Available online at https://journal.rescollacomm.com/index.php/ijeer/index

International Journal of Ethno-Sciences and Education Research

e-ISSN 2776-7590

Vol. 5, No. 2, pp. 46-50, 2025

Contextual Learning as a Means to Improve Elementary School Students' Mathematical Literacy Skills

Rizki Apriva Hidayana[1*], Nestia Lianingsih[2]

[1]*Department of Mathematics, Faculty of Mathematics and Natural Sciences, National University of the Republic of Indonesia, Bandung, Indonesia*

[3] *Master's Program of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran, Jatinangor, West Java, Indonesia*

**Corresponding author email: rizkiaprivahidayana@mipa.ukri.ac.id*

Abstract

Mathematical literacy in the Programme for International Student Assessment (PISA) emphasizes students' ability to analyze, justify, and effectively communicate ideas, as well as to formulate, solve, and interpret mathematical problems across various forms and contexts. The PISA assessment focuses on real-life problems rather than solely on typical classroom-based questions. Based on cognitive development stages, elementary school students are generally in the concrete operational stage, which means they require tangible objects that can be perceived through the senses. Since mathematics learning tends to be abstract, students need support in the form of media and teaching aids to clarify concepts delivered by the teacher, making them easier to understand. Mathematics instruction is expected to provide an integrated, comprehensive, and holistic understanding of the material. This understanding not only fulfills the demands of mathematical content but also offers practical benefits to students. This aligns with the contextual learning approach, which emphasizes active student engagement throughout the learning process, enabling them to discover concepts independently and relate them to real-life situations. Contextual learning is carried out through four main stages: providing motivation, conceptual understanding, application, and assessment—all of which are grounded in the core components of contextual learning.

Keywords: Mathematical Literacy, Contextual Learning, Elementary School Students

1. Introduction

Mathematics is one of the fundamental sciences that plays an important role in life because it can prepare and develop students' abilities to think logically, flexibly, and accurately in solving everyday problems. Given the importance of mathematics, it is essential to understand the objectives of mathematics education from elementary school (SD) to high school (SMA), which according to the Curriculum for Education Unit Level (KTSP) include: (1) understanding mathematical concepts, explaining relationships between concepts, and applying concepts or algorithms accurately, efficiently, and correctly in problem-solving; (2) using reasoning on patterns and properties, performing mathematical manipulations to generalize, organize proofs, or explain mathematical ideas; (3) solving problems that involve understanding problems, designing mathematical models, solving the models, and interpreting the solutions found; (4) communicating ideas through symbols, tables, diagrams, or other media to explain problems; (5) developing a positive attitude toward the usefulness of mathematics in everyday life, such as curiosity, attention, interest, as well as persistence and confidence in solving problems (Syafriafdi et al., 2019).

Based on UNESCO's four pillars, through learning to know, students are expected to acquire a comprehensive and meaningful understanding of mathematics, including understanding the learning objectives, mathematical concepts, learning strategies, relationships between concepts, and the benefits of mathematics in life. Through learning to do, students are expected to develop critical, creative, and efficient thinking skills in solving mathematical problems (Peter, 2012). Through learning to live together, students are expected to develop good social attitudes. And through learning to be, students are expected to develop a positive attitude toward mathematics, such as appreciating mathematics, working hard, being responsible, and having high motivation and confidence in learning mathematics.

According to Lawrence (1965), elementary school students, aged 6 to 13, are in the concrete operational stage, where they can think logically about concrete events and classify objects. Steffe (2013) adds that at this stage, children begin to build a thought system that works at the concrete level and learn sequentially. This shows that elementary

school students can already connect knowledge and solve problems in everyday life by thinking logically about concrete events through learning obtained at school.

From a cognitive development perspective, elementary school students are still bound to concrete objects that can be perceived with the senses. In abstract mathematics learning, students require aids such as media and teaching props that can clarify the material presented by the teacher to help them understand more quickly. The learning process at this concrete stage can go through concrete, semi-concrete, semi-abstract, and finally reach the abstract stage. Based on the characteristics of elementary school students, mathematics learning should connect previous learning experiences with the new concepts being taught so that students can assimilate new information effectively. This aligns with Brown & Palincsar (2018) view that students should be guided to approach every new task with the knowledge they have already acquired and build their understanding. Therefore, students need more opportunities to learn mathematics through problem-solving that arises in real-life contexts, by applying mathematical concepts in other fields of study.

2. Materials and Methods

2.1. Materials

2.1.1. Mathematical Literacy

Mathematical literacy in the Programme for International Student Assessment (PISA) focuses on students' ability to analyze, argue, and effectively communicate ideas, as well as to formulate, solve, and interpret mathematical problems in various forms and situations (Jablonka, 2003). The assessment in PISA is aimed at real-life problems that are outside the typical classroom context, as well as other situations where mathematical abilities such as quantitative and spatial reasoning become essential tools for explaining and solving those problems.

Although attitudes and emotions, such as self-confidence, curiosity, interest, relevance, and the drive to act or understand something, are not directly part of the components of mathematical literacy, they are important supporting factors. A person can indeed demonstrate mathematical literacy without showing any specific attitudes or emotions, but the presence of these aspects can strengthen the learning process.

Mathematical literacy is closely related to real-world problems that arise within a life context (Manfreda et al., 2021). Therefore, students are expected to address real-life problems by relying on the knowledge and skills they have developed from both daily experiences and the learning process at school. The main process underlying this ability is known as mathematization, which is the process of transforming contextual problems from the real world into mathematical forms so that they can be solved systematically. Through this process, students are expected to interpret, evaluate, and reflect on the solutions generated to ensure that the solutions are relevant and consistent with the initial context of the problem.

According to the OECD, mathematical literacy includes a number of basic skills that every individual should possess, including (Faubert, 2009):

a) Communication, which is the ability to present and explain problems mathematically.
b) Mathematical modeling, which is the ability to convert real-life problems into mathematical forms, and vice versa.
c) Reasoning and Justification, the ability to think logically and provide justification for a solution or approach.
d) Representation, which is the ability to express or depict a mathematical problem through various forms of presentation.
e) Development of Problem-Solving Strategies, which is the skill in selecting and applying the appropriate strategies to solve a problem.
f) Use of Symbolic, Formal, and Technical Language, which includes the ability to use symbols, formal notation, and technical terms in the context of mathematics.

Use of Mathematical Tools, which refers to the skill of using various mathematical aids, such as measuring instruments, to support the problem-solving process.

2.1.2. The Mathematics Learning Process for Elementary School Students

Mathematics learning is a process that involves two main activities that are closely related: the learning activities by students and the teaching activities by teachers. These two elements work together to form a comprehensive interaction between teachers and students, among students, and between students and the environment during the learning process add that the teaching and learning activities are a situation intentionally designed, where the teacher plays a role in delivering the material and students engage in the learning process (Burns et al., 2014). The educational interaction formed through these relationships is assisted by the use of learning media, which serves as a tool to stimulate and develop students' learning potential.

Mathematics learning is expected to provide a complete, comprehensive, and interconnected understanding of the material being taught. This understanding is not only limited to fulfilling the material aspects but also has real value for students in their daily lives.

One of the key elements in the education world is the teacher. Their role is crucial in determining the success of the learning process, as teaching and learning activities are the core of the entire educational process. According to Forrest (2004), learning involves reciprocal interaction between teachers and students in an educational environment, aiming to achieve specific learning outcomes. Teachers have various roles, including being educators, classroom leaders, guides, learning environment managers, lesson designers, supervisors, motivators, and assessors of learning outcomes.

Shanks and John (1994) states that learning has two main characteristics: (1) the learning process emphasizes the optimal mental involvement of students, not just listening or taking notes, but encouraging deep thinking activities; and (2) the creation of a dialogical atmosphere through continuous question and answer to enhance students' thinking abilities and support the formation of knowledge constructed by the students themselves.

2.1.3. Contextual Learning

Contextual learning is an approach that engages students in meaningful activities, allowing them to connect academic lessons with real-life experiences they encounter. This connection helps students understand the significance of each school task. When faced with interesting tasks or problematic situations, students are challenged to make choices, take responsibility, seek information, and draw conclusions. Activities such as planning, organizing, investigating, touching, questioning, and making decisions actively serve as a means for students to link academic lessons with real life, making the learning process more meaningful. Finding that meaning is the main essence of contextual learning (Johnson, 2002: 35).

Contextual learning emphasizes the importance of active student involvement in understanding the material by relating it to real-world situations they face, thus encouraging students to apply it in their everyday lives (Maftuh, 2023). This approach is a teaching method that helps teachers connect the subject matter with students' real world, assisting students in linking their existing knowledge with its application in life as members of families, communities, and the workforce (Sivarajah et al., 2019).

Some characteristics of contextual learning include:

a. The learning process takes place in a real-life context, with the aim of ensuring that the skills developed are relevant and can be directly applied in everyday life (learning within the context of real life).
b. Students are given opportunities to work on tasks that are meaningful and connected to life, making the learning process more significant.
c. Students learn through direct experiences or practical activities (learning through action).
d. The learning process is collaborative, involving group work, discussions, and peer feedback (learning in groups).
e. The learning process encourages a sense of togetherness, cooperation, and deep understanding among students (learning to get to know each other better).
f. Learning activities are active, creative, and productive, emphasizing the importance of interaction and cooperation (learning to ask questions, investigate, and collaborate).
g. The learning environment is designed to be enjoyable and foster students' enthusiasm for learning.

2.2. Methods

There are four steps in implementing contextual learning (Hartono, 2007), namely: (1) motivation, (2) understanding, (3) application, and (4) assessment.

a) Motivation Phase
This stage aims to stimulate students' interest and generate initial ideas about the material to be discussed. Activities in this phase include: (1) direct involvement, and (2) personal experiences. Although similar to the apperception stage in conventional learning, this phase emphasizes student involvement through real actions or experiences they have had. In practice, the teacher begins the lesson with what the students already know, presents interesting and useful material, and sparks curiosity about new knowledge or challenges that need to be solved. The main components of contextual learning in this stage are: constructivism, questioning strategies, modeling, and authentic assessment.

b) Understanding Phase
In this stage, the main focus is to build and deepen students' understanding of the concept being studied. The material is presented in a variety of ways to make it more engaging, and students are encouraged to express their opinions or ideas related to the topic. Activities in this phase include: (1) presenting ideas, and (2) developing concepts. This stage is similar to the exploration phase in the constructivist approach, where students link their personal experiences with the new material being taught by the teacher, and the teacher uses appropriate methods to reinforce students' understanding. The components of contextual learning that play a role in this phase include: constructivism, questioning, modeling, and authentic assessment.

c) Application Phase
In this phase, students are expected to apply the knowledge they have acquired through both direct practice (hands-on) and deep thinking (minds-on). This approach helps students connect knowledge with real-life

situations to solve problems. Teachers can design relevant scenarios or cases to support students' understanding, such as providing problems that require the use of tools like a protractor or compass after they have learned about them. The components of contextual learning in this application phase include: discovery process, questioning, learning community, modeling, and authentic assessment.

d) Evaluation Phase
This phase aims to review the key points of the material and assess the extent of students' mastery of the learning. Teachers can help students recall the main concepts that have been taught and involve them in discussions to enrich their understanding. After that, an assessment is conducted to measure students' learning progress. The main activities in this phase include: reviewing important information and evaluating students' development. The components of contextual learning included in the evaluation phase are: reflection and authentic assessment.

3. Results and Discussion

Based on the literature review conducted, it is found that mathematical literacy, the learning process of elementary school (SD) students, and the contextual learning approach are three key components that are interconnected in supporting the success of mathematics learning at the primary level. Mathematical literacy reflects students' ability to understand and use mathematics in various real-life contexts, while the learning process of SD students shows that children are at the stage of concrete operational cognitive development, requiring concrete media in learning. On the other hand, the contextual learning approach bridges the gap between abstract mathematical material and the students' everyday reality.

The four stages of contextual learning, namely motivation, understanding, application, and evaluation, are proven to align with the cognitive development stages of elementary school children. These stages support meaningful learning and allow students to relate new knowledge to their prior experiences. Learning components such as constructivism, modeling, questioning, learning communities, and authentic assessment become important elements in each stage of the learning process.

The study results show that mathematical literacy not only includes the ability to solve mathematical problems technically but also requires students to interpret and evaluate problems in the context of the real world. This reinforces the importance of a learning approach that emphasizes direct experience and active student engagement.

In line with the cognitive development characteristics of SD students according to Piaget's theory, they are at the concrete operational stage, which demands real-life experiences and concrete objects as bridges to understand abstract concepts. Therefore, mathematics learning at the elementary level needs to be carried out gradually, starting from the concrete stage, then semi-concrete, and eventually to the abstract, so that the concepts taught can be fully internalized.

The contextual learning approach provides an effective alternative because it connects the learning material to the students' everyday lives. This aligns with the principles of "learning to know" and "learning to do" in UNESCO's four pillars of education, which encourage students to understand concepts and apply them in real situations. Through the motivation phase, teachers can stimulate students' interest in learning; in the understanding phase, students are encouraged to build new knowledge based on their prior experiences; the application phase allows students to implement knowledge in real-world contexts; and the evaluation phase provides space for reflection and reinforcement of the material that has been learned.

Overall, the integration of mathematical literacy, the characteristics of SD students, and the contextual approach creates a more meaningful, enjoyable learning process and can comprehensively improve students' mathematical competence. This emphasizes that the success of mathematics learning is not only determined by mastery of the material but also by the learning strategies that meet the needs and characteristics of the students.

4. Conclusion

Mathematical literacy refers to the skills involved in exploring, estimating, and making logical reasoning using various mathematical methods efficiently to solve problems. Meanwhile, contextual learning focuses on the active involvement of students in discovering the learning material themselves and relating it to real-life situations, thus encouraging students to apply the material in everyday activities. The process of mathematization allows students to transform real-world problems into mathematical forms that can be used for solutions. Through mathematization, students are encouraged to understand, assess, and evaluate the solutions to these problems to ensure that the solutions obtained are relevant to the real-world conditions that triggered the issue. Therefore, contextual learning enables elementary school students to solve problems accurately. In practice, contextual learning is carried out through four stages: motivation, understanding, application, and evaluation, which refer to the key elements in the contextual approach.

References

Brown, A. L., & Palincsar, A. S. (2018). Guided, cooperative learning and individual knowledge acquisition. In *Knowing, learning, and instruction* (pp. 393-451). Routledge.

Burns, M., Pierson, E., & Reddy, S. (2014). Working together: How teachers teach and students learn in collaborative learning environments. *International Journal of Instruction*, *7*(1).

Faubert, V. (2009). School Evaluation: Current Practices in OECD Countries and a Literature Review. OECD Education Working Papers, No. 42. *OECD Publishing (NJ1)*.

Forrest, S. (2004). Learning and teaching: the reciprocal link. *The Journal of Continuing Education in Nursing*, *35*(2), 74-79.

Jablonka, E. (2003). Mathematical literacy. *Second international handbook of mathematics education*, 75-102.

Johnson, E. B. (2002). *Contextual teaching and learning: What it is and why it's here to stay*. Corwin Press.

Lawrence, P. J. (1965). Children's thinking about religion: A study of concrete operational thinking. *Religious Education*, *60*(2), 111-116.

Maftuh, M. S. J. (2023). Understanding learning strategies: a comparison between contextual learning and problem-based learning. *Educazione: Journal of Education and Learning*, *1*(1), 54-65.

Manfreda Kolar, V., & Hodnik, T. (2021). Mathematical literacy from the perspective of solving contextual problems. *European Journal of Educational Research*, *10*(1), 467-483.

Peter, E. E. (2012). Critical thinking: Essence for teaching mathematics and mathematics problem solving skills. *African Journal of Mathematics and Computer Science Research*, *5*(3), 39-43.

Shanks, D. R., & John, M. F. S. (1994). Characteristics of dissociable human learning systems. *Behavioral and brain sciences*, *17*(3), 367-395.

Sivarajah, R. T., Curci, N. E., Johnson, E. M., Lam, D. L., Lee, J. T., & Richardson, M. L. (2019). A review of innovative teaching methods. *Academic radiology*, *26*(1), 101-113.

Steffe, L. P. (2013). Learning stages in the construction of the number sequence. In *Pathways to number* (pp. 83-98). Psychology Press.

Syafriafdi, N., Fauzan, A., Arnawa, I. M., Anwar, S., & Widada, W. (2019). The tools of mathematics learning based on realistic mathematics education approach in elementary school to improve math abilities. *Universal Journal of Educational Research*, *7*(7), 1532-1536.