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Analysis of critical thinking skills in mathematics subjects of fourth grade students of SD Muhammadiyah Sugio Lamongan

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ABSTRACT

Critical thinking skills are an ability that must be possessed by students in the learning process. The process of learning mathematics is interrelated with the learning process of critical thinking in students because it trains students to solve problems that are included in the indicators of critical thinking skills. Many students are not interested in learning mathematics so that their critical thinking skills become low due to lack of problem solving. This study aims to determine the critical thinking skills of fourth grade elementary school students in mathematics. This research uses a qualitative descriptive method. Qualitative descriptive method is a research method carried out based on a qualitative approach that covers natural conditions and problems about a person's experience in the place under study. The instruments used in collecting research data are observation, interviews, questionnaires, and documentation studies. The subjects of this research were students of SD Muhammadiyah Sugio Lamongan. The focus of this research is the ability of critical thinking in grade IV students at SD Muhammadiyah Sugio Lamongan. The results of this study indicate that students' critical thinking skills in math subjects are still fairly low. This is because among the six indicators of critical thinking skills observed there are still many students who have not fulfilled these indicators.

Keywords: Analysis, Critical Thinking, Learning, Mathematics, Primary School

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INTRODUCTION

Education plays an important role in determining one's future life journey. Through education, individuals are expected to develop critical thinking potential that enables them to actively participate in life. Education also serves to train critical thinking skills, especially for students. With this critical thinking ability, they are expected to be able to overcome various problems through active thinking, thus fostering great curiosity (Tinambunan et al., 2023). Critical thinking ability is an ability that must be possessed by students in the learning process. By thinking critically, students will be better able to face and solve various problems that arise in the real world. (Saputri, 2020). The learning process in the independent curriculum, the ability to think critically is essential because independent curriculum learning emphasizes the ability of a student-centered learning process. This can train students to think more critically. In connection with the results of the 2022 PISA assessment, Indonesia ranked 68th with an increase in math (379), science (398), and reading (371) scores (Waluyo & Fiantika, 2024).

The results of the PISA survey show that the numeracy skills of students in Indonesia still need to be improved because they have not reached the optimal level, so that the critical thinking skills of students are low (Benu et al., 2024). A learning process is needed that can improve students' critical thinking skills by learning mathematics so that students are able to solve problems or problems. Numeracy skills in math learning not only help students face challenges during the learning process, but also train them to solve everyday problems that are closely related to mathematical principles (Rahmasari, 2022).

According to (Sihotang, 2019) the context of the critical thinking process, mindsets in the past tended to be constant, automatic, spontaneous, and followed existing rules. However, in the current era, students are required to have a more adaptive mindset and be sensitive to the learning environment which is one of the sources of learning. This is important so that students can train their thinking process. With better thinking skills, especially critical thinking, students are expected to solve learning problems synergistically and cooperatively. Therefore, improving the critical thinking skills of innovative teachers is also needed through a higher order thinking approach, especially in overcoming the challenges of learning in the current era of society 5.0 (Subandowo, 2022). Critical thinking is a process of purposeful and clear judgment, based on reflective thinking used in decision-making. If this ability is not trained early, students will have difficulty in understanding complex concepts at the next level of education. Therefore, critical thinking is an ability needed in the learning process where students are trained to solve problems early on.

Critical thinking skills are influenced by various factors. Among these are the creation of a conducive learning environment, formulation of questions relevant to the material, solving problems that arise, and applying learning concepts that support critical thinking. Indicators of critical thinking skills include: (1) the ability to analyze arguments, (2) the ability to ask questions about the arguments that have been analyzed, (3) the ability to provide answers to questions related to the argument, (4) the ability to solve problems in the analyzed arguments, (5) the ability to draw conclusions, and (6) the ability to evaluate and criticize the results of observations. Thus, there are six steps that can be taken to improve critical thinking skills, all of which are interrelated with the processes of interpretation, analysis, evaluation, and decision making in an effort to improve students' critical thinking skills (Faidah et al., 2022).

Students' critical thinking skills at the elementary school level can be improved through learning mathematics. In this process, students are invited to understand how arithmetic operations work, especially when learning about fractions and how to treat them (Setiawan & Aji, 2024). In addition, they are also given the opportunity to deal with math operations such as addition, subtraction, multiplication and division. With this learning approach, students will continue to develop, which in turn will improve their critical thinking skills (Waluyo & Fiantika, 2024).

Critical thinking in mathematics involves a series of activities, such as analyzing arguments, evaluating information, and developing logical reasons and conclusions. Among the materials that elementary school students often find difficult are fractions. However, this topic actually provides many opportunities to practice critical thinking skills through different types of contextualized problem-solving problems. For example, when students are asked to compare fractions or solve mixed operations in story problems, they are required to use logic, apply problem-solving strategies, and evaluate the results in a critical way (Sumarmo, 2010).

Mathematics should be taught to all students from the primary school level, to equip them with critical thinking skills. This is important so that students can obtain, manage and gain the information needed to live a better life in the midst of ever-changing, uncertain and competitive conditions (Dian Oktaviani et al., 2023). In order for students to better understand math learning, a model is needed that serves as a bridge between abstract and concrete concepts. In this context, the use of props or media in learning mathematics is very important. In addition, it is expected that students are always actively involved in the learning process, so that they can more easily understand the material being taught. However, in practice, there are often various obstacles that hinder the mathematics learning process. In fact, until now there are still many students who consider math as a difficult, unpleasant, and even scary subject. Learning mathematics is not only related to counting numbers, but emphasizes relationships, patterns, shapes, structures, facts, concepts, operations, and principles. This shows that mathematics deals with structured ideas, where the relationships are organized logically. The concepts in mathematics are abstract and the reasoning is deductive. To improve students' positive attitude, a conducive learning atmosphere is needed so that they can be more focused and interested in the learning process. Therefore, teachers should apply various methods and learning resources, including the use of innovative digital media in learning (Jediut et al., 2022).

Therefore, it is very important to explore ways of learning mathematics, especially regarding fraction material, so that it can be maximally utilized in improving the critical thinking skills of elementary school students. Learning mathematics is as important as learning logic, because the position of mathematics in the world of knowledge is as a fundamental science or as a basic tool (Shoffa et al., 2022). The selection of methods, models and media in learning can improve students' critical thinking skills. This is based on previous research conducted by (Ainurrohmah et al., 2024) with the title "The Effect of TGT Learning Model Assisted by Wordwall Media on Students' Critical Thinking Ability," it was found that the TGT learning model supported by Wordwall media was proven valid in improving students' critical thinking ability. This is evidenced by the results of the paired sample t-test which shows a Sig. (2-tailed) of 0.00.

Based on the results of interviews and observations, it is found that critical thinking skills have been applied, but not all indicators in critical thinking skills have been optimized. Given the importance of critical thinking skills for students, it is necessary to conduct further research on critical thinking skills. Therefore, the research will analyze with the title "Analysis of critical thinking skills of grade IV elementary school students in mathematics subjects" in order to determine the category of critical thinking skills, as well as the achievement of each indicator of students' critical thinking. It is hoped that teachers can plan relevant lessons to hone critical thinking skills in elementary school students.

METHODS

This research uses a descriptive qualitative method with a case study approach that integrates various data collection techniques and sources of information to explore the critical thinking skills of fourth grade students in mathematics. The research was conducted in November in the even semester of the 2024/2025 school year at SD Muhammadiyah Sugio Lamongan. The

research subjects included the class teacher and grade IV students consisting of 20 students for class IV A and 20 students for class IV B.

Instruments used to collect data include observation, interviews, questionnaires, and documentation studies. Data collection technique through observation is a scientific activity that is empirical and factual, which is carried out based on experiences gained through the five senses without manipulation. In the context of qualitative research, observation functions to generate theories and hypotheses, while in quantitative research, observation is used to test existing theories and hypotheses (Hasanah, 2020). The data collection technique through interviews is a data collection technique that involves direct interaction between researchers and interviewees. Through this method, researchers can explore in-depth information about the views or experiences of the interviewees (Romdona et al., 2025). The data collection technique through questionnaires aims to identify student needs related to problems faced in learning mathematics. And data collection techniques through documentation studies are techniques for obtaining data by collecting documents that are relevant to the research problem. Documentation studies involve collecting information from documents, archives, or other written materials related to the topic under study (Ardiansyah et al., 2023).

RESULTS

Based on interviews conducted with the fourth grade teacher of SD Muhammadiyah Sugio, the following information was obtained: (1) SD Muhammadiyah Sugio implements the Merdeka curriculum with two classes, namely IV A and IV B, which consist of 40 students in total; (2) On average, students have been able to read and write, but still have difficulty in math lessons, especially in counting, as seen during observations when students seemed confused when answering teacher questions related to arithmetic operation material; (3) Students' mathematics skills are still relatively low due to lack of focus in learning, so many students have not been able to complete tasks from the teacher; (4) Students also show low critical thinking skills when facing math problems, as indicated by the teacher being more active in the question and answer process than students.

Through the results of learning observations and documentation analysis in class IV SD Muhammadiyah Sugio found several things: (1) The selection of learning strategies is still fairly monotonous, namely using the lecture method that refers to the package book or Student Worksheet (LKS); (2) Student involvement in learning is not optimal, as seen from the number of students who are less focused; (3) The lack of student enthusiasm in learning due to the rare use of learning media, both print and digital media, which is only limited to explanations outside the classroom; (4) Many students do not pay attention during math lessons, so they have difficulty solving problems and affect their critical thinking skills. Previous learning results showed that 75% of students scored below the Learning Objective Achievement Criteria (KKTP) set at 75, while only 25% of students managed to score above KKTP. Therefore, a learning approach such as more interesting media is needed to improve students' motivation in learning and their learning outcomes.

The results of the questionnaire distributed to fourth grade students of SD Muhammadiyah Sugio showed: (1) 97% of students rarely ask questions and feel bored in learning, especially in math subjects; (2) 73% of students have difficulty in solving math problems; (3) 73% of students stated that they have never used printed or digital learning media, such as mobile phones, Chromebooks, or PCs; (4) 100% of students are enthusiastic about digital-based learning such as making videos or images. The conclusion from this questionnaire confirms that there is an urgent need for more interesting learning methods, so that students can be more active and motivated in learning, and trained in critical thinking.

DISCUSSION

The ability to think critically is a very important ability in facing various challenges in life. Critical thinking skills are the ability to solve problems (Ramdani et al., 2021). This statement is in line with the view of Hartat et al., (2022) who argues that critical thinking skills allow a person to analyze and evaluate information in depth. This ability also includes asking questions and identifying important issues, as well as formulating these questions and issues clearly. In addition, critical thinkers are able to gather and assess relevant information using abstract ideas, be open-minded, and communicate effectively. A critical thinker is also skilled in criticizing, questioning, evaluating, and reflecting on the information obtained. Students' critical thinking skills can be improved through asking questions that focus on problem solving. With this focus, students are able to analyze and interpret the problems they face, and feel more motivated to find solutions using the knowledge they already have. They can understand, plan, and execute the steps in problem solving. In the context of arithmetic problem solving, it is very important for students to apply their critical thinking skills, to evaluate, analyze, and interpret various problems that arise, so that they can find solutions more effectively (Hikmah, 2022).

Critical thinking skills are a necessity for students, because in real life and the world of work, this ability plays an important role in determining one's success and success. Thus, students who have critical thinking skills will be able to ask the right questions, provide accurate answers, and gather the information needed efficiently and creatively (Riyanto & Ishartono, 2022). Therefore, it is very important for primary schools to start developing a learning process that not only focuses on memorizing information, but also trains students to think critically from an early age. This can be done by creating a learning environment that encourages students to actively ask questions, find out, discuss with friends, and try to solve simple problems related to everyday life. For example, teachers can ask open-ended questions that make students think more deeply, or assign projects that require them to work together and find solutions together. Through these activities, students not only understand the subject matter better, but also learn how to think logically, analyze information, and make decisions with sound reasoning. By familiarizing students with critical thinking from an early age, it is hoped that they will grow into individuals who are independent, confident, and able to face various challenges in the future in a creative and responsible way.

In the learning process, students are encouraged to develop thinking skills, especially in terms of critical thinking when faced with various problems. To be able to think critically, an approach that allows students to gain factual and relevant insights is needed. (Rachmawati et al., 2020). Learning should not only be done with a theoretical approach from the teacher, but also involve students actively in the process. Through interactive learning methods, students will be encouraged to develop high curiosity and be trained to think critically about various problems that arise during the learning process (Adella et al., 2022). The use of learning media in today's digital era is expected to improve teaching standards, as this can encourage a more efficient learning process. The application of learning media that can increase students' engagement, enthusiasm for learning, and cognitive abilities (Isnaini et al., 2023). Therefore, the use of media will make students have the ability to reason, reflect, take responsibility, and expertise is very important in the application of critical thinking skills.

According to (Faidah et al., 2022) indicators that reflect a person's critical thinking skills can be summarized in the acronym FRISCO, which consists of six main components:

1. Focus: the ability of students to explore and analyze the problem at hand;
2. Reason: students' ability to present arguments based on relevant facts, including asking questions related to the analysis;
3. Inference: students' ability to draw accurate conclusions;
4. Situation: students' ability to utilize data in accordance with the context of the problem and produce solutions based on the analysis that has been done;

5. Clarity: the student's ability to explain the argument clearly to avoid errors in drawing conclusions;
6. Overview: students' ability to evaluate the validity of the conclusions that have been drawn.

By understanding and developing these six components, students are expected to improve their critical thinking skills in various situations. Efforts to optimally develop students' critical thinking skills require an interactive classroom. In this context, students are appreciated as thinkers, not just individuals who are taught. On the other hand, teachers act as mediators, facilitators, and motivators who support students' learning process, not just teaching. This study aims to analyze students' critical thinking skills, which is very important to provide input to teachers in designing effective learning and improving students' critical thinking skills. Critical thinking skills are needed so that students are able to collect, organize, and utilize information well, so that they can survive and not easily give up in facing various mathematical problems in everyday life. (Nurfitriyani et al., 2022). Dengan melatih kemampuan berpikir kritis, siswa dapat menemukan berbagai solusi dan lebih berhati-hati dalam menyelesaikan berbagai permasalahan matematis (Ulfa et al., 2023).

Mathematics learning, as an integral part of education, has a very important role in life. Mathematics is a science obtained through a reasoning process, which can improve students' rational thinking skills in dealing with various problems. However, the implementation of mathematics learning cannot be separated from various obstacles, both from teachers and students. Often times, students perceive math as a difficult and irrelevant subject to learn. Therefore, it is important for students to be given a deep understanding of mathematical concepts, so that they can more easily follow the learning process. In this context, the role of the teacher becomes crucial, as they are the figure in control of the learning process and function as the center of education in the classroom. (Wibowo et al., 2022). The ability to process numbers is a crucial basis for students in facing various challenges, especially those related to mathematical problem solving (Primasari et al., 2021).

This problem-solving process supports the development of students' critical thinking. In mathematics, an understanding of fractions is a very important material to master. Mastery of this material not only helps students in learning, but also contributes to improving their critical thinking skills (Alfiansyah & Hakiky, 2021). In addition, teachers need to empower students as much as possible to play an active role in the learning process. To overcome this problem, innovation is needed in the presentation of Mathematics material in the classroom by applying various learning models, strategies, and utilizing media that can support the smooth teaching and learning process. (Hermayuni et al., 2022). In today's ever-evolving digital era, learning media has a very strategic role in the teaching and learning process. The advancement of increasingly sophisticated information and communication technology devices has strengthened this concept. Learning media can be interpreted as a means of conveying information or instructional messages, so that it functions to support the teaching and learning process more effectively. (Anindyah et al., 2024)

Based on the results of research conducted through observations, interviews, questionnaires, and documentation studies, it is known that the critical thinking skills of class IV students in mathematics learning at SD Muhammdiyah Sugio Lamongan are generally low. Students' critical thinking skills are low due to learning that is not student-centered because of monotonous learning methods. In learning mathematics, students are not active in asking questions and answering questions so that learning does not meet the indicators of critical thinking skills. Many students still cannot solve the problem so that students are less able to explore solutions according to the results of students' own thinking. In line with research Hermayuni et al., (2022) which states that students' low problem-solving skills in mathematics are generally caused by students' lack of interest in learning as well as weaknesses in their thinking skills. Therefore, the most important thing to emphasize to students in the process of solving mathematical problems is the development of their critical thinking skills.

Mathematics learning can develop their critical thinking skills because in that learning students solve problems with higher-level thinking which is part of students' critical thinking skills.

The process of solving problems is part of the indicators of critical thinking skills. Therefore, by learning mathematics students can solve problems independently which can be applied to everyday life. This is based on the theory of constructivism by Jean Piaget, which is an approach born from cognitive learning theory. The main purpose of applying constructivism methods in the learning process is to improve student understanding. This approach is closely related to discovery learning and meaningful learning, both of which are based on cognitive learning theory. Constructivism encourages students to actively construct their own knowledge, by following the learning model design that has been prepared by the teacher in accordance with the current curriculum. (Masgumelar & Mustafa, 2021).

The Merdeka Curriculum is a new paradigm in education designed to meet the challenges of the 21st century. In this approach, emphasis is placed on developing skills relevant to the needs of the 21st century, such as critical thinking, creativity, collaboration, communication, problem solving, and digital literacy. In the midst of rapid and complex changes due to technological developments and globalization, the Merdeka Curriculum is present as a solution to prepare a generation that is able to adapt to the dynamics of the times (Iskandar et al., 2023). The 21st century learning model emphasizes the importance of critical thinking skills in a creative, innovative, communicative, collaborative, and problem-solving process. It also requires high social awareness and a global perspective. This concept is in line with the profile of Pancasila Learners in the Merdeka Curriculum, where Critical Reasoning skills are a provision for students to think logically and analyze information in depth (Susandi et al., 2025).

CONCLUSION

Based on the results of research conducted through interviews, observations, questionnaires, and documentation studies in class IV of SD Muhammadiyah Sugio, it can be concluded that students' critical thinking skills in learning mathematics are still at a low level. Some of the factors that contribute to this include the use of monotonous and non-student-centered learning methods, the lack of interesting learning media, and the lack of active involvement of students in the learning process. Many students have difficulty in solving math problems and feel unaccustomed to expressing opinions or questions. In addition, the learning results show that most students have not reached the Criteria for Achieving Learning Objectives (KKTP). Critical thinking skills are important abilities that greatly support problem solving skills in mathematics.

Therefore, there needs to be innovation in the use of learning media that can encourage student activeness, strengthen critical thinking aspects, and create a more enjoyable learning atmosphere. One solution that can be applied is to optimally utilize digital learning media, such as interactive videos, mathematics applications, or educational games that are in accordance with the developmental level of elementary school students. Digital media that is attractive and easy to use can help students focus more, understand concepts in a more visual and contextual way, and build greater curiosity. With this approach, students are expected to be more courageous in asking questions, try to solve problems independently, and get used to thinking logically and systematically. If applied consistently, these efforts will not only improve students' critical thinking skills in mathematics, but also help them build a strong foundation of thinking skills for the next level of education.

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