



The Effectiveness of Project-Based Learning Model on Critical Thinking Skills in Grade IV Elementary School on Fraction Number Material in Bantul District

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ABSTRACT: Project Based Learning is one of the learning models that provides space for students to explore knowledge. The purpose of this research is to find the effectiveness of Project Based Learning (PjBL) on the development of critical thinking skills on fractional number material. The method used is mixed method (qualitative and quantitative) with the research objective to identify the effectiveness of the PjBL model on critical thinking skills. Data collection by questionnaire and document analysis Skills measured based on 5 aspects of critical thinking skills consisting of 12 indicators. This research was conducted in grade IV elementary schools in Bantul district. Data collection by test The results showed that critical thinking skills were obtained at 97.1% with very good criteria. It can be concluded that students have very good critical thinking skills development.

KEYWORDS: Critical thinking skills, Effectiveness, Project Based Learning.

INTRODUCTION

Effectiveness is something that shows the level of achievement of a goal. An effort can be said to be effective if the effort achieves its ideal goal (Asiah, 2016). According to Putri (201) effectiveness is an assessment related to achievement, both individual and group. The closer their achievement is to the expected achievement, the more effective it is considered. Learning effectiveness is a learning process carried out by teachers to change students' abilities and perceptions from difficult to learn something to easy to learn. In the context of learning activities, effectiveness is not only viewed in terms of achievement, but also in terms of processes and supporting facilities (Hidayah et al., 2020). The effectiveness of the learning model is a measure of the success of the learning process. Learning can be said to be effective if it can help students gain knowledge and skills (Trisnawati, 2020).

Problem Based Learning (PjBL) or project-based learning is learning that is delivered by presenting a problem, asking questions, opening dialog, and facilitating investigation (Sani, 2014). According to Susanto (2016) project-based learning is a learning model that can encourage students to be active, creative and productive to improve student learning outcomes optimally. Meanwhile, according to Winoto (2020) PjBL is a learning model that uses real problems as a stimulus to encourage students to use their knowledge in solving problems and think critically, creatively, analytically, systematically, and logically through empirical data exploration to foster scientific attitudes.

Project Based Learning (PjBL) is a learning model that presents various problems in the real world of students to serve as a source of learning facilities as an effort to provide experience in improving critical thinking skills, problem solving skills without putting aside knowledge (Setyo et al., 2020). Anggelia et al., (2022) also explained that Project Based Learning (PjBL) learning is a model whose learning is centered on students through providing projects that can direct students to experience the inquiry process (investigating and seeking information) so that students are free to explore and express ideas and find the final conclusion in the form of learning outcomes. Based on the description above, researchers can conclude that the PjBL learning model is a problem-centered learning model as a stimulus in order to stimulate students' ability to think critically, creatively, logically, analytically and systematically.

The steps in implementing the project-based learning (PjBL) learning model are explained by Maryati (2018), namely: a) orienting students to the problem; b) organizing students to research; c) assisting independent and group investigations; d) developing and presenting work; e) analyzing and evaluating the problem solving process. According to Wahyudi and Kriswandani, (2013), the general characteristics of PjBL are problems as the beginning of learning and problem design comes from dilemmatic problems in the surrounding environment to attract students' interest in solving problems. Meanwhile, according to Sastradiharja



and Febriani (2023), the characteristics of the PjBL learning model include: a) the teacher is only a facilitator and evaluates work products; b) using projects as a learning medium; c) using problems that exist in the daily lives of students as the first step of learning; d) emphasizing contextual learning; e) creating a simple product as a result of project learning.

In the PjBL learning model there are several advantages (Hamruni, 2012), including: a) a good learning technique to better understand learning content; b) challenge students' abilities and gain new knowledge; c) increase student activity in learning activities; d) help in sharing knowledge and understanding problems faced in their lives; e) develop their knowledge and be responsible for the learning they do; f) help in evaluating the process or results of their learning; g) show that each subject is a way of thinking to understand something and not always sourced from teachers or books; h) can develop critical thinking skills and adjust other knowledge; i) use the knowledge they have to be applied in the real world; and j) encourage students to continue learning. This project-based learning has enormous potential to train students' activeness and thinking processes that lead to critical thinking skills (Nusa et al., 2021).

Critical thinking skills are explained by Winoto (2020), namely a thought process to process knowledge obtained in an organized manner by criticizing, selecting, solving problems, making decisions, evaluating facts or assumptions and / or logic with rational and accountable reasons. Larasati and Syamsurizal (2022), also found that critical thinking skills are the ability to correctly conclude a problem, review and thoroughly examine the decisions taken. In the learning process critical thinking skills are needed in solving problems. Ariadila et al. (2023) explained that students who have these skills tend to be better able to understand and solve problems, and do better on tests and quizzes. In addition, critical thinking skills also help students avoid mistakes that may occur in decision making.

Numbers are one of the materials that need to be mastered by grade IV students. Mariyani (2019) explains that fractions are part of something intact from an object. Objects in fractions are not fragmented but still intact. The part that is given a mark to distinguish the others is called the numerator. Meanwhile, the intact part is the part that is considered as a unit and is called the denominator, so the number is written in the form of symbols, namely: Fractional number material consists of: 1) ordinary fractions, denoted by $\frac{a}{b}$; 2) mixed fractions, denoted by $a\frac{a}{b}$; 3) decimal fractions, denoted by $a.b$; and 4) percent fractions, denoted by $a\%$, where a .

Learning using PjBL is a form of realizing concrete stages. In the learning in this study, fractions are explained through project activities to prove: equivalent fractions, simple fractions, capable fractions, addition and subtraction operations, decimals, and percentages. Each project activity the teacher gives assignments to students to use manipulative media. In PjBL uses manipulative media. Susilowati, N. (2014) explains that manipulative media are all objects that can be seen, touched, heard, felt, and manipulated. This understanding is the basis for choosing the PjBL learning model, because there is a habituation method in learning to relate to the experience of students.

Based on the description above, researchers can formulate the problem formulation, namely: how much is the effectiveness of Project Based Learning (PjBL) on the development of critical thinking skills on fractional number material? The purpose of this research is to find the effectiveness of Project Based Learning (PjBL) on the development of critical thinking skills on fractional number material in class IV elementary schools in Bantul district.

METHODS

This research uses a type of experimental research with a *mix method* (qualitative and quantitative). The *mix method* is a procedure for collecting, analyzing, and "mixing" quantitative and qualitative methods in a study or series of studies to understand the problems in the study (Creswell and Clark, 2017). This approach is done in combination with the aim of providing a better understanding of the problems and research questions than if done separately or individually.

Data collection by means of questionnaires and document analysis using the PjBL learning model. This research was conducted in grade IV elementary schools in Bantul district. Qualitative data analysis from criticism and suggestions from teachers and observers, while quantitative data analysis from the results of student critical thinking skills tests at the end of learning. The skills measured are based on 5 aspects of critical thinking skills consisting of 12 indicators according to Ennis (2011). The following is a table of critical thinking indicators.



Table 1. Indicators of critical thinking

| No. | Aspects | Indicator |
|-----|---------------------------------|--|
| 1. | Providing simple explanations | 1) Focusing the question 2) Analyzing arguments 3) Asking and answering questions |
| 2. | Building basic skills | 4) Considering whether the source is reliable or not 5) Observe and consider observation reports |
| 3. | Summarize | 6) Deduce and consider the results of deduction 7) Inducing and considering the results of induction 8) Make and determine the result of consideration |
| 4. | Provide further explanation | 9) Define terms and consider a definition 10) Identifying assumptions |
| 5. | Organize strategies and tactics | 11) Determining an action 12) Interacting with others |

The effectiveness of critical thinking skills is supported using question sheets according to the 12 indicators used. The results of student work are assessed according to the assessment rubric, and then analyzed using the following formula:

$$\text{Value} = \frac{\text{Total score obtained}}{\text{Maximum score}} \times 100$$

The analysis results were converted using the critical thinking skills categories in the following table:

Table 2. Critical thinking skill level criteria

| No. | Percentage (%) | Criteria |
|-----|----------------|--------------|
| 1 | 85,00 - 100 | Very good |
| 2 | 70,00 – 84,99 | Good |
| 3 | 55,00 – 69,99 | Fair |
| 4 | 40,00 – 54,99 | Insufficient |
| 5 | 0 – 39,99 | Very Poor |

Source: Sudjono in Nuraini (2017)

RESULTS AND DISCUSSION

Results

Based on the above method, 12 questions were obtained as representatives of 12 indicators that aim to determine the level of critical thinking skills in grade IV elementary school students in Bantul district. Data from the test results of critical thinking skills of students using the *Project Based Learning* (PjBL) learning model are presented in the following table:



Table 3. Data Results of Critical Thinking Skills of Students

| No | Indicator | Average (%) | Category |
|-----------------|--|-------------|-----------|
| 1. | Focusing the question | 92,5 | Very good |
| 2. | Analyzing arguments | 96,2 | Very good |
| 3. | Ask and answer questions | 91,2 | Very good |
| 4. | Considering whether the source is trustworthy or not | 97,8 | Very good |
| 5. | Observe and consider observation reports | 95,8 | Very good |
| 6. | Deduce and consider the results of deduction | 95,5 | Very good |
| 7. | Induce and consider the results of induction | 96,8 | Very good |
| 8. | Make and determine the result of consideration | 97,8 | Very good |
| 9. | Define terms and consider a definition | 97,8 | Very good |
| 10. | Identifying assumptions | 97,5 | Very good |
| 11. | Determine an action | 97,8 | Very good |
| 12. | Interact with others | 96,5 | Very good |
| Overall Average | | 97,1% | Very good |

Discussion

Based on the research results above, of the 12 indicators, the overall average value is 97.1%. This can be interpreted that students have been able to master various aspects of critical thinking well, starting from the ability to focus questions to interact with others. This is in accordance with the opinion of Maulana (2017) who states that critical thinking involves various processes of evaluating information systematically and objectively, so that critical thinking skills are formed.

Each indicator used is an important component in building critical thinking skills. In the first indicator, focusing on questions is a crucial first step in the critical thinking process. This indicator refers to the ability to formulate clear and specific questions that demonstrate the ability to identify the core of the problem. The second indicator is analyzing arguments. This indicator is a core skill in critical thinking. Learners with the ability to analyze arguments are able to distinguish facts, opinions, and assumptions in a statement. Thus, allowing one to evaluate information objectively. The third indicator is asking and answering questions, through questions and answers, one can dig deeper information and build a more comprehensive understanding. This indicator shows an inquisitive and active attitude in seeking knowledge. The fourth indicator is considering the source. The ability to evaluate the credibility of information sources shows awareness of the importance of seeking accurate and relevant information. This is an important part of critical thinking, especially in an information age full of hoaxes. The fifth indicator is observing and considering observation reports. Systematic and objective observation is the basis of scientific inquiry. The ability to interpret observations demonstrates the ability to draw logical conclusions.

The sixth and seventh indicators are deduction and induction. Deduction and induction are two forms of reasoning that are very important in critical thinking. Deduction is the process of drawing specific conclusions from general premises, while induction is the process of drawing general conclusions from special cases. The next indicator is making and determining the results of considerations. After analyzing information and evaluating various alternatives, learners must be able to make decisions. This ability shows the ability to synthesize information and act on rational considerations. The ninth indicator is defining terms. Clear and accurate definitions are essential to avoid misunderstandings. The ability to define terms shows a deep understanding of the concepts being discussed. The tenth indicator is identifying assumptions. Assumptions are premises that are assumed to be true without strong evidence. Identifying assumptions helps us to see a problem from multiple perspectives and avoid bias. The eleventh indicator is determining a course of action. After analyzing the problem and considering various alternatives, the next step is to take action. This ability shows the ability to apply critical thinking in real life. The twelfth indicator is interaction with others. Critical thinking not only involves individuals, but also involves social interaction. The ability to communicate effectively and cooperate with others is an important skill in solving complex problems.

All of the above indicators are interrelated and form a coherent system. Each indicator contributes to one's ability to think critically, i.e. the ability to analyze information, evaluate arguments, make rational decisions and so on. In other words, critical thinking is not a stand-alone skill, but rather a collection of various complementary skills.



CONCLUSION

Based on the results and discussion of the research above, it can be concluded that the Project Based Learning learning model by utilizing manipulative media has been able to develop critical thinking skills in students by 97.1%, with very good criteria.

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