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Enhancing Critical Thinking Skills of Elementary School Students Using the PBL Model

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1. Abstract

This research aims to enhance the critical thinking skills of elementary school students in science learning through the implementation of the Problem-Based Learning (PBL) model. The type of research conducted is classroom action research, which consists of planning, action, observation, and reflection. Data collection techniques used were essay tests and observations. The data were analyzed using both quantitative and qualitative descriptive data analysis techniques. The subjects of this study were ten fifth-grade students from an elementary school. Data were collected using essay tests and observation sheets. The data analysis techniques employed were descriptive quantitative and qualitative analysis. The research findings indicate that: (1) the percentage of students answering questions that require explanations increased by 1%, from 79% in cycle I to 80% in cycle II; (2) the percentage of students observing and considering observation results increased by 14%, from 67% in cycle I to 81% in cycle II; (3) the percentage of students inducing/deducing and considering induction/deduction results increased by 5%, from 75% in cycle I to 80% in cycle II; and (4) the percentage of students determining a

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course of action increased by 4%, from 74% in cycle I to 78% in cycle II. Moreover, 80% of the students demonstrated critical thinking skills in the good category. The success indicators were met, with critical thinking ability reaching a minimum percentage of 75%, and 75% of the students possessing good critical thinking skills. Therefore, it can be concluded that the problem-based learning model can enhance the critical thinking skills of elementary school students as it has fulfilled the success indicators.

Kata kunci: *kemampuan berpikir kritis, model PBL, sekolah dasar*

2. Introduction

Critical thinking skills are essential for students to keep their acquired information up to date by continuously exploring it with critical thinking. These abilities do not develop on their own but need to be continually trained (Baker et al., 2010). One way to do this is by implementing a learning model that facilitates the development of students' critical thinking skills. Teachers no longer act as the primary providers of information. Instead, students must learn critical thinking and problem-solving skills to face everyday life challenges (Baker et al., 2010). Based on the learning observation results, various issues were identified, one of which is the insufficient critical thinking skills of students in science learning. Several indications support this claim. First, teachers have asked several questions during the learning process. However, no student took the initiative to answer the questions, and they still had to be prompted by the teacher to respond or express their opinions. Second, only one to three students dare to ask the teacher questions while working on tasks, and even then, they are the same students each time. Third, no student voluntarily presented their work results. After repeated coaxing, only one student dared to do so. Fifth, teachers have not provided evaluation questions that can hone students' critical thinking skills. The Problem-Based Learning (PBL) model can be applied in science learning to address the lack of critical thinking skills in students. This learning model is

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suitable for teaching science as it can enhance students' critical thinking abilities, consistent with the views of Pebriana & Disman (2017) that the use of the PBL model in learning can improve students' critical thinking skills. The Problem-Based Learning model, with a focus on authentic problems, allows students to construct their knowledge, develop higher-order skills, inquiry, empower students, and enhance their self-confidence (Arends, 2012). In this context, the teacher acts as a facilitator who guides students to independently discover concepts and understand the learning materials. Discussions and question-and-answer sessions are also used as a means to build students' knowledge, thereby increasing their confidence and critical thinking abilities. Engaging in Problem-Based Learning activities can motivate students as they are trained to think critically, analyze, and improve their higher-order thinking skills (Nugraha et al., 2017).

3. Method

3.1. Research Subjects and Focus

The research subjects in this study were fifth-grade students of an elementary school. There were a total of 10 students, consisting of 7 males and 3 females. The focus of this research was to enhance the student's critical thinking skills by implementing the PBL model.

3.2. Research Instruments

The type of research conducted was Classroom Action Research (CAR) using the Kemmis and McTaggart model, which consists of four components, namely: (1) planning, (2) action, (3) observation, and (4) reflection (Kemmis & McTaggart, 2014).

3.3. Data Collection and Analysis

The data collection techniques used in this research were observation and tests. The researcher employed structured observation to facilitate the observation process. Structured observation was conducted using an observation guide. The test used was an

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essay-type test to measure students' critical thinking skills after the intervention. This was done to assess the extent of students' critical thinking ability. The data analysis techniques used in this research were qualitative and quantitative data analysis. Qualitative data management involved describing the results of learning observations and evaluations of students' critical thinking skills in science learning in each cycle. The quantitative data analyzed were the evaluations of students' critical thinking skills, which were conducted at the end of each cycle. The formula used to calculate the percentage of students' critical thinking skills is as follows (Purwanto, 2010)

$$NP = \frac{R}{SM} x100$$

Explanation:

NP = The percentage value being sought or expected

R = The obtained raw score (actual score)

SM = The ideal maximum score of the value/score (ideal score)

100 = A constant number

Based on the obtained percentage, it can be interpreted and classified according to the following table (Purwanto, 2010).

Table 1. Categories of Students' Critical Thinking Skill

No	Percentage	Category
1.	86%-100%	Very good
2.	76%-85%	Good
3.	60%-75%	Moderate
4.	55%-59%	Insufficient
5.	0%-54%	Very insufficient

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3.4. Research Limitations

Based on the conducted research, there are several limitations that should be considered for future studies. Some of the limitations of this research include the focus on students' critical thinking skills as the research object, which indicates that further investigation is needed to apply the PBL model to enhance other variables. Additionally, the research was conducted with a small sample size of 10 students, thus the findings cannot be generalized.

4. Result and Discussion

4.1. Result

The evaluation of students' critical thinking skills is assessed per indicator. The following is a comparison of the evaluation results of students' critical thinking skills for each indicator.

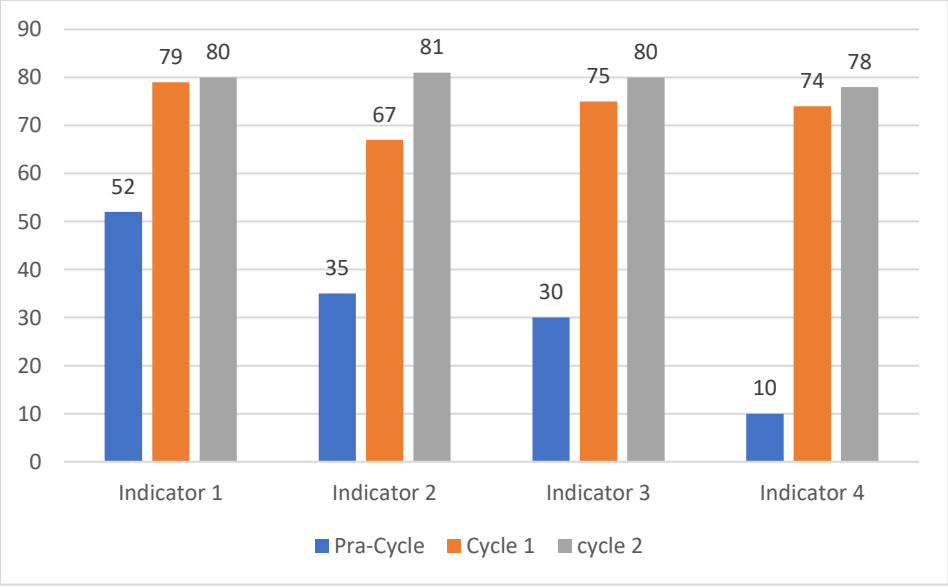

Figure 1. Comparison of Students' Critical Thinking Skills Results

Based on the diagram above, it can be observed that the percentage of students' ability

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to ask and answer challenging questions that require explanations increased by 1%, from 79% in cycle I to 80% in cycle II. The percentage of students' ability to observe and consider observation results decreased by 14%, from 67% in cycle I to 81% in cycle II. The percentage of students' ability to induce and consider induction results increased by 5%, from 75% in cycle I to 80% in cycle II. Lastly, the percentage of students' ability to define terms and consider a definition increased by 4%, from 74% in cycle I to 78% in cycle II.

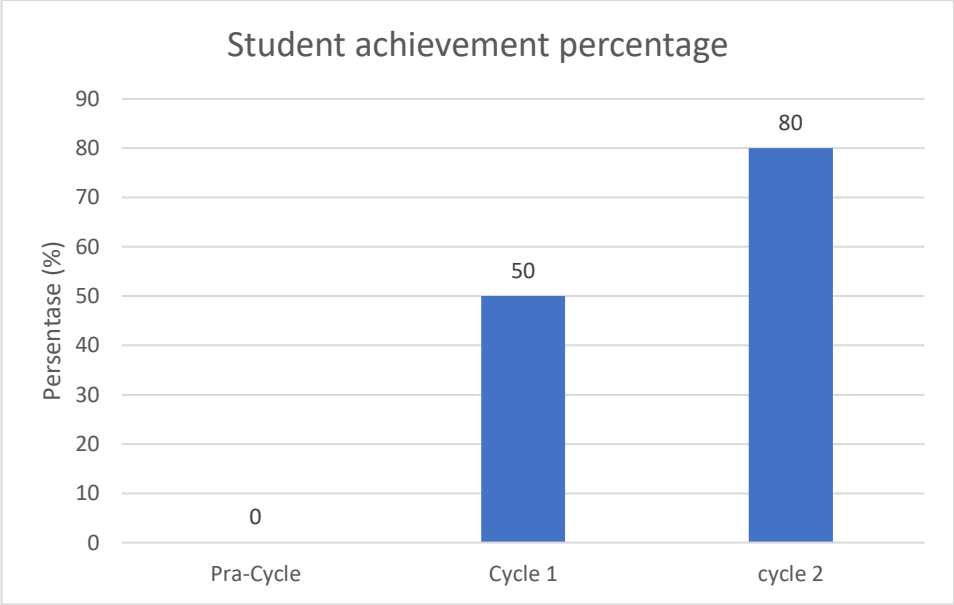

Figure 1. Diagram of the Number of Students who Achieved Competence

Based on the diagram above, it can be observed that there are eight students or 80% of the students who have excellent critical thinking skills in cycle II. This number increased by three students or 30% compared to cycle I.

4.2. Discussion

The critical thinking skills of fifth-grade elementary school students in science learning improved after the implementation of the PBL model. This was evidenced by 80% of the

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students showing good and excellent critical thinking skills in cycle II. The percentage increased by 30% compared to cycle I, which obtained a percentage of 50%. This percentage has met the set success criteria of having 75% of students with good critical thinking skills. The enhancement of students' critical thinking skills was achieved through the Problem-Based Learning model, which is in line with the findings of Sendaq & Odabas (2009) who stated that students who participated in PBL learning improved their critical thinking abilities compared to those who followed traditional instructional models.

There are five indicators reflecting the critical thinking skills of elementary school students, which refer to Norris and Ennis's views (Davidson & Dunham, 1997). Students who are critical thinkers have the ability to: (1) ask and answer challenging questions that require explanations; (2) observe and consider observation results; (3) induce and consider induction results; (4) define terms and consider a definition; and (5) determine a course of action. The success criteria in this study is achieved when the percentage of critical thinking skills for at least five indicators reaches 75%.

The percentage of students' ability to ask and answer challenging questions that require explanations increased by 1% from 79% in cycle I to 80% in cycle II. This skill has been accomplished as it exceeds the predetermined success indicator of 75%. The students' ability to ask and answer challenging questions was enhanced through question and answer sessions during warm-up activities, problem orientation, reflection/evaluation of learning, discussing problems and solutions, addressing difficulties encountered during learning, and after presentations. These activities were conducted effectively by both teachers and students in cycles I and II.

Teachers also play a role in creating a conducive atmosphere during the learning process. This is done to enable students to think clearly during teaching and learning activities. Positive thinking skills can help an individual determine the truthfulness of a

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statement (Crews-Anderson, 2007). Students can answer various simple questions posed by the teacher. Furthermore, Tan (2003) argues that PBL is a collaborative learning method. During discussions, students are required to engage in questioning and answering, both with their fellow group members and with the teacher if they encounter any difficulties.

Critical thinking is not an inherent or innate trait, but rather a specific method aimed at exploring evidence/reasons/facts in a certain way (Cottrell, 2005). This means that students' critical thinking skills are not obtained instantly or present from birth. These abilities need to be trained in a specific manner to develop, allowing individuals to explore evidence/reasons/facts. Hence, in the application of the PBL model, students are trained to respond to various questions that require explanations.

The percentage of students' ability to observe and consider observation results decreased by 14% from 67% in Cycle I to 81% in Cycle II. This ability is not yet satisfactory as it falls below the success indicator set at 75%. Students' ability to observe and consider observation results is improved through: (1) simple experiments; (2) observations of the differences between pure substances and mixtures; (3) writing experiment or observation results on group work sheets; and (4) presenting experiment or observation results.

Science learning in elementary school involves experiments and observations of natural phenomena. Science is a theory that systematically discusses natural phenomena based on experiments and observations conducted by humans (Samatowa, 2006). Students are expected to conduct experiments according to the provided worksheets and record their experiment or observation results in the form of a report. Self-conducted observations are considered the most reliable source of information (Moore & Parker, 2015).

The percentage of students' ability to induce and consider inductive results increased by 5% from 75% in Cycle I to 80% in Cycle II. Elementary school students are expected

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to be able to infer specific statements into a general conclusion. The final conclusion is derived from several supporting opinions and statements with explanations (Bowell & Kemp, 2002; Browne & Keeley, 2007).

The percentage of students' ability to determine an action increased by 4% from 74% in Cycle I to 78% in Cycle II. This ability is already satisfactory as it exceeds the success indicator set. Students' ability to determine an action is improved through: (1) providing questions that require students to determine an action; (2) explaining how to fill out worksheets; (3) expressing opinions and giving presentations; (4) awarding stickers with labels such as exemplary student, disciplined student, or intelligent student to active students; and (5) giving punishment by singing the national anthem for less active students or groups. When students encounter specific situations, they must decide on a course of action to face them. These situations may involve daily challenges. Students' ability to determine an action can be trained through the implementation of PBL in science learning at school. This is consistent with the opinion of Ansarian & Lin (2018), who stated that PBL is a collaborative process where students are grouped together to solve given problems. The problem-solving process involves the integration of ideas from each individual in order to find solutions.

Based on the above discussion, it can be concluded that students' abilities for: (1) asking and answering challenging questions that require explanations; (2) defining a term and considering a definition; and (3) determining an action have met the success indicators set, as three out of five indicators of critical thinking ability have percentages greater than or equal to 75%. Additionally, the Problem Based Learning model can enhance students' critical thinking abilities in science learning for fifth-grade students in elementary school. This is in line with the opinion of Lien (2009) who stated that PBL learning can improve students' critical thinking skills and self-directed learning abilities.

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5. Conclusion

Based on the results of the classroom action research on the improvement of students' critical thinking abilities through the Problem Based Learning model in science learning for fifth-grade students in elementary school, it can be concluded that the Problem Based Learning model can enhance students' critical thinking abilities in science learning for fifth-grade students in elementary school. This is evidenced by the percentage of mastery of four indicators of students' critical thinking abilities in cycle I, which increased in cycle II. In cycle I, two indicator of critical thinking ability was mastered, while in cycle II, it increased to four indicators that have been mastered according to the established success criteria. Students' abilities for: (1) answering questions that require explanations; (2) observing and considering observation results; (3) inducing/deducing and considering inductive/deductive results; and (4) determining an action have met the success indicator criteria, as the percentage of critical thinking ability indicators is greater than or equal to 75%. Additionally, the critical thinking ability of fifth-grade students in elementary school is already good. In cycle I, 50% of students had good and very good critical thinking abilities. This percentage increased by 30% to 80% of students having good and very good critical thinking abilities in cycle II.

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7. References

Ansarian, L., & Lin, T. M. (2018). *Problem-Based Language Learning and Teaching: An Innovative Approach to Learn a New Language*. Springer.

Arends, R. I. (2012). *Learning to teach* (Ninth Edit). McGraw-Hill.

Baker, M., Rudd, R., & Pomeroy, C. (2010). *Relationships between Critical and Creative Thinking*.

Bowell, T., & Kemp, G. (2002). *Critical Thinking: A Concise Guide*. Routledge.

Browne, M. N., & Keeley, S. M. (2007). *Asking The Right Questions*. Pearson Prentice Hall.

Cottrell, S. (2005). *Critical Thinking Skills: Developing Effective Analysis and Argument*. Palgrave MacMillan.

Crews-Anderson, T. A. (2007). *Critical Thinking: Human Beings Reason Well When They Take The Time to Do So*. Humanities-Ebooks.co.uk.

Davidson, B. W., & Dunham, R. A. (1997). Assesing ELF Student Progress In Critical Thinking With the Ennis-Weir Critical Thinking Essay Test 1. *JALT Journal*, *19*(1), 43–57.

Kemmis, S., & McTaggart, R. (2014). *The Action Research Planner*. Deakin University Press.

Lien, P. C. (2009). Learning from Problem-Based Learning in A Web-Based Environment: A Systematic Review. *Reflection on PBL*, *2*(9), 12–17.

Moore, B. N., & Parker, R. (2015). *Critical Thinking* (Eleventh E). McGraw-Hill Education.

Nugraha, A. J., Suyitno, H., & Susilaningsih, E. (2017). Analisis Kemampuan Berpikir Kritis Ditinjau dari Keterampilan Proses Sains dan Aktivitas Belajar melalui Model PBL. *Journal of Primary Education*, *6*(1), 35–43.

Pebriana, R., & Disman. (2017). Effect of Problem Based Learning to Critical Thinking Skills Elementary School Students in Social Studies. *Journal of Elementary Education*, *1*(1), 109–118.

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Purwanto, N. (2010). *Prinsip-Prinsip dan Teknik Evaluasi Pengajaran*. PT Remaja Rosdakarya.

Samatowa, U. (2006). *Bagaimana Membelajarkan IPA di Sekolah Dasar*. Depdiknas.

Sendaq, S., & Odabas, H. F. (2009). Effects of an Online Problem Based Learning Course on Content Knowledge Acquisition and Critical Thinking Skills. *Computers & Education*, *53*, 132–141.

Tan, O.-S. (2003). *Problem-Based Learning Innovation: Using Problems to Power Learning in The 21st Century*. Cengage Learning.