



Problem-Based Learning (PBL): An Innovation in Natural Sciences Studies to Improve Critical Thinking Skills

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ABSTRACT

The goal of this study was to see if students in class V Theme 6 could improve their critical thinking skills outcomes by using the Problem-Based Learning (PBL). This type of research is classroom action research using 2 cycles, namely, cycle I and cycle II, where each cycle consists of 2 meetings. The stages in the implementation of the PBL model are: 1) student orientation to the problem; 2) organizing students to learn; 3) guiding individual and group investigations; 4) developing and presenting the work; and 5) analyzing and evaluating the problem-solving process. Based on the results of data analysis, there is an average increase in classical critical thinking skills in the first cycle of 67.5 and the second cycle of 76.35. So it can be concluded that the Problem-Based Learning (PBL) can improve students' critical thinking skills outcomes

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INTRODUCTION

Natural Sciences is one of the contents of lessons in thematic learning incorporated into a theme. One of the objectives of science subjects for thematic learning in elementary schools is to apply critical thinking skills. Critical thinking skills are students' cognitive processes in analyzing **specifically** and **systematically** **existing** **problems**, distinguishing these problems carefully and thoroughly, and identifying and then reviewing information to plan appropriate problem-solving strategies (Azizah et al., 2018).

There is some information from observations related to learning that has been carried out on fifth-grade students at SDN Lojejer 03 Wuluhan Jember, including the critical thinking skills possessed by students are still at a reasonably low stage. This happens because of the teacher's reference role in the implementation of learning, such as the process of preparing the Learning Implementation Plan (RPP), which uses stages in the cognitive domain C1-C3, which include: remembering; understand; and applying the indicators, while those leading to critical thinking skills use indicators C4-C6 which include: analyzing; assess; and create. Based on these observations, it can be concluded that critical thinking skills in the implementation of learning in fifth-grade students at SDN Lojejer 03 Wuluhan Jember have not been honed well.

The problems in learning for V class students at SDN Lojejer 03 Wuluhan Jember, which have been described above, need to be considered and overcome so that students can become more active in class and have strong critical thinking skills. The progress of practicing critical thinking skills in students in a learning process can be realized by exposing students in everyday problems. In addition, to improve critical thinking skills can be assisted through the application of a problem-based learning model, namely the Problem Based Learning (PBL) learning model. *PBL* is a learning model that focuses on students' real-life problems as the primary material for teaching students (Septiyowati in Hasanah, 2021). The *PBL* learning model has a problem in the orientation stage included in the analysis stage to increase student's critical thinking skills.

There are several relevant studies related to the application of the model *PBL* and getting the results that there is an increase in students' critical thinking skills. The research conducted by Sujana et al. (2021) with the title "Increasing student learning outcomes in science through the *PBL* model with the help of audio-visual media" showed an increase in the average value of science learning outcomes in the cognitive domain in the first cycle, which was 72%. In the second cycle, it increased to 81.67%. Utami et al. (2019), in their research, also explained that the application of the *PBL* learning model using audio-visual media could improve students' critical thinking skills. In the first cycle, it reached 19.20%, then in the second cycle, it reached 22.24%.

The formulation of the problem in this study focuses on improving critical thinking skills in Science Theme 6 in fifth-grade students through applying the *PBL* learning model at SDN Lojejer 03 Wuluhan, Jember. At the same time, the purpose of writing articles to be achieved is to improve critical thinking skills

METHODOLOGY

The type of research used is Classroom Action Research (CAR). The implementation of the action in this study used two cycles, namely cycle I and cycle II, with each cycle containing two meetings. The research subjects in this study were the fifth-grade students of SDN Lojejer 03 Wuluhan Jember, totaling 29 students. There are 13 male students and 16 female students. The data collection instrument that will be carried out in this research uses scoring guidelines that have been formulated for critical thinking skills. The data collection method is used to obtain the data needed for research activities. The data collection methods used in this study were the methods of observation, interviews, documentation, and tests.

Data analysis is an activity carried out to find out the results of research that has been carried out. This study used four of the five indicators proposed by Ennis (in Masani et al., 2020). Analysis of critical thinking skills in this study was used to measure the improvement of critical thinking skills in fifth-grade students at SDN Lojejer 03 Wuluhan Jember through the final cycle I and cycle II test. The following is the formula for calculating the increase in students' critical thinking skills according to Purwanto (in Fuaddah, 2017:40)

$$\bar{x} = \frac{\sum x}{N} \times 100$$

Description:

$\bar{x}$: The Average score of students' critical thinking skills classically

$\sum x$: Total score

N : Maximal score in the class

100 : Number

Table 1. The Guidelines for Student's Critical Thinking Skill

Average Score	Qualification
$X > 87,5$	Very Good
$75 < X \leq 87,5$	Good
$62,5 < X \leq 75$	Enough
$50 < X \leq 62,5$	Not Enough
$0 < X \leq 50$	Very Less

Four indicators are used in assessing students' critical thinking skills, namely providing simple explanations (elementary clarification), building essential skills (basic support), drawing conclusions (inferring), and making further explanations (advanced clarification). In this case, a scoring guideline is made and used to assess students' critical thinking skills.

Table 2. The Scoring Guideline for Student's Critical Thinking Skill

Critical Thinking Skill's Aspects	Score	Desc.
Giving a Simple Explanation (<i>Elementary Clarification</i>)	3	Write down the identification of the problems contained in the questions entirely and completely correct
	2	Incomplete in writing the identification of the problems contained in the questions
	1	Unable to write down the identification of the problem contained in the question
Building the Basic Skill (<i>Basic Support</i>)	3	Find answers to questions based on the identification of problems that have been obtained correctly
	2	Not true in find the answer to the question based on the identification of problems that have been obtained
	1	Cannot find answers to questions based on problem identification that has been obtained
Making Conclusion (<i>inferring</i>)	3	Finding conclusions or solutions to problems correctly
	2	Less precise in writing conclusions or solutions to problems
	1	Unable to write conclusions or solutions to problems
Making an Advanced Explanation (<i>Advanced Clarification</i>)	3	Explain the definition of assumptions based on the data that has been obtained correctly
	2	Inaccurate in writing the definition of assumptions based on the data that has been obtained
	1	Cannot write the definition of assumptions based on the data

Critical Thinking Skill's Aspects	Score	Desc.
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that has been obtained

The guidelines for scoring students' critical thinking skills that have been prepared will be applied by researchers in the final test of the student cycle to analyze and obtain data on students' critical thinking skills by applying the Problem Based Learning (PBL) learning model assisted by audio-visual media. It hopes that there will be an increase in students' critical thinking skills from cycle I to cycle II.

RESULT AND DISCUSSION

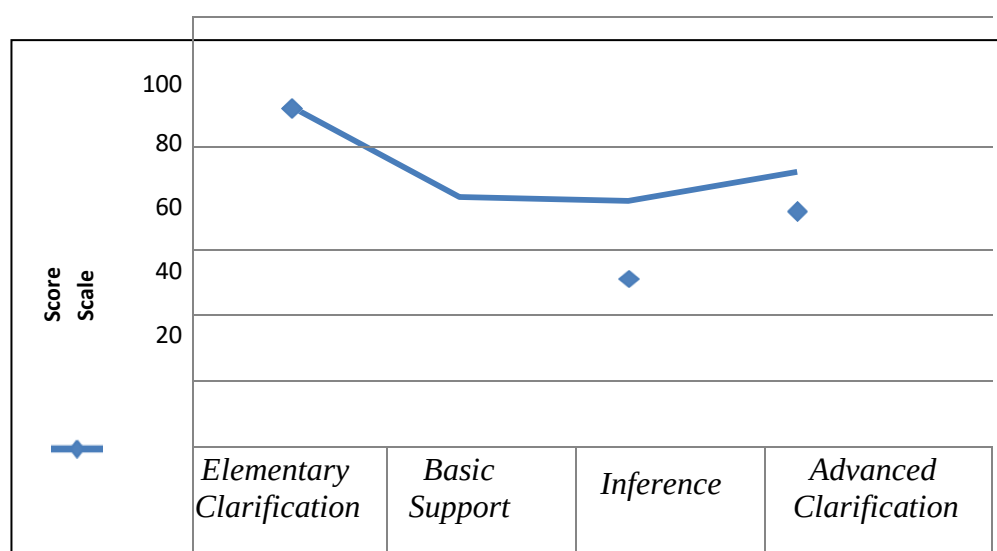
a. Analysis of Students' Critical Thinking Skills Cycle I

Based on data analysis from the final test of the student's cycle I, the critical thinking skills of fifth-grade students at SDN Lojejer 03 Wuluhan Jember were obtained in table 4 below

Table 4. The Result of Student's Critical Thinking Skills

Total Student	Analysis Result Category	Mastery Level Percentage Interval	Percentage
6	Very Good	$X > 87,5$	24 %
5	Good	$75 < X \leq 87,5$	20 %
4	Enough	$62,5 < X \leq 75$	16 %
8	Not Enough	$50 < X \leq 62,5$	32 %
2	Very Less	$0 < X \leq 50$	8%

While the data analysis of the results of students' critical thinking skills based on the aspects that have been determined in the first cycle is contained in the following diagram



Critical Thinking Skills Aspects

Cycle 1	92	57,5	56	67
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Figure 1. The Average Diagram of Critical Thinking Skills based on 1st Cycle Aspects

After analyzing the data on the final test of the first cycle, the results obtained were the average classical score of students for critical thinking skills in Theme 6 with conduction and convection heat transfer material, which was 67.5. The average can be categorized as sufficient but not according to the expected target. The expected target is that there are 75% of students to get a score of 75. In the final test of the first cycle, there were only 11 students or 44% of the 25 students who attended a score above 75. Because the first cycle was deemed less than optimal, the researchers will continue the research in the next cycle, namely the second cycle, based on the reflection of the first cycle.

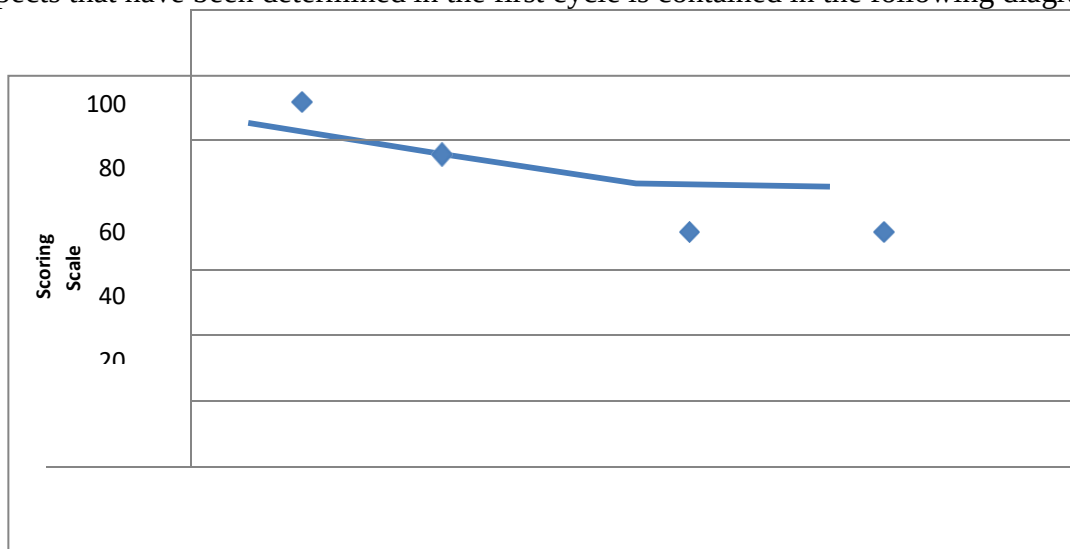
a. Analysis of Students' Critical Thinking Skills Cycle II

After learning in cycle II has been carried out, an analysis of students' critical thinking skills will be carried out based on the end of the cycle test. The following is the data on the results of the critical thinking skills of fifth-grade students at SDN Lojejer 03 Wuluhan Jember in table 5 below.

Table 5. The Result of Student's Critical Thining Skills 2nd Cycle

Total Student	Analysis Result Category	Mastery Level Percentage Interval	Percentage
6	Very Good	$X > 87,5$	25 %
12	Good	$75 < X \leq 87,5$	50 %
2	Enough	$62,5 < X \leq 75$	8,33 %
2	Not Enough	$50 < X \leq 62,5$	8,33 %
2	Very Less	$0 < X \leq 50$	8,33 %

While the data analysis of the results of students' critical thinking skills based on the aspects that have been determined in the first cycle is contained in the following diagram



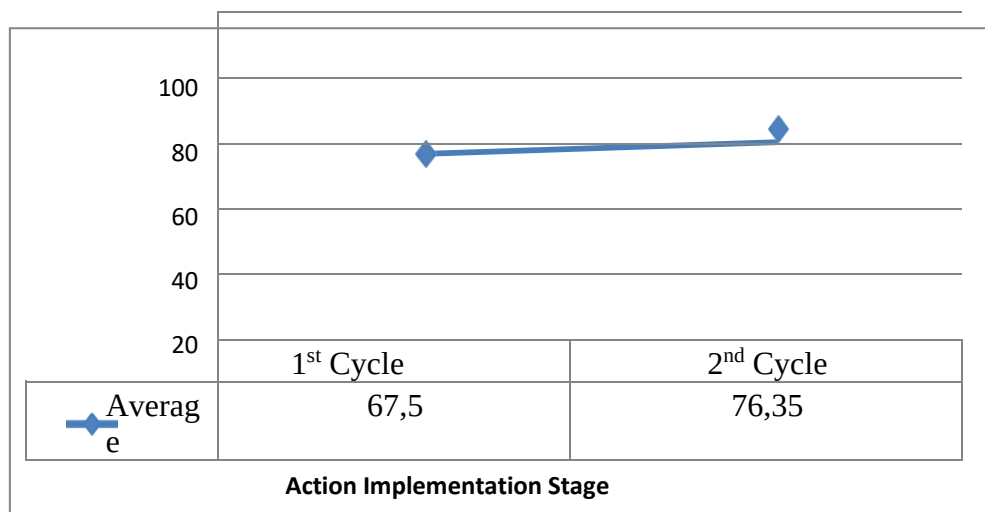
	<i>Elementary Clarification</i>	<i>Basic Support</i>	<i>Inference</i>	<i>Advanced Clarification</i>
<i>2nd Cycle</i>	92,5	79,5	67,4	66

Picture 2. The Average Diagram of Critical Thinking Skills based on 2nd Cycle Aspects

After analyzing the average score classically of the student's critical thinking skills in cycle II based on their aspects, the next activity is to calculate the average score of students' critical thinking skills. The average score of students' critical thinking skills in cycle II with conduction and convection heat transfer material by applying the Problem Based Learning (PBL) learning model assisted by audio-visual media is 76.35. The average was in accordance with the expected target, namely 75% of students who scored above 75—so based on the results of students' critical thinking skills in cycle II, it was said to be successful, and there was an increase from cycle I to cycle II.

a. Analysis of Improving Students' Critical Thinking Skills

In the previous subtitle, it has been explained that there is an increase in students' critical thinking skills from cycle I to cycle II. The following is a picture of improving critical thinking skills in cycle I and cycle II as contained in diagram 3.



Picture 3. The Average Diagram of Critical Thinking Skills based on the Average of 1st and 2nd Cycle Aspects

Based on diagram 3 above, the average increase in students' critical thinking skills on heat transfer material by conduction and convection through the application of the Problem Based Learning (PBL) learning model assisted by audio-visual media from cycle I to cycle II. In the first cycle, the average critical thinking skills obtained by students classically is 67.5, while in the second cycle, it reaches 76.35. From these data, the increase in students' critical thinking skills from cycle I to cycle II achieved an increase of 8.85.

Based on the results of interviews and observations at the pre-cycle stage or before the action was carried out, data was obtained that the critical thinking skills of fifth-grade students at

SDN Lojejer 03 Wuluhan Jember were still classified as relatively low. This is because the teacher refers to the lesson plan, which in its indicators uses the stages of thinking in cognitive theory, which includes remembering and understanding, not yet at the stage of analyzing. While critical thinking skills in students can be improved using the stages of thinking in cognitive theory, which includes analyzing to the stage of creating. So students' critical thinking skills have not been appropriately honed, which causes low learning outcomes. An external factor that causes students' low critical thinking skills is the Covid-19 pandemic which causes school conditions to be less effective. During the pandemic, studying at school was replaced with studying at home. The role of parents is also needed in helping students learn independently. Not a few parents do not understand the task or material given by the teacher.

Then action is given by applying the Problem Based Learning (PBL) learning model. Through applying this model, cycle I and cycle II can be said to be successful students' critical thinking skills increase. However, there are some obstacles in the learning process. One of them is at the stage of organizing students to learn, or in the second stage in cycle I, there are still many students who do not understand and are turned upside down when giving an example in everyday life. This can be seen when the teacher observes the discussion in each group, and the average group is still upside down in giving examples of heat transfer in everyday life. This is because the media used, namely audio-visual or video media, emphasizes the notion of heat transfer by conduction and convection and the difference between the two. So that students have difficulty or even reverse when asked to give examples of problems in everyday life. Therefore, these constraints are used to reflect the first cycle to be corrected in the second cycle.

Obstacles that occur next occur at the guiding stage group investigation or the third stage of the PBL model. Some students in the group are not conducive. This is because the group that is divided is a group created by the homeroom teacher before the action was carried out. There is a group consisting of all men and all women. The group, which consisted of all men, was not very conducive; they tended to talk to their friends and were busy playing with their friends, so the worksheets that were supposed to be done together were only done by one person. Therefore, like the previous constraints, this will also reflect the first cycle to be improved in the second cycle. So that in cycle II, learning can run according to expectations.

After implementing the actions in cycle I and cycle II, it can be seen that there is an increase in students' critical thinking skills through the application of the PBL learning model in Theme 6. The expected increase is by the targets that have been designed, namely in critical thinking skills, there is an increase of $\geq 75\%$ of students getting scores of 75 or in the excellent category so that the actions that have been implemented can be said to be successful.

This is evidenced by the average score in the classical final test cycle I and II. In the first cycle, the classical average of class V students is 67.5. The average is included in the excellent category. So that the second cycle was carried out, and the classical average was 76.35. The average in the second cycle is already in the excellent category.

Furthermore, based on the analysis of students' critical thinking skills scores, it turns out that two students fall into the inferior category because these students have problems in learning, such as being unable to read and students with special needs. So that the student does the final evaluation of learning cycle I and cycle II with a makeshift, so based on the data and explanation above, it can be concluded that applying the PBL learning model can improve students' critical thinking skills. This is following the opinion expressed by Misidawati and Sundari (2021) that the PBL learning model is a model which it uses constructivism learning theory, namely, thinking and problem-solving skills can be developed if students do it themselves, find, and transfer existing knowledge complexes. Based on the opinion expressed by Misidawati and Sundari, it can be seen that the PBL learning model, in addition to developing students' problem-

solving skills authentically, can also develop thinking skills, one of which is critical thinking skills. This can be seen based on the improvement of students' critical thinking skills after the PBL learning model is applied.

CONCLUSION

Based on the data analysis that has been carried out, it can be concluded that the application of the Problem Based Learning (PBL) learning model on theme six can improve science critical thinking skills in fifth-grade students at SDN Lojejer 03 Wuluhan Jember. This can be proven by an increase in the score in each cycle. When learning is carried out using the PBL learning model, especially in the content of science lessons, it is expected to use media as a learning aid so that students can understand abstract or difficult-to-understand learning concepts to support the learning that occurs. Then it is hoped that further research will pay more attention to classroom conditioning when the PBL model is applied so that all stages of the PBL model can run according to the plan.

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