

NUMERACY LITERACY IN ELEMENTARY SCHOOL MATHEMATICS LEARNING

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Abstract

This research aims to describe numeracy literacy in elementary school mathematics learning. The approach used is qualitative, with a case study in several elementary schools. Data collection in this research involves searching for journals available in various electronic media, such as digital libraries and the internet, through Google Scholar. The results of the numeracy literacy analysis indicate that students' numeracy literacy skills involve three main components. Firstly, students need to have skills in understanding and using mathematical symbols and numbers in various contexts. Secondly, students should be able to analyze information presented in various visual forms, such as graphs and tables. Thirdly, students also need to be able to solve mathematical problems that involve using numbers and symbols. The implications of this research can be used as a foundation for developing a more inclusive and contextual mathematics curriculum and to assist teachers in designing effective learning strategies to enhance students' numeracy literacy.

Keywords: Numeracy literacy, Mathematics learning

INTRODUCTION

Mathematics plays a crucial role in various aspects of daily life, from calculating expenses and managing time to understanding the information presented in the form of data. Therefore, numeracy literacy is essential for students to navigate their daily lives more independently and intelligently. Many students struggle to comprehend mathematical concepts, which are often perceived as abstract and challenging to apply in real-world contexts. The approach of numeracy literacy helps address this challenge by bridging mathematical concepts with relevant real-life situations for students.

In the current era of technology and information, skills like critical thinking, creativity, and problem-solving have become exceptionally crucial. The numeracy literacy approach assists students in developing these skills by fostering a profound understanding of mathematics and the ability to apply it in real-world situations. Many

education systems are adopting competency-based curricula that emphasize conceptual understanding and practical application, rather than mere rote memorization of formulas. The numeracy literacy approach aligns with this methodology by prioritizing a deep comprehension of mathematical concepts.

In Indonesia, the Ministry of Education and Culture initiated the National Literacy Movement through its program in 2016. This effort is in line with the implementation of Ministerial Regulation No. 23 of 2015 concerning the Formation of Character. The National Literacy Movement, launched by the government, is implemented in the education sector through the School Literacy Movement. The School Literacy Movement aims to create a learning environment rich in literacy and to cultivate moral values within the school community through various activities, including non-academic book reading for 15 minutes (Ekowati et al., 2019; Suswandari, 2018; Perdana, 2021).

Based on the results of the PISA survey, which is the Program for International Student Assessment for 15-year-old students, the mathematical literacy ranking in Indonesia from 2009 to 2015 showed a slight improvement but remained relatively low. In 2009, Indonesia was ranked 68 out of 74 countries. In 2012, Indonesia was ranked 64 out of 65 countries with relatively low achievement levels. In the PISA survey results for 2015, Indonesia's ranking slightly improved to 63rd out of 72 countries. These three surveys show that Indonesian students' mathematical literacy skills remained low compared to those participating in PISA countries (Ayuningtyas & Sukriyah, 2020).

The findings of research conducted by Salvina et al. (2022) titled "Analysis of Students' Numeracy Literacy Ability in Relation to Math Anxiety," using a qualitative method, indicated that the low numeracy literacy of students is attributed to a lack of teachers capable of creating numeracy-related questions, particularly for elementary school teachers. Furthermore, Rani (2022) in a study titled "Causes of Low Numeracy Literacy Skills among Third-Grade Students in Elementary School," using a qualitative approach, found that the low numeracy literacy skills were due to elementary school students' tendency to engage with electronic gadgets. Additionally, a study by Hazin et al. (2021) titled "Psychosocial Support and Elementary School Learning Modules to Overcome Learning Loss" revealed that the lack of numeracy and literacy skills among

upper-grade elementary school students is also influenced by the absence of encouragement and motivation from parents. This is further supported by the study of Nastati & Dwiyantri (2022) titled "Literature Review: Numeracy Literacy of Upper-Grade Elementary School Students," which used a literature review methodology, indicating that numeracy literacy among elementary school students is still relatively low.

Many students experience anxiety towards mathematics. Numeracy literacy helps create a more inclusive and supportive environment where students feel more confident in approaching mathematical concepts. Strong numeracy literacy at the elementary school level lays a solid foundation for mathematics learning in subsequent education levels. Students will be better prepared to tackle more complex topics as they have developed a strong understanding from an early stage.

From this description, it is evident that the low numeracy literacy among Indonesian students may be attributed to several factors, including their ability to solve mathematical problems and their overall literacy levels. On the other hand, students' ability to handle mathematical problems is also influenced by various factors, among which is their level of comprehension of mathematical concepts. This fact demonstrates that one of the causes of failure in mathematics learning is a lack of understanding of mathematical concepts or misunderstandings in grasping them. Errors in comprehending mathematical concepts in the early stages of learning can impact misconceptions in subsequent learning stages. As mathematical topics are closely interconnected, these errors can affect further understanding (Novitasari, 2016).

In the context of mathematics education in elementary schools, especially for fifth-grade students, numeracy literacy instruction requires a creative and innovative role from teachers. Teachers must design teaching approaches that engage students and facilitate easy understanding. Creating learning situations that align with students' needs and connecting them with the learning content makes education more captivating and meaningful for students (Wahyuni et al., 2017). Therefore, further research on numeracy literacy in elementary school mathematics education becomes highly important.

LITERATURE REVIEW

Mathematics is one of the core subjects in formal education and plays a significant role in enhancing the quality of education. Mathematics lessons involve various concepts, which are abstract ideas used to categorize objects as examples or non-examples. These concepts are interconnected, and a solid understanding is necessary because one concept can influence others (Novitasari, 2016). Many students often perceive mathematics as challenging, including difficulties translating real-life problems into mathematical forms. This negative perspective affects the motivation to learn mathematics and academic adaptation in school (Siregar, 2017).

Numeracy literacy is the capacity of an individual to apply critical thinking. Critical thinking involves analyzing and comprehending statements by manipulating symbols or mathematical language in everyday situations and expressing these ideas in written or spoken form (Yunus et al., 2017). Numeracy literacy is an integral part of the mathematical discipline, and its components are closely intertwined with mathematical content. Mathematics involves structured knowledge of rules, concepts, logical reasoning, and logical structure (Yuliana, 2017).

In the midst of the widespread popular culture, the importance of books is increasingly being overlooked. In fact, society tends to absorb oral and audio culture more readily than engaging in reading and expressing it in written form. Oral communication culture or the habit of speaking still remains dominant among the Indonesian population. More people prefer to check their smartphones for status updates and watch television programs rather than engage in reading activities (Suswandari, 2018).

Reading ability is a crucial initial stage in understanding various other basic literacy aspects, including scientific literacy, numeracy literacy, digital literacy, cultural and civic literacy, as well as financial literacy. One of the fundamental literacy aspects implemented in the elementary school educational environment is numeracy literacy. Numeracy literacy refers to the knowledge and skills in using various numbers and symbols related to basic mathematics to solve everyday problems. It also involves the ability to analyze information presented in various forms and interpret the results of such analysis to make predictions and decisions (Mahmud & Pratiwi, 2019). According to (Ekowati et al.,

2019), numeracy literacy refers to an individual's ability to employ reasoning. This reasoning process involves analyzing and comprehending statements by manipulating symbols or mathematical language encountered in everyday life and expressing those statements either in written or spoken form.

Numeracy literacy consists of three main elements: counting skills, numeracy relations, and mastery of arithmetic operations. Counting skills involve the ability to count objects and recognize their quantity verbally. Numeracy relations relate to the capacity to differentiate the quantity of objects, such as more, less, higher, or lower. Meanwhile, arithmetic operations encompass the ability to perform basic mathematical operations like addition and subtraction. These three elements of numeracy literacy form an essential foundation in mathematics teaching, especially during the early learning and school years (Mahmud & Pratiwi, 2019).

Numeracy literacy ability is defined as students' skills in deciphering information related to numbers or mathematics, then formulating a problem, analyzing the problem, and finding a solution for it (Hartatik, 2019). This numeracy literacy ability plays a crucial role in mathematics teaching, as mathematics is not solely centered around formulas, but also requires students' logical and critical thinking skills when facing each presented task. Furthermore, numeracy literacy also contributes to helping students understand how mathematical concepts can be applied to solve everyday problems (Salvia et al., 2022).

According to the results of PISA 2018 published by OECD (2019), it appears that the average mathematics score of students in Indonesia reached 379, while the average score in OECD member countries reached 487. This indicates that the numeracy literacy ability of Indonesian students is still at a low level. Several factors may contribute to the low numeracy literacy ability among Indonesian students. In general, only a small fraction of students apply numeracy literacy skills in everyday situations. Although students may have mastered basic mathematical concepts such as counting, their ability to apply them in real-life situations or tackle complex problems often receives insufficient attention. For example, exercises involving numeracy literacy problems are often lacking in daily routines. The lack of preparedness of teachers to design numeracy literacy problems, especially at the elementary school level, can be a factor influencing this. Such problems could actually help students become accustomed to solving

unstructured problems. The habit of teachers using routine problems with clear solutions through applying specific formulas is also common (Kartikasari et al., 2016).

METHODOLOGY

This approach is routinely applied to collect, organize, and arrange information using specific methods to address the issues at hand (Dits Prasanti, 2018). Literature research gathers data and information from various sources in the library, such as reference books, similar previous research, articles, notes, and journals relevant to the issue to be addressed. In this research, the primary focus of literature research is to analyze concepts and theories based on existing references, including articles in scientific journals that discuss theories related to the research problem. The scope of this research includes numeracy literacy, thematic learning, and mathematics instructional content. The research subjects are students at the upper level of elementary school.

Data sources in this research are obtained through searching for scholarly articles using various electronic sources such as digital libraries and the internet, particularly by utilizing Google Scholar. Google Scholar is an information service that provides comprehensive and free access to articles in PDF format. Typically, Google Scholar is used by students and scholars to find references for academic writing (Rafika et al., 2017). The data analysis technique applied in this research is bibliography annotation analysis, which refers to a simple summary of articles, books, journals, or other written sources. Bibliography annotations aid in library collection management because readers do not need to search for library documents directly but can gain information about the existence of those documents. This helps maintain the integrity of the library collection (Yanto & Nelisa, 2014). In this context, a bibliography refers to a list of sources related to a topic. It provides information about the content of books or other materials, facilitating readers' comprehension of the content. The bibliography annotations in this research are derived from relevant books and journals by searching for scholarly articles from previous research.

RESULT AND DISCUSSION

Numeracy refers to the knowledge, skills, and behaviors required by students to apply mathematical concepts in various situations, including understanding mathematics in their surroundings and the ability to effectively use that knowledge and skills according

to the desired objectives. Numeracy literacy is an integral part of mathematics. Several journals, as highlighted by (Ashri & Pujiastuti, 2021), underscore that students' mathematical proficiency encompasses not only the ability to formulate, use, and interpret mathematics in the context of mathematical thinking but also to use concepts and tools to describe, explain, and predict situations accurately, thereby aiding in the understanding of the relevance of mathematics in daily life.

Literacy does not just encompass the ability to read and the capacity to analyze texts and understand the concepts contained within them. On the other hand, numeracy competency refers to analyzing and utilizing numbers. Both of these aspects form the foundation for the introduced minimum assessment starting in 2021, which not only relies on subjects and mastery of content.

Literacy and numeracy serve as the fundamental minimum competencies required by learners to engage in the learning process. This assessment is conducted midway through the educational journey, motivating schools and teachers to enhance the quality of education (Rachman et al., 2021). Such mid-educational assessment provides information to help schools identify students' learning needs. Various strategies and efforts are made to strengthen literacy and numeracy, thus supporting the concept of "self-directed learning". One strategy employed is fostering a literacy culture within each educational unit. Numeracy literacy is an integral part of mathematics. This literacy holds practical dimensions (applied in daily activities), citizenship dimensions (understanding societal issues), professional dimensions (in the workforce), recreational dimensions (e.g., understanding scores in sports and games), and cultural dimensions (as part of deep knowledge and cultured human heritage).

From the results of several studies, it is evident that students' numeracy literacy is significantly low. One of the key causes is the uncontrolled use of technology, such as excessive smartphone usage, leading to a decline in reading books and practicing problem-solving. The contrast is striking, with students showing more enthusiasm for using their phones than learning from textbooks. The repercussions of this situation hurt students' numeracy and literacy skills. Numeracy literacy involves students' ability to apply numerical-related information, analyze problems, and find solutions. This literacy skill is highly relevant in the context of mathematics education, especially for elementary

school students, particularly in the upper grades. Mathematics learning goes beyond understanding formulas; it also engages logical and critical thinking abilities.

Mere knowledge of mathematics is not sufficient for developing numeracy skills. Numeracy literacy helps students understand how mathematics can be applied in solving everyday problems. For instance, students can understand that the result of multiplication, like two times three, remains the same even if the order of the numbers is reversed to three times two. From this perspective, we can observe that the scope of numeracy literacy is extensive, reaching beyond the subject of mathematics and intersecting with other literacies, such as cultural and civic literacy. Numeracy literacy is a part of mathematics and draws components from the curriculum's mathematical scope. Components of numeracy literacy include estimating and counting with numbers, using fractions, decimals, percentages, and ratios, recognizing and applying spatial reasoning, employing measurements, and interpreting statistical information. As for curriculum coverage, it encompasses numbers and algebra, geometry and measurement, and data handling.

Numeracy literacy involves the application of mathematical concepts in everyday life and culture, which is utilized to make decisions in addressing problems that involve mathematical symbols, calculations, numbers, and figures. The table's elements can guide the development of students' numeracy literacy skills within the context of mathematics education (Han et al., 2017). When assessing an individual's numeracy literacy skills, clear indicators are needed to describe each ability encompassed by it. Han et al. (2017) continue by stating that the indicators for numeracy literacy skills are outlined in the following table:

- (1) Using Various Numbers and Symbols: Utilizing a variety of numbers and symbols related to basic mathematics to solve problems across various contexts in daily life.
- (2) Analyzing Information: Deciphering information presented in various forms such as graphs, tables, charts, diagrams, etc.
- (3) Interpreting Results: Drawing interpretations from the analyses and using them to predict and make decisions.

These indicators provide a framework for assessing and developing an individual's numeracy literacy skills within the context of mathematics education.

Based on the presented analysis, it can be observed that numeracy literacy skills consist of three components. First, the ability to interpret symbols and numbers in a mathematical context. Second, the capability to analyze information presented in various forms, such as graphs, tables, diagrams, and similar formats. Third, having the proficiency to solve mathematical problems. Within numeracy literacy, emphasis on using symbols and numbers aims to enable learners to apply these skills in everyday situations.

Strengthening literacy and numeracy skills requires the participation of various relevant parties to achieve its goals (Suhartono, 2021). By involving support from literacy advocacy groups, academic institutions, community organizations, media, and the Business and industry World, efforts to enhance literacy and numeracy in the school environment can be accelerated. Through collaboration among these stakeholders, spearheaded by the Literacy and Numeracy Empowerment Team (TPLD), it is hoped that there will be an improvement in the quality of education. One of the indicators of success is the enhancement of literacy and numeracy skills, as well as students' critical, creative, collaborative, and communicative thinking skills. This step is aligned with the effort to strengthen literacy and numeracy in accordance with the dimensions of the Pancasila student profile in the policy of independent learning.

One strategy that can be implemented is mobilizing practitioner communities. In the independent learning policy context, teachers and schools are expected to form practitioner communities as an integral part of the learning process (Muliantara & Suarni, 2022). This approach involves several steps. First, the initial step involves generating ideas and initiating conversations. These ideas arise as responses to identified needs. The next stage is the dissemination of valuable knowledge and practices through the practitioner communities. These communities will provide education related to strengthening literacy and numeracy in the school environment. Finally, the stage of maintaining sustainability aims to ensure that the practitioner communities continue to positively impact their members and students, even when the circumstances surrounding the communities undergo changes.

School programs that support the enhancement of literacy and numeracy can be implemented through innovative practices and various sources of reading materials and

information. This strengthening can be realized through the development of extracurricular activities (Wulandari et al., 2021). Various extracurricular activities are conducted in schools, and nowadays these activities serve not only as a means to develop students' potential but also as a way to reinforce basic literacy. Numeracy literacy can be enhanced through various extracurricular activities. For instance, entrepreneurial activities can teach students about numbers and the value of money in real-world contexts. The reinforcement of numeracy literacy is accomplished through the planning, implementation, and evaluation of entrepreneurial activities, involving mathematical concepts in capital calculations, pricing, expenses, and profits.

Furthermore, regular social service activities can also serve as a means to reinforce numeracy literacy. Students can collect data on the amount and types of contributions and ensure fair distribution to the recipients. This activity may involve creating reports in the form of tables or diagrams. Similarly, scouting activities as extracurriculars can be integrated to enhance numeracy literacy. Teachers and trainers can design scouting programs that support improving students' numeracy skills.

In this manner, the strengthening of literacy and numeracy in the educational context is carried out through active collaboration among various parties, the development of practitioner communities, and the integration of extracurricular activities that support the development of students' numeracy literacy.

CONCLUSION

Numeracy literacy encompasses students' skills in interpreting and applying mathematical numbers and symbols in various everyday situations. Studies indicate that numeracy literacy goes beyond mere mastery of mathematical concepts; it also involves analytical skills, problem-solving abilities, and interpretation of information from graphs, tables, and diagrams. The analysis of numeracy literacy indicators confirms the existence of three main components. First, students must understand and use mathematical symbols and numbers in diverse contexts. Second, students must decipher information presented in visual formats, such as diagrams and tables. Third, they must also excel in solving mathematical problems involving numbers and symbols. In the context of mathematics education at the elementary school level, numeracy literacy provides a strong foundation for students to delve deeper into the subject matter. This not only

facilitates a better understanding of mathematical concepts but also allows the application of that knowledge and skills in real-world situations. Therefore, integrating numeracy literacy in the mathematics learning process at the elementary school level holds significant importance in ensuring that students develop solid mathematical skills that are relevant and applicable to their daily lives.

Numeracy literacy plays a crucial role in the context of mathematics education for elementary school students. Students' ability to interpret and use mathematical numbers and symbols in real-world situations is a crucial foundation for a comprehensive understanding of mathematics. Integrating numeracy literacy into the curriculum and mathematics teaching methods at the elementary school level will help students sharpen their mathematical skills, which are both academically relevant and beneficial in their everyday activities.

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