

Improving Critical Thinking Character Through Numeracy Literacy For Elementary School Students

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Dikirim : 23 Juli 2025

Diterima : 29 Juli 2025

Terbit : 31 Agustus 2025

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Cara citasi: Anggraini, D.M., Mubarak, H., & Sari, I.F. (2025) Improving Critical Thinking Character Through Numeracy Literacy For Elementary School Students. Dawuh Guru: Jurnal Pendidikan MI/SD, 5(2), 137- 148. <https://doi.org/10.35878/guru.v5i2.1807>



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Abstract

Numeracy literacy is very important for elementary school students because it provides a basis for applying mathematics in everyday life. Numeracy literacy requires students to think critically in solving problems. Moreover, elementary school is early childhood education to start getting used to thinking through research and analysis. Researchers use qualitative research in literature studies by reviewing various sources such as books, articles, modules, and final research assignments. The results of the research are that there are several ways to shape the critical thinking character of elementary school students with numeracy literacy, namely 1) using interactive learning models such as project-based learning and problem-based learning; 2) application of numeracy literacy in various classroom activities; and 3) conveying meaningful mathematical values during learning. A teacher can use these three methods optimally, provided that a teacher must also apply numeracy literacy in everyday life. So it will be easier for students to imitate and apply it.

Keyword: Critical Thinking Character, Numeracy Literacy, Elementary School Student

A. Introduction

The results of the 2018 PISA study released by the OECD show that Indonesian students' ability in mathematics has an average score of 379, with an OECD average score of 487 (Situmorang, 2022). To solve this problem, the Government conducted a national assessment to determine the level of numeracy literacy specifically and in detail. Numeracy literacy in Indonesia still needs to improve, especially in elementary schools. Data shows that 18 percent of education units at the elementary school require special intervention. This figure is much higher compared to other levels, such as middle school (8 percent), high school (6 percent) and vocational school (7 percent) (Masyhadi, 2022). Elementary school is a priority because it is the most crucial period to correct literacy and numeracy issues at this level.

Numerical literacy is beneficial for elementary school students because students can have knowledge and skills in planning and managing good activities, doing calculations and interpreting existing data in everyday life, making the right decisions in every aspect of their lives. Mathematics as a basic concept for solving problems in everyday life (Anggraini, 2023). Critical numeracy literacy impacts not only educational aspects but also social aspects and community sustainability.

If numeracy literacy is low, it will significantly impact the ability to process information critically, which will be very low. So, it is vulnerable to hoaxes and manipulation (Geiger et al., 2015). Critical thinking is necessary for students to be crucial throughout the learning process in the classroom. Students are accustomed to using reasoning systems to solve problems faced by students. The ability to think critically in elementary school students is something that students must develop. Critical thinking skills will train students to examine, analyze, and evaluate information or opinions before accepting or rejecting that information (Mubarok et al., 2023).

Several previous studies have been carried out. However, we only focus on one aspect, such as Numeracy as Critical Thinking (O'Donoghue, 2006). This study emphasizes that numeracy is not merely a basic calculation skill, but also a form of critical thinking. O'Donoghue explains that numeracy involves the ability to use mathematical knowledge in real-life situations reflectively, logically, and critically. In the educational context, this approach encourages students not only to solve problems but also to understand, evaluate, and apply numerical information in various situations. This demonstrates that numeracy has great potential as a means to build critical thinking character. In other side, Husni Mubarok research about literation skill to improve higher-order thinking skills in elementary school students (Mubarok & Anggraini, 2020). This study shows that the implementation of literacy, both reading and numeracy, can help elementary school students develop higher-order thinking skills (HOTS). Through contextually designed literacy activities, students are encouraged to analyze, evaluate, and create new ideas from

the information provided. In this case, numeracy literacy becomes one of the mediums that can enhance students' critical thinking skills, as they are guided to think logically and systematically when solving problems. Critical thinking: Why we must transform our teaching (Elder et al., 2016) This study highlights the importance of transforming teaching approaches to foster students' critical thinking skills. Elder and colleagues argue that critical thinking is not a naturally occurring ability but must be explicitly taught through structured teaching strategies. One of the recommendations is to integrate critical thinking skills into all subjects, including mathematics, so that students not only learn content but also how to think deeply, logically, and reflectively. Learners' critical thinking about learning mathematics (Sachdeva & Eggen, 2021). This study focuses on how students practice critical thinking in the process of learning mathematics. The findings reveal that when students are encouraged to reflect on how they learn mathematics (metacognition), they become more aware of their own thinking processes. This helps improve their critical thinking skills as they are able to identify effective strategies, evaluate mistakes, and make better decisions in solving mathematical problems. All four sources confirm that numeracy can be an effective tool for developing critical thinking character, especially at the elementary school level. Numeracy literacy not only enhances basic arithmetic abilities but also trains students to Analyze and evaluate information, Use logic in decision-making, Reflect on their thinking processes, and Solve problems creatively and systematically. Therefore, this research aims to explain how to improve critical thinking character through numeracy literacy in elementary school students. Teachers can use the results of this research as learning material for elementary school students.

B. Research Methods

This research is qualitative, like a literature study. According to Zed, library research is a series of activities related to collecting library data, reading, recording, and processing research materials (Zed Mestika, 2017). The data collected in this research was obtained by reading and taking notes, then processing the appropriate information needed to answer the problem formulation to be solved. The research data source is a secondary data source because the data is obtained from news, articles, and journal publications. The data collection technique is done through documentation, namely exploring the variables or things being researched through notes, books, papers, news articles, and journal publications (Arikunto, 2024).

The procedures carried out in this library study research include: 1) exploring general ideas about the research, 2) looking for information that supports the research topic, 3) emphasizing the focus of the research and organizing appropriate materials, 4) Searching for and finding data sources in the form of primary library sources, namely books and scientific journal articles, 5) re-organizing material and conclusions obtained from data sources, 6) reviewing information that has been

analyzed and is suitable for discussing and answering the research problem formulation, 7) enriching data sources to strengthen data analysis and 8) compiling research results. (McMillan & Schumacher, 2010)

C. Result and Discussion

Based on the results of the literature search, it was found that there are several ways to improve critical thinking character through numeracy literacy for elementary school students.

1. Using interactive learning models such as problem-based learning and project based learning

a. Problem based learning

Teachers can use the problem-based learning (PBL) model to improve critical thinking skills through numeracy literacy. Because problem-based learning includes coverage of numeracy literacy, students must be able to think and communicate quantitatively understand data (Marhayati, 2022), have spatial awareness, understand patterns and sequences, and recognize situations where mathematical reasoning can be applied to solve problem (Ronis, 2008). Problem-based learning is a model that helps improve lifelong learning skills in an open, reflective, critical, and active learning mindset (Etherington, 2011). Problem-based learning uses real-world problems as a context for students to learn through critical thinking and problem-solving skills to obtain essential knowledge and concepts from the subject matter (Jonassen & Hung, 2008) .

The Problem-Based Learning model uses authentic problems so students can construct their knowledge, make students independent, develop higher skills and inquiry, and increase self-confidence. With this learning model, students from the start are faced with various life problems that they may encounter later after graduating from school. The Problem-based learning model presents learning material by making problems the starting point for discussing problems to be analyzed and synthesized to find solutions or answers by students (Khoiriyah et al., 2018) . Problems can be raised or given by teachers to students, from students with teachers, or from students themselves, which are then used as discussions, and solutions are sought as student learning activities. Problem-Based Learning invites students to learn how to solve problems in groups to find solutions to everyday contextual problems (Wilson et al., 1999).

The problem-based learning model aims to improve learning skills in an open, critical, and active mindset, which can improve students' numeracy abilities. Applying the Problem-Based Learning model requires a learning model adapted to the students' environmental conditions. Implementing problem-based learning can improve thinking and reasoning skills, thereby triggering students' creativity in expressing ideas.

Problem-based learning can motivate and create a sense of challenge in students to find solutions. The problem-based learning model also trains students to have higher-order thinking skills (Nurcahyono, 2023). There are 6 steps in problem-based learning, which he later called the problem-solving method, namely (JS Miller, 2004):

- 1) Formulating the problem, namely the student's step in determining the problem to be solved.
- 2) Analyzing the problem, namely the student's step in reviewing the problem critically from various points of view.
- 3) Formulating a hypothesis, namely the steps students take to formulate various possible solutions according to their knowledge.
- 4) Collected data, namely the steps by students to search for and describe the information needed to solve the problem.
- 5) Hypothesis testing is the steps by students to draw or formulate conclusions by accepting and rejecting the proposed hypothesis.
- 6) Formulate recommendations for solving the problem, namely the students' steps in describing recommendations that can be carried out according to the formulation of the results of hypothesis testing and the formulation of conclusions.

b. Project Based Learning

Project Based Learning is innovative learning centered on students and establishes teachers as motivators and facilitators where students can work autonomously to construct their learning (Kokotsaki et al., 2016). The project-based learning model relies on the concept of constructivist learning, so it can support students in building their knowledge based on their own experiences (Krajcik & Czerniak, 2018). This Project Based Learning learning model is designed so that students can solve a problem through project activities. Students will get real experience in planning a project with this project work.

Project-based learning is a learning model that uses problems to collect and integrate new knowledge based on experience in actual activities. The use of the project-based learning model influences students to be able to communicate construct results related to the experiences they have had with numeracy literacy and digital literacy material, to be more active in providing the ideas they have, to be able to represent mathematical situations in the form of graphs, tables, diagrams or equations. , the power of creative thinking and critical thinking increases (Krajcik & Czerniak, 2018). Not only that, students can filter information obtained from the internet without needing to be reminded and can maintain ethics in using the internet properly.

A learning model that uses projects as a learning process activity achieves competency in attitudes, knowledge, and skills. The advantages of using the Project Based Learning learning model are that it can increase students'

motivation in preparing projects, improve problem-solving abilities, increase collaboration and cohesiveness, and improve resource management skills (Aksela & Education, 2019).

2. Application of numeracy literacy in various classroom activities

Numeracy literacy can be applied with various activities in elementary school classes so that students can achieve optimal critical thinking skills. Many learning activities can be used by teachers who can refer to the website of the Ministry of Education and Culture <https://bersamahadapikorona.kemdikbud.go.id/tingkat-sd-modul-belajar-literasi-numerisasi/>. The website has three modules: a module for students, a module for accompanying teachers, and a module for accompanying parents. The Student Learning module contains contextual learning activities, which can be carried out by students accompanied by parents or other family members from home and will help students achieve literacy and numeracy competencies in various subjects. The Accompaniment Module for Parents contains tips for accompanying children when studying, tips for other literacy and numeracy activities that can be carried out, and an organizer table that summarizes learning in one week, making it easier for parents to prepare children's learning needs and strategies for learning. The Companion Module for Teachers contains an explanation of the module distribution mechanism, how to provide feedback for assessing student performance, a description of KD mapping and the module's frame of reference, and an explanation of student activities during one week of learning so that teachers can continue to facilitate and monitor students when learning from home.

One example of learning activities is in Mathematics class .

Basic Knowledge Competency, namely explaining the meaning of whole numbers up to 50 and the place values that makeup number symbols using a collection of concrete objects and how to read them. The primary competency skill is to present whole numbers up to 50, which express the number of members of a collection of objects with the idea of place value. Numeracy literacy learning in class consists of seven activities.

a. Number Sense Routine

Number sense is the ability to think flexibly with numbers, which includes magnitude values, mental computation, estimation, and the reasonableness of calculation results. In number intuition activities, students carry out activities that train the ability to "see" numbers, count, relationships between quantities, and so on. For example, Students can quickly recognize the number of objects without counting.

b. Mathematical Concepts

In this activity, students are given a copy of a book containing a script explaining concepts to be read interactively. If students have internet

access, students can watch videos on the YouTube channel. Teachers have told parents how to access videos on YouTube. Copies of the book and videos on the YouTube channel introduce mathematical concepts and are followed up with activities. For example, after reading a book copy and watching a video about numbers appearing everywhere, students are asked to look for numbers in their houses and surroundings.

c. Mathematical exploration/problem solving

Parents and students carry out activities together that contain mathematical elements in mathematics exploration activities. In this activity, students will explore mathematics to build concepts and solve problems that can improve high-order thinking skills.

d. Exercise

The practice activity is to master the concepts that have been explored. Here, students can do it independently with the worksheets provided. For class 1, the exercises are still simple and illustrated. In grade 1, the exercises are still simple, with pictures and lots of drawing, coloring, or circling activities. Pictures are still used for grades 2 and 3, but there are exercises in the form of numbers.

e. Project (on day 6)

The project is carried out at the end of learning, day 6. The projects that will be carried out are integrated with literacy and cross-subjects as possible. For example, students make posters about themselves and their families using numbers. The complexity of the numbers used is according to the class level: class 1 uses simple numbers up to ten, class 2 uses more significant numbers in the form of sums or differences, and class 3 uses multiplication and division. Through this activity, students also integrate it with other subjects, such as linking culture with family traditions and habits, science with their senses, etc.

f. Reflection on Learning

The learning activity ends by filling in a reflection sheet. This reflection aims to see student progress in achieving learning goals. This reflection also provides input for teachers to know the support that should be given to students in the learning process. This learning reflection includes activities: number intuition, mathematical concepts, mathematical exploration/problem-solving, and exercise.

3. Conveying meaningful mathematical values during learning.

Real problems from everyday life are used as a starting point for learning mathematics to show that mathematics is close to everyday life. Natural objects familiar with students' daily lives are used as teaching aids in mathematics learning (Anggraini et al., 2023). Students become more interested and enjoy learning mathematics and show satisfactory increases in learning outcomes

(Sarumaha et al., 2024). This argument is in line with Nur Cahyono's opinion that a good and effective learning model, especially in the learning process and mathematics learning, is learning that can combine contextual and realistic problems (Nurcahyono, 2023). This pattern includes mathematical environmental orientation, modeling of teaching aids, building foundations, and formal mathematics. Meaningful mathematics learning is the use of reality and the environment that students understand to assist in the mathematics learning process so that the desired goals can be achieved better than before. Meaningful mathematics learning is closely related to several things, including mathematical concepts, problem-solving, and critical thinking skills to solve everyday problems. Meaningful mathematics learning brings students into the real world of everyday experiences so that the lessons learned in mathematics classes are not separated from the real world (Purnawanto, 2022).

Students are allowed to actively respond to contextual problems given by the teacher by being given the freedom to search for answers in various ways. Students can solve questions or problems the teacher gives in their way. Apart from that, students are given the freedom to compare and discuss the answers obtained. This assumption is based on Freudenthal's theory that mathematics is a human activity. According to him, this means that students must be allowed to rediscover mathematics under adult guidance, prioritizing contextual problems, and students are free to find ways to solve the problems given (Khakima et al., 2021).

D. CONCLUSION

Improving critical thinking character through numeracy literacy can be done in three ways, namely 1) using interactive learning such as problem-based learning and project-based learning. In problem-based learning, students can construct knowledge, become independent, develop higher skills and inquiry, and increase self-confidence. Meanwhile, the use of the project-based learning model invites students to be able to communicate construct results related to the experiences students have with numeracy literacy and digital literacy material, to be more active in providing ideas, able to represent mathematical situations in the form of graphs, tables, diagrams or equations, creative thinking skills, and critical thinking increases. 2) Application of numeracy literacy in various class activities consists of seven activities, namely a) Number Sense Routine; b) Mathematical Concepts; c) Mathematical Exploration/Problem solving; d) Exercise; e) Project; f) Reflection on Learning. 3) Meaningful learning in mathematics subjects. Natural objects familiar with students' daily lives are used as teaching aids in mathematics learning so that students become more interested and enjoy learning mathematics and show satisfactory increases in learning outcomes.

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