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Analysis of Critical Thinking Ability of Elementary School Students in Learning Mathematics with Problem-Based Learning Model

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Abstract. This research aims to describe the mathematical critical thinking abilities of elementary school (SD) students in mathematics learning using the Problem-Based Learning model and to determine the indicators of critical thinking abilities that students master best. This research was carried out in order to determine the abilities of students who have critical thinking skills who are expected to have a scientific attitude, good problem solving abilities in learning and in everyday life. The research method used is descriptive qualitative. This research was conducted at SDN Bandung Elementary School by taking a sample of 4 students. The instruments used in this research are instruments about critical mathematical thinking skills and interview instruments. The data collection method begins with learning observations, then students are asked to work on critical mathematical thinking skills questionsthrough Problem-Based Learning, then interviews are conducted with students and class teachers. Theresearch results show that the Problem Based Learning learning model used can hone students' criticalthinking skills, based on indicators that have been determined, 3 students have various critical thinkingabilities.

Keywords: Critical thinking, PBL model, Mathematics

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INTRODUCTION

At elementary school level, learning mathematics is not just mastering knowledge, formulas and concepts, but if you look at mathematics in elementary school it is more than that and tends to be more complex. In mathematics there are 2 skills, namely high level skills and lowlevel skills. Basically, elementary school students are also expected to have high level skills. For example, students can have critical thinking skills in solving problems. So that students can have these skills, they need guidance from teachers. So teachers must also be able to facilitate their students to have these high-level thinking abilities.

The ability to think critically in learning mathematics is called the ability to think critically mathematically. One of the abilities that students must have is the ability to think critically mathematically because this ability is always used by students to face various problems bothin learning and in everyday life. Seeing how important critical thinking skills are in students, this ability should be built from the elementary school level to the secondary level. Surya (Karim, 2010) stated that students really need critical thinking skills because students essentially use their minds to understand problems and find solutions to existing problems. The ability to think critically has various benefits for facing various possibilities and if seen from the characteristics of critical thinking itself, this ability can be developed through learning mathematics (Ministry of National Education, 2003).

Wahidin (Ahmatica, 2017) explains that learning that focuses on the critical thinking process has several benefits, including learning that tends to stick with students' thinking longer, building students' enthusiasm for learning and increasing students' enthusiasm for learning. Students

who have critical thinking skills are expected to have a scientific attitude, problem solving abilities both in learning and in everyday life. Critical thinking skills have many benefits that can be felt at both primary and secondary school levels. Therefore, this ability must be built and trained at the elementary school level so that when students enter a higher level, students are not surprised and can adapt and make it easier for students to solve various problems. This is no exception in learning mathematics. Because from what we know, this learning is the most terrifying monthly learning period for students. If students' critical mathematical thinking skills are developed as early as possible. Then students will not feel that learning mathematics will be difficult, in fact the child's mindset will change and find the learning process very enjoyable, especially learning mathematics.

If you look at it from an educational perspective, it turns out that this ability still tends to be very minimal for elementary school students. Even though this ability is considered very important for students to have because there are so many benefits that students can experience. (Nurulaen, 2011) explains that the critical thinking skills of elementary school students are still low, especially when learning mathematics in algebra and geometry. In line with this (Nahdi, 2015) explained the findings that there has been no habituation in elementary schools regarding learning related to critical thinking. The argument above is also strengthened by (Ahmatica, 2017) (Eviyanti et al., 2020) who explains that the learning process is still teacher-centered or better known as teacher center, where children only listento the teacher's explanation, then are given exercises and then discussed together. Based onthis, it can be seen that learning does not involve critical thinking skills at all. Meanwhile, according to Turmudi (2010) "A teacher's best efforts in learning mathematics are to stimulatestudents to search independently, using reasoning in conducting investigations to prove a problem." It can be concluded that directly learning activities that involve students can solve problems in their own way are able to build students' thinking to be more critical in dealing with various problems presented.

This can also be seen from the learning activities so far, teachers need to review the models, media methods and approaches that will be used in learning, especially in mathematics learning. In the teaching and learning process, it must be planned carefully and systematicallyso that meaningful learning is formed for students. In this case, the selection of learning models becomes a very crucial thing in the teaching and learning process. There are severalimportant reasons for the development of learning models, including a) effective learning models are very helpful in the learning process as a result of which learning objectives are

more practically achieved; b) learning models can convey useful information for students in their learning process; c) variations in learning models can provide students with learning enthusiasm, avoid boredom, and will have implications for students' interests and motivations in following the learning process. Thus, it is important to pay attention to learning models in classroom learning, especially in Mathematics learning. Quoting from the Regulation of the Minister of National Education No. 23 of 2006, that Mathematics subjects need to be given toall students at every level of education including junior high school. Mathematics is the basis for equipping students to use logical, analytical, systematic, critical, creative, and collaborative intelligence. During Mathematics learning, students tend to get bored or even afraid when learning Mathematics. This is similar to the opinion expressed by Leonard & Supardi (in Mashuri), that not a few students also feel uninterested in learning Mathematics. The key to learning mathematics is a good understanding of concepts. That is why in understanding mathematics, an interesting learning model is needed, one of which is a learning model that plays a direct role in this, in accordance with the opinion expressed that Children are creators of knowledge, therefore they do not simply absorb new views - ideas given by their teachers.

Therefore, one example of a learning model that is suitable for teaching students to play an active role in learning is Problem-Based learning. As we know, this learning model is centeredon students by presenting problems in learning activities so that students' critical mathematical thinking skills are seen when solving the problems that have been given.

Researchers conducted interviews with grade IV teachers of SDN 134 Panorama about how Mathematics is taught in class. The material taught in grade IV is fractions. There are various kinds of questions in this lesson. Students are also required to work on HOTS (Higher Order Thinking Skill) questions. Fahrur Rozi and Citra Bahadur Hanum stated that HOTS or Higher Order Thinking Skill is a higher thinking ability compared to simply memorizing and retelling. From this opinion, HOTS itself is the highest level of cognitive thinking possessed by students, as a result students are required to be more critical in working on it, the purpose of using HOTS questions at the student evaluation stage is to find out how far students understand the material that has been taught. Hutabarat argues that HOTS is included in one of the plans or components of issues in the 21st century. Hutabarat (in Rozi and Hanum) also added that based on Bloom's Taxonomy which has been revised by Krathwoll and Anderson, the abilities that students need to achieve are not only LOTS (Lower Order Thinking Skills) namely C1 (knowing) and C-2 (understanding), MOTS (Middle Order Thinking Skills) namely C3 (applying) and C-4 (analyzing), but there must also be an increase to HOTS (Higher Order Thinking Skills), namely C-5 (evaluating), and C-6 (creating). With the existence of HOTS questions and how 21st century education is, students are not only asked to know the original answers

to the questions they are working on, but are also required to understand the questions that have been given so that students' thinking skills become even higher.

In delivering learning materials, the use of learning models plays an important role insupporting the formation of high-level thinking skills in students, one of which is mathematicalcritical thinking skills. The use of the right learning model can have an influence on the formation of students' critical thinking skills. The Problem Based Learning (PBL) learning model is one alternative model that has been revealed in various studies as a model that can improve students' mathematical critical thinking skills. One study that uses this model to improve students' critical thinking skills is a study conducted by Wynn Sr, Mosholder, and Larsen (2014) entitled Measuring the Effects of Problem-Based Learning on the Developmentof Postformal Thinking Skills and Engagement of First-Year Learning Community Students. This study discusses the use of the PBL model to stimulate metacognitive reflection in discussions and integration into learning communities. The framework used in this study is neo-Piagetian, which is used to build a metacognitive reflection approach that also identifies targets that reflect high-level thinking skills and complex problem-solving abilities in adults. Indeveloping critical thinking skills, the Problem Based Learning (PBL) model is considered appropriate for use in solving existing problems. The use of the Problem Based Learning (PBL)learning model contains problems that exist in everyday life presented in various interesting forms so that students can solve them so as to foster critical thinking skills in students. To trainand build students' critical thinking skills, the Problem Based Learning (PBL) learning model is used (Daryanto & Tarno, 2015). Therefore, one of the right solutions to develop students' critical thinking skills is to use the Problem Based Learning (PBL) learning model so that it supports students' memory of the learning material. (Trianto, 2010).

Previous research conducted by Lesi Luzyawati revealed that the results of the analysis of students' critical thinking skills on the material of sensory organs through the inquiry pictorial riddle learning model in class XI MIPA 6 of SMA Negeri 1 Sindang Indramayu showed different variations. Of the 32 students, 50% were in the very good category, 26.5% in the good category, and 23.5% in the moderate category. The achievement of the five critical thinking indicators was also not uniform, where the critical thinking indicator that provides a simple explanation has the highest percentage, which is 90% (very good), compared to other indicators. The indicator that builds basic skills reaches a percentage of 84% (good), while the indicator that concludes gets a percentage of 80% (good). The indicator that provides further explanation only reaches 60% (moderate), which is the lowest achievement among other indicators. The indicator that regulates the art of management and tactics gets a percentage of 73% (good). Thus, the average critical thinking ability of all students in class XI MIPA 6 of State Senior High School 1 Sindang Indramayu is 77%, which is included in the good category.

The results of the study by Firosila Kristin and Indri Anugrahi Windi Oktaviani showed that the application of the problem solving learning model in science learning can improve students' critical thinking skills. In the first cycle, students' critical thinking skills were in the moderate category with a percentage of 71.12%. However, in the second cycle, students' critical thinking skills increased to 80.5% and were in the high category. Based on observations in the pre-cycle, students' critical thinking skills were classified as low with a percentage of 58.64%. Then, the ability increased to the moderate category with a percentage of 67.37%, and again increased to the high category of 79.07% in cycle II.

In a study by I. Anugraheni, M. Ariyanto, and F. Kristin, it was found that the application of problem-solving-based learning models in science learning can improve students' critical thinking skills. The test results showed that in the first cycle, students' critical thinking skills were in the medium category with a percentage of 71.12%. In the second cycle, students' critical thinking skills increased to 80.5% and were in the high category. Based on observations,students' critical thinking skills in the pre-cycle were in the low category with a percentage of 58.64%, increased to the medium category with a percentage of 67.37%, and continued to increase again to the high category with a percentage of 79.07% in cycle II.

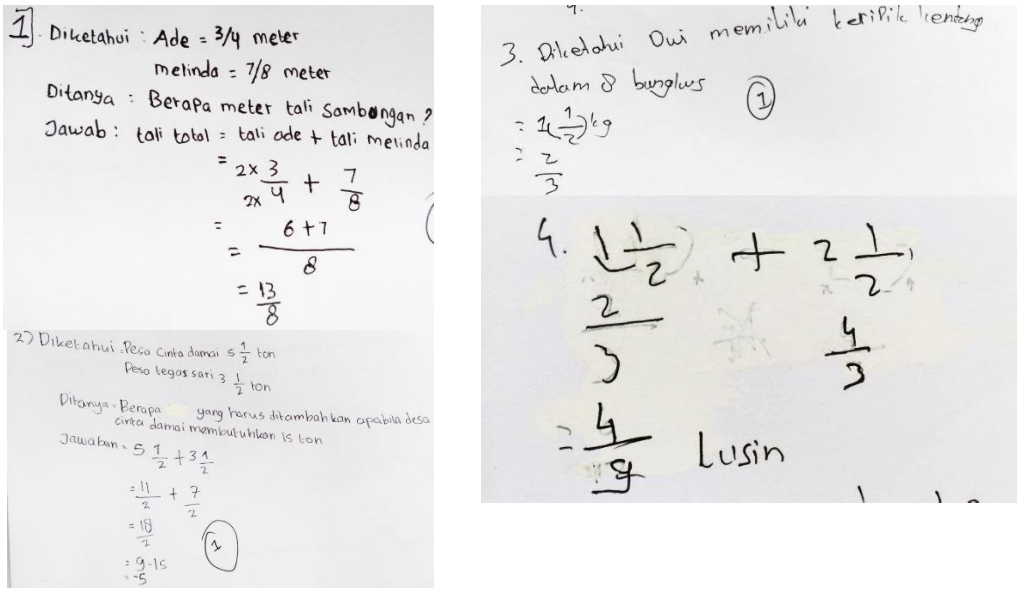
Based on the background, the objectives of this study are (1) to describe the critical thinking skills of elementary school students in mathematics learning with the Problem Based Learning model and (2) to find out the indicators of students' critical thinking skills that are most mastered by students. Based on the explanation and objectives, the researcher took the research title Analysis of Elementary School Students' Critical Thinking Skills in MathematicsLearning with the Problem Based Learning Model.

METHODOLOGY

The type of research used is qualitative research. The research was conducted at SDN 134 Panorama on October 24, 2024. The subjects of the study were class IV with a total of 8 students, which were then sampled as many as 3 people to represent the predetermined critical thinking indicators, 1 teacher of SDN 134 Panorama for the 2024/2025 academic yearsemester 1. The data collection techniques used were observation, interview, and documentation techniques.

RESULTS AND DISCUSSION

The results of this study obtained data in the form of student work results which were then analyzed by researchers based on data collection techniques that had been compiled by researchers. The following is a picture of the results of student work with the initials A.

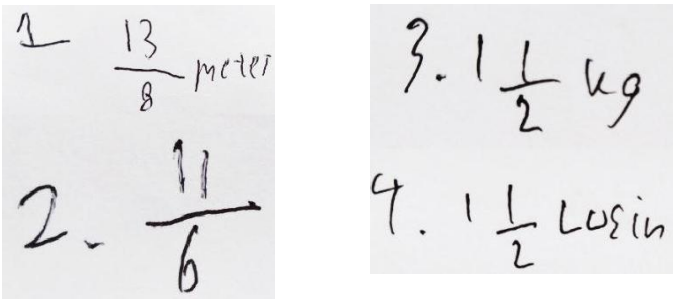


In the picture, students are able to solve the problem using routine procedures and in accordance with the instructions of the problem and the answers given are also correct. This can be seen from students who write down the information known from the problem and the form of the problem displayed in the problem. After writing down the information in the problem, students answer questions about fractions with structure. First, students equate the denominators of the two fractions, then after the denominators have been equated, the fractions can be added and the answer to the existing problem is obtained.

Based on the interview results, student A also explained that when the teacher explained, the subject could understand the teacher's explanation. This can be seen when the teacher gave a problem about fractions, then the subject would give an opinion about fractions that exist ineveryday life. However, based on the researcher's observations, when the teacher gave a story problem, student A tended to be able to understand the story problem and would often ask the teacher and then work on it according to the problem instructions.

This is reinforced by the results of the interview which said that when there were story questions, the subjects would be able to work on them more easily and according to the instructions. However, the subjects often asked questions first about the questions presented. Similar things were also found from the results of interviews with class teachers.

The next subject is a student with the initials H. The following is a picture of the results of the work of the student with the initials H.

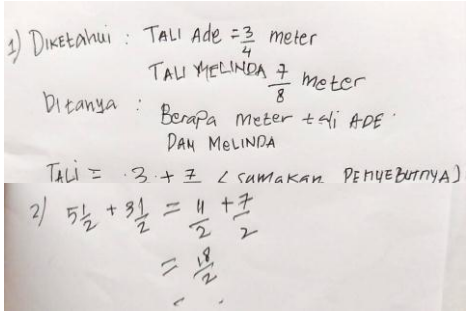


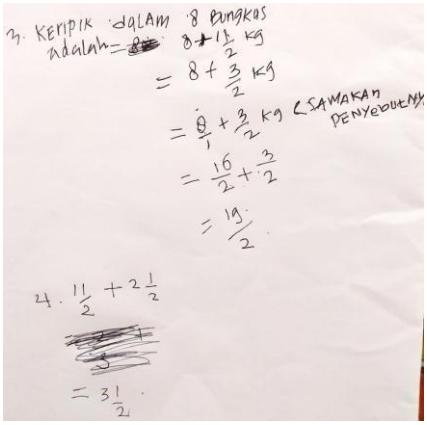
Based on the results of the researcher's observations of student H, the subject tends to be quiet when learning takes place, even when the teacher explains the lesson material, the subject will only listen for a moment then the subject will invite his deskmate to talk and tends to get bored easily in learning. When the teacher gives everyday examples related to fractions, the subject will join in to mention activities that occur in everyday life and will be quiet again if he is tired of talking. In addition, when the teacher gives story problems, student H also tends to have difficulty in understanding the story problems.

Based on the picture, it can be seen that in solving the existing problems, students are unable to solve the problems according to routine procedures and question instructions. Students immediately provide the final answer. Students write down the answers to the existing questions without providing an explanation of the answers given in the form of what is known and asked so that it can make it difficult for students to understand the existing questions. According to Akbar et al (2017), some children are accustomed to not writing down various information that is known in the existing questions, this is known based on the test results where children make mistakes because they do not display the information in the questions before answering the problems contained in the questions.

Based on the results of the interview with the homeroom teacher, it is known that student H tends to be less enthusiastic or even less interested in working on Mathematics problems. When correcting the answers with the homeroom teacher, based on the researcher's observations and interviews with student H's older sibling via the WhatsApp application, the subject said that when at home, student H would ask about the homework given by the teacher if they do not understand the questions given. In addition, the subject rarely asks about the material being taught, what the subject asks is questions that the subject cannot do.

The next subject is a student with the initials M. The following is a picture of the results of the work of the student with the initials M.





In the picture, student M is able to solve the problem using routine procedures and in accordance with the instructions of the problem and the answers given are also correct. This can be seen from the student who wrote down the information known from the problem and the form of the problem displayed in the problem. After writing down the information in the problem, the student answered the question about fractions with structure. At first, the student equates the denominators of the two fractions, then after the denominators have been equated, the fractions can be added and the answer to the solution of the existing problem isobtained. However, this only applies when the child is working on the first problem. When continuing to the second to fourth problems, the child is seen working irregularly, unlike the answer to question no. 1.

Based on the interview results, student p also explained that when the teacher explained, the subject could understand the teacher's explanation. This can be seen when the teacher gave a problem about fractions, then the subject would give an opinion about fractions that exist ineveryday life. However, based on the researcher's observations, when the teacher gave a story problem, student M tended to be able to understand the story problem and would often ask the teacher and then work on it according to the instructions of the problem, but there was boredom when working on the problem so that his concentration decreased and he was lazy to work on the next problem according to the procedure that student M had learned.

This is reinforced by the results of an interview with his homeroom teacher who said that when there are story problems, the subject will be able to work on them more easily and according to instructions. However, the subject often asks questions first about the questions presented. After he understands and works on one problem well and according to the procedure, the student will feel lazy to work on the next problem according to the existing procedure.

CONCLUSION

Based on research in determining students' critical thinking by using the Problem Based Learning model for Fraction material, it was obtained that, 1) Of the 7 indicators that have been determined, student A has fulfilled 5 indicators, namely: formulating questions, providing examples, answering the question 'why', reporting observation results, and considering alternative answers, for the indicator generalizing data, tables, and graphs and providing conclusions are still lacking. For student H, out of 7 indicators, there are 2 indicators that are fulfilled, namely: providing examples and reporting observation results, while for the indicators formulating questions, answering the question 'why,' generalizing data, tables, and graphs, providing conclusions, and considering alternative answers are still lacking. Student M, out of 7 indicators, there are 6 indicators that are fulfilled, namely: formulating questions, providingexamples, answering the question 'why,' reporting observation results, providing conclusions,and considering alternative answers, while for the indicator generalizing data, tables, and graphs the subject is still lacking. to obtain the results of critical thinking skills of elementary school students in learning mathematics on Fraction material using the Problem Based Learning model, when combining indicators of critical thinking skills with the syntax containedin the Problem Based Learning learning model, there is mutual continuity. 2) Of the 7 indicators of students' critical thinking skills, the indicator of giving examples and the indicator of reportingobservation results are the indicators that students master the most.

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