.

Kata kunci: Numerasi; Matematika; Siswa SMP

INTRODUCTION

Education is a perennially relevant topic of discussion. This is because education encompasses all aspects of human life (Saleem et al., 2021). Education is not solely based on mastering knowledge

and skills; it also requires students to be able to relate these skills to the needs of everyday life, reflecting a better quality of education. Technological developments today are occurring very rapidly. In this modern era, students are required to master various basic competencies and literacy skills (Hardhienata et al., 2022). Numeracy is an important component of mathematical literacy that students need to master. Numeracy includes the ability to apply mathematical concepts to solve problems, make estimates, and make decisions in everyday life (Manfreda Kolar & Hodnik, 2021). Numeracy is a person's skill in understanding, applying, and interpreting mathematical concepts in various situations, to help make predictions and make appropriate decisions in facing everyday life problems (Khomariah et al., 2022). Iswara et al. (2022) stated that students with good numeracy skills can utilise symbols and analyse various forms of data to find solutions to problems. Numeracy is the ability to manage numbers and information and use logical thinking to assess problems and acquire important skills that are much needed (Reyna & Brainerd, 2023).

Numeracy literacy plays a crucial role in education and the development of 21st-century skills. Amidst the rapid advancement of technology and the flow of information, students are required to have the ability to analyse and solve problems related to numerical data (Mhlongo et al., 2023). This ability not only supports academic achievement but is also crucial in preparing students to face complex global challenges. Therefore, improving mathematical literacy among junior high school (SMP) students is one of the main priorities in realising the Sustainable Development Goals (SDGs) in the field of quality education (Yuan et al., 2022). Numeracy literacy is the ability to think using mathematical concepts, procedures, facts, and tools to solve contextual problems, both as individuals and as members of Indonesian and global society (Iswara et al., 2022). Numeracy literacy includes the skills to use various types of numbers and symbols related to basic mathematics, with the aim of solving practical problems in real-life contexts (Abbas & Bito, 2024). In general, numeracy can be understood as the ability to apply numbers and mathematical symbols to overcome challenges faced in everyday life (Susanta et al., 2023).

The low level of mathematical literacy in Indonesia is caused by various factors. Three main aspects influence students' mathematical literacy achievement: 1) internal factors, stemming from a lack of confidence in one's abilities; 2) instructional factors, related to the teaching methods used; and 3) environmental factors, such as teacher character and the availability of learning resources in schools (Aisyah & Juandi, 2022). In response, the government has launched an initiative through the National Literacy Movement (GLN) as a campaign to improve literacy.

Developing numeracy skills requires an understanding that encompasses the use of numbers and symbols, analysis of various types of data, and the ability to interpret results to make decisions and predict conditions (Agbata et al., 2024). However, the mathematics learning process does not always correlate with numeracy literacy achievement. This indicates that numeracy is not limited to mathematics but can be applied in various fields of study and everyday life contexts (Megawati & Sutarto, 2024).

METHOD

This study employed a qualitative approach. It aimed to describe the extent of mathematical numeracy literacy among junior high school students in Ende Tengah District. The research method used was descriptive qualitative. This approach was deemed appropriate because it allowed researchers to directly and in-depthly describe the actual conditions related to the level and diversity of students' numeracy understanding and authentic situations, without having to alter or manipulate existing variables. This study involved junior high school students (SMP) located in Ende Tengah District, Ende Regency, East Nusa Tenggara Province. A total of 180 students participated in the study, drawn from

six different schools. The six schools used for data collection were SMP Negeri 1 Ende, SMP Negeri 2 Ende, SMPSK Maria Goreti, SMP Yos Soedarso, SMP Adyaksa, and SMPS Kristen Ende. These schools were selected based on location distribution, school status (both public and private), and ease of access to complete the online questionnaire. Respondents came from diverse academic and social backgrounds, thus providing a comprehensive picture of junior high school students' understanding of mathematical numeracy in the region. This study used a questionnaire instrument developed online using the Google Forms platform. This questionnaire was specifically designed to assess junior high school students' understanding of mathematical numeracy concepts, using numeracy indicators (Wakhata et al., 2022). The instrument is divided into two parts. The first part contains respondent identification information, such as name, class, gender, and school of origin. The second part consists of 10 statements reflecting their numeracy abilities. Each statement has four response options: SL (always), SR (often), KD (sometimes), and TP (never).

This study used a survey approach for data collection, with the primary tool being a questionnaire. The instrument was created in digital format and distributed online via Google Forms. This method was chosen based on practical considerations, such as ease of access for respondents, efficiency of implementation, and the ability to reach students from various schools across the Ende Tengah District. The survey lasted seven days. During this period, a Google Forms link was sent to students in coordination with the school. The questionnaire was distributed with the assistance of homeroom teachers, who acted as liaisons to ensure all students received and completed the questionnaires effectively. Students were given time to complete the questionnaires outside of class hours and were still able to receive assistance from the teacher if they encountered difficulties. The questionnaire was designed to assess students' understanding of numeracy in mathematics. Questionnaires covered aspects of basic conceptual mastery, application skills in everyday situations, and logical and analytical thinking. This data collection technique was deemed efficient and relevant, particularly in situations that require speed and broad data coverage, without the constraints of geography or time.

RESULTS AND DISCUSSION

Based on the results of a questionnaire completed by 180 eighth-grade students from six junior high schools across the Ende Tengah District, it was found that students' understanding of mathematical numeracy generally remains at a moderate to low level. This is reflected in the tendency of respondents to choose "sometimes" and "often" for most of the numeracy indicators. This choice suggests that applying mathematical concepts in everyday life has not yet become a deeply ingrained habit among students (Babu et al., 2023).

Table 1. Data from 180 Mathematical Numeration Respondents

No	Statement	Always	Often	Sometimes	Never
1	I like reading books outside of textbooks	48	68	62	3
2	I can read story questions, tables, graphs and diagrams well	50	67	61	3
3	I can understand story problems, tables, graphs and diagrams well	38	84	54	6
4	I can answer or complete story problems, tables, graphs and diagrams well	36	64	72	8
5	I try to check my answers again after completing word problems, tables, graphs and diagrams	83	44	50	3

No	Statement	Always	Often	Sometimes	Never
6	I can account for or present the results of my work on story questions, tables, graphs and diagrams well	51	56	68	7
7	I can explain the steps for solving word problems, tables, graphs and diagrams well to friends	35	53	66	26
8	I feel happy when I learn numeracy literacy at school	77	53	48	2
9	I am confident when working on numeracy literacy questions	63	61	49	7
10	I feel that numeracy literacy is important in everyday life	96	58	26	2

This finding is further supported by visual data in the form of a table, the frequency distribution of answers for each indicator. Only a small number of students chose the "always" option, indicating that consistent mastery and application of numeracy has not yet been achieved. Meanwhile, the "never" option was also not dominant, indicating that some students still interact with numeracy materials, although they are not yet able to apply them routinely and effectively (Attard & Holmes, 2022). Several factors suspected to contribute to low numeracy literacy rates include low student confidence in solving problems that require logical and mathematical thinking skills (Pratiwi, et al., 2024), learning models that are not yet relevant to real-life contexts, making mathematics feel distant from students' experiences (Wickersham & Nachman, 2023), limited learning support tools such as visual media, concrete aids, or adequate learning resources, and minimal integration of numeracy into learning activities across subjects, which results in students being unaccustomed to utilizing numerical skills outside of the context of mathematics (Low et al., 2024).

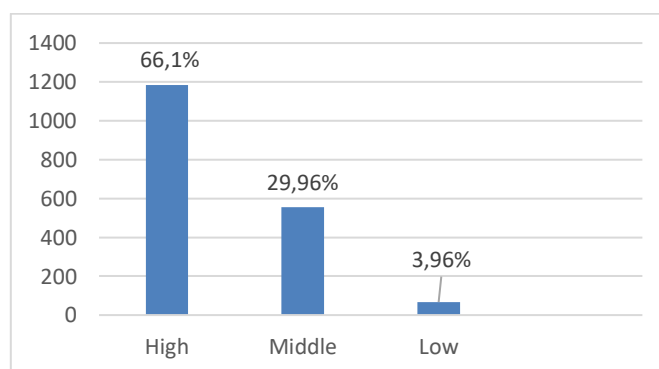


Figure 1. Numerical Integration Results Diagram

Based on the diagram above, 180 students responded to the 10 statements in the questionnaire regarding junior high school students' numeracy skills. The results are as follows: it can be concluded that junior high school students' numeracy skills are categorised as high (66.1%), moderate (29.96%), and low (3.96%), primarily supported by positive attitudes toward the importance of numeracy. However, weaknesses remain in contextual problem solving and mathematical communication, as reflected in the high percentages in the low and very low categories. Therefore, more varied and contextual learning strategies are needed to improve numeracy skills across students (Hidayana & Lianingsih, 2025). Overall, these data show a positive trend, with a predominance of the high category, which can be an indicator of the success of the learning approach or intervention. However, it is important to provide support to the medium and low groups to avoid gaps in achievement between

students (Cabral-Gouveia et al., 2023). Students' numeracy mastery is strongly influenced by three main aspects: internal factors (self-confidence), instructional factors (teaching strategies), and the learning environment. The mismatch between learning methods and students' needs, coupled with limited resources, makes it difficult for students to understand and relate mathematics to the real world (Pepin & Kock, 2021). Numeracy is not simply arithmetic skills, but encompasses the processes of understanding, reasoning, and decision-making based on available data and information (Hadley & Oyetunji, 2022).

From an educational perspective, these results demonstrate the importance of reforming the approach to mathematics learning at the junior high school level (Wibowo, et al., 2025). The application of context-based strategies and real-world problem-solving (Contextual Teaching and Learning/CTL) is highly relevant in helping students connect abstract concepts with the real world (Maftuh, et al., 2023). Furthermore, numeracy skills need to be practised in various other subjects so that students become accustomed to applying them in various life situations. In addition to reforming teaching strategies, strengthening teacher competencies is also crucial (Hidayah et al., 2025). Teachers need training to be able to design more contextual learning and encourage the use of numeracy in learning activities (Lee & Vongkulluksn, 2023). On the other hand, strengthening the national literacy movement program can be one of the driving forces in building a comprehensive numeracy literacy culture in the school environment (Kusumawati & Umam, 2025).

CONCLUSION

Based on the data findings and discussion, it appears that junior high school students in the Central Ende District still have a relatively low understanding of mathematical numeracy literacy, at 66.1%. This is evident in the tendency for students to respond with "sometimes" and "often" options to questions assessing numeracy skills, such as reading and understanding story problems, tables, and graphs, as well as the ability to solve and explain steps. Although the majority of students recognise that numeracy literacy is important for everyday life, its application in learning activities has not yet fully become part of the culture. This low understanding of numeracy is not solely caused by internal student factors but is also influenced by the learning environment, the teaching methods used, and support from the overall education system. Therefore, comprehensive improvement efforts are needed, including improving teacher competency through training, implementing questions that hone higher-order thinking skills (HOST), strengthening integrated numeracy programs, and developing relevant and contextual learning media. Given this situation, a renewed focus on relevant and contextual learning strategies is needed, for example, by implementing problem-based learning models, integrating numeracy aspects into various lessons, and providing opportunities for students to actively engage in activities involving information processing and solving problems from everyday life. With this approach, it is hoped that students' numeracy skills will develop more effectively and evenly across all schools in the region.

DAFTAR PUSTAKA

- Abbas, N., & Bito, N. (2024). Students' Numeracy Literacy Ability through the Implementation of Problem-Based Learning and STEM Approach. *Technium Soc. Sci. J.*, 59, 40.
- Agbata, B. C., et al. (2024). Everyday uses of mathematics and the roles of a mathematics teacher. *Science World Journal*, 19(3), 819-827.
<https://www.ajol.info/index.php/swj/article/view/280931>

- Aisyah, A., & Juandi, D. (2022). The description of Indonesian student mathematics literacy in the last decade. *International Journal of Trends in Mathematics Education Research*, 5(1), 105-110. DOI: <https://doi.org/10.33122/ijtmer.v5i1.114>
- Attard, C., & Holmes, K. (2022). An exploration of teacher and student perceptions of blended learning in four secondary mathematics classrooms. *Mathematics Education Research Journal*, 34(4), 719-740. <https://doi.org/10.1007/s13394-020-00359-2>
- Babu, K. S., Nagaraju, M. V., & Johnson, G. (2023). *Mathematics in everyday life: The hidden language of the world*. India: Shineeks Publishers.
- Cabral-Gouveia, C., Menezes, I., & Neves, T. (2023). Educational strategies to reduce the achievement gap: a systematic review. In *Frontiers in education* (Vol. 8, p. 1155741). <https://doi.org/10.3389/feduc.2023.1155741>
- Hadley, K., & Oyetunji, W. (2022). Extending the theoretical framework of numeracy to engineers. *Journal of Engineering Education*, 111(2), 376-399. <https://doi.org/10.1002/jee.20453>
- Hardhienata, S., Suchyadi, Y., & Wulandari, D. (2021). Strengthening technological literacy in junior high school teachers in the industrial revolution era 4.0. *JHSS (Journal of Humanities and Social Studies)*, 5(3), 330-335. DOI: 10.33751/jhss.v5i3.4220
- Hidayah, I. R., Sa'dijah, C., Anwar, L., Yerizon, Y., & Arnawa, I. M. (2025). Empowering students' numeracy skills: Mathematics teachers' perceptions regarding the effectiveness and challenges of Indonesian national curriculum and the programs—A mixed method study. *Infinity Journal*, 14(1), 163-188. DOI: <https://doi.org/10.22460/infinity.v14i1.p163-188>
- Hidayat, Z., Syamsuddin, A., & Mukhlis, M. The Numeracy Literacy Process of Fifth-Grade Elementary School Students in Solving Word Problems. *Journal of Educational Sciences*, 9(4), 2409-2418. DOI: <https://doi.org/10.31258/jes.9.4.p.2409-2418>
- Hikmah, A. A. N. dkk. (2024). Analisis Kemampuan Literasi Numerasi Siswa SMP dalam Menyelesaikan soal cerita pada persamaan linear satu variabel. *Jurnal Didactical Mathematics*, 6(2), 314-322. <https://doi.org/10.31949/dm.v6i2.10672>
- Iswara, H. S., Ahmadi, F., & Da Ary, D. (2022). Numeracy literacy skills of elementary school students through ethnomathematics-based problem solving. *Interdisciplinary Social Studies*, 2(2), 1604-1616. DOI: <https://doi.org/10.55324/iss.v2i2.316>
- Khomariah, N., Zawawi, I., & Suryani, S. (2022). Analisis Kemampuan Literasi Numerasi Peserta Didik SMP Ditinjau dari Pola Pikir Matematis. *AKSIOMA: Jurnal Matematika dan Pendidikan Matematika*, 13(3) 381-391. <https://journal.upgris.ac.id/index.php/aksioma/article/view/13632>
- Kusumawati, E., & Umam, K. (2025). Strengthening teacher competence for leading and sustaining the implementation of the Merdeka Curriculum. *Cogent Education*, 12(1). <https://doi.org/10.1080/2331186X.2025.2501458>
- Lee, H. J., & Vongkulluksn, V. W. (2023). Enhancing mathematics teacher professional learning through a contextualized professional development program. *Teacher Development*, 27(1), 92-115. <https://doi.org/10.1080/13664530.2022.2134195>
- Low, W. S., Tahar, M. M., & Maat, S. M. (2024). Teaching Aids for Remedial Mathematics Instruction: A Systematic Review. *Pegem Journal of Education and Instruction*, 14(3), 311-321. DOI: <https://doi.org/10.47750/pegegog.14.03.29>

- Maftuh, M. S. J., Lawal, U. S., Ade, M., Lama, A. V., & Adzim, A. F. (2023). Understanding learning strategies: a comparison between contextual learning and problem-based learning. *Educazione: Journal of Education and Learning*, 1(1), 54-65. DOI: <https://doi.org/10.61987/educazione.v1i1.496>
- Manfreda Kolar, V., & Hodnik, T. (2021). Mathematical literacy from the perspective of solving contextual problems. *European Journal of Educational Research*, 10(1), 467-483. <https://eric.ed.gov/?id=EJ1284367>
- Megawati, L. A., & Sutarto, H. (2021). Analysis numeracy literacy skills in terms of standardized math problem on a minimum competency assessment. *Unnes Journal of Mathematics Education*, 10(2), 155-165. <https://journal.unnes.ac.id/sju/ujme/article/view/49540>
- Pepin, B., & Kock, Z. J. (2021). Students' use of resources in a challenge-based learning context involving mathematics. *International Journal of Research in Undergraduate Mathematics Education*, 7(2), 306-327. <https://doi.org/10.1007/s40753-021-00136-x>
- Pratiwi, S. A., Peni, N. R. N., & Prabowo, A. (2024). STUDY ON LITERACY NUMERACY TOWARDS STUDENTS' LOGIC MATHEMATICS: A LITERATURE REVIEW. *Numeracy*, 11(1), 58-69. DOI: <https://doi.org/10.46244/numeracy.v11i1.2601>
- Reyna, V. F., & Brainerd, C. J. (2023). Numeracy, gist, literal thinking and the value of nothing in decision making. *Nature Reviews Psychology*, 2(7), 421-439. <https://www.nature.com/articles/s44159-023-00188-7>
- Saleem, A., Kausar, H., & Deebea, F. (2021). Social constructivism: A new paradigm in teaching and learning environment. *Perennial journal of history*, 2(2), 403-421. DOI: <https://doi.org/10.52700/pjh.v3i2.131>
- Susanta, A., Sumardi, H., Susanto, E., & Retnawati, H. (2023). Mathematics Literacy Task on Number Pattern Using Bengkulu Context for Junior High School Students. *Journal on Mathematics Education*, 14(1), 85-102. <https://eric.ed.gov/?id=EJ1382290>
- Wakhata, R., Mutarutinya, V., & Balimuttajjo, S. (2022). Secondary school students' attitude towards mathematics word problems. *Humanities and social sciences communications*, 9(1), 1-11. <https://doi.org/10.1057/s41599-022-01449-1>
- Wickersham, K., & Nachman, B. R. (2023). "I never learned more in my life in such a short period of time": Math contextualization as momentum toward community college student success. *Community College Journal of Research and Practice*, 47(4), 273-289. <https://doi.org/10.1080/10668926.2021.1999341>
- Wibowo, W. A., Suryatama, H., & Siswanto, D. H. (2025). Exploring the impact of the Merdeka Curriculum on mathematics education in Elementary Schools. *International Journal of Learning Reformation in Elementary Education*, 4(01), 27-38. DOI: <https://doi.org/10.56741/ijlree.v4i01.793>
- Yuan, X., Yu, L., Wu, H., She, H., Luo, J., & Li, X. (2022). Sustainable development goals (SDGs) priorities of senior high school students and global public: Recommendations for implementing education for sustainable development (ESD). *Education Research International*, 2022(1), 2555168. <https://doi.org/10.1155/2022/2555168>