Implementation of Project Based Learning with Practicum Methods to Improve Critical Thinking Skills of Students

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Implementation of Project Based Learning with Practicum Methods to Improve Critical Thinking Skills of Students

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Abstract

One of the main goals of going to school is to improve students' ability to think critically, so they can make rational decisions about what to do or what to believe. Students at the junior high school (SMP) level are expected to be able to think deductively, analyze and synthesize, think reflectively and abstractly, and be able to solve various problems. The education system has a top priority, namely educating students to learn think critically. One way to improve critical thinking skills is to use the Project Based Learning (PjBL) learning model using the practicum method. This research was conducted to improve students' critical thinking skills in science subjects. The type of research carried out was classroom action research consisting of two cycles. Each cycle consists of planning stages, implementation stages, and evaluation and reflection stages. The reflection results in cycle I will be improved in cycle II. The results of this study are that there is a significant increase in students' critical thinking skills through the application of the Project Based Learning (PjBL) learning model with the practicum method in class VII D SMP Negeri 1 Bagor academic year 2022/2023 by 48% of students who pass in cycle 1 and increased to 84% in cycle 2.

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INTRODUCTION

Education is one of the most important things for a country (Kurniawati, 2022). Education is one manifestation of human culture, dynamic and full of development. The development of education must be in line with changes in the culture of life. This is so that education is not outdated and also to support human life. To improve education, permanent changes must be made at all levels in anticipation of future benefits. Building an education system requires many considerations originating from several aspects of society (Adha, 2019). The education system has a top priority, namely educating students to learn and think critically. Thinking is a habit that humans do when they get a problem whose solution cannot be known easy (Diva, 2023). Thinking can be divided into critical and creative, analytical, logical and systematic. Students are required to be able to think critically in order to be able to analyze and compare information (Imayanti, 2021). The functioning of students' critical thinking is reflected in their ability to solve problems thoroughly and systematically.

One of the main goals of going to school is to improve students' ability to think critically, they can make rational decisions about what to do or what to believe (Fisher, 2019). Students at the junior high school (SMP) level are expected to be able to think deductively, analyze and synthesize, think reflectively and abstractly, and be able to solve various problems (Trimawati, 2020). Ability means ability, skill, power, ability to do something. Thinking is an activity of

the human personality, the result of which is a deliberate discovery. Critical thinking is a thinking skill that is able to analyze and evaluate a problem until it finds an appropriate decision to solve the problem. According to (Winarti, 2022) indicators of critical thinking are (1) asking questions, (2) answering questions, (3) being able to draw conclusions, (4) expressing opinions, (5) solving problems, and (6) evaluating.

Natural Sciences (IPA) is a science which mission is to improve critical and creative thinking. Natural Science is a science related to how to learn about nature systematically, so Science is not only about managing a collection of information in the form of facts, concepts or principl, but also about a process of discovery (Asmoro B. P & Mukti, 2019). The nature of science includes four main elements, namely: (1) attitude, curiosity towards objects, natural phenomena, living things and causal relationships, which give rise to new problems that can be solved with the right method, (2) processes, problem solving procedures with the scientific method; the scientific method includes formulating hypotheses, designing experiments or trials, evaluating, measuring and drawing conclusions, (3) products in the form of facts, principles, theories and laws, (4) the application of the scientific method and scientific concepts that apply in everyday life (Muliadi, 2022). These four elements are an integral feature of all science. These four elements are designed to appear in scientific learning so that students can experience the learning process as a whole, understand natural phenomena through problem solving activities, scientific methods, and imitate the work of researchers in discovering new facts. The current trend of learning science is that students learn science only as a product, memorizing concepts, theories and laws. This situation is exacerbated by test-based learning (Firmansyah, 2022). This does not affect science as a process, attitude and application in learning.

Science learning is expected to be a means for students to learn about themselves and their environment, as well as opportunities for development in daily application (Harefa, 2020). In addition, science learning is also expected to be able to construct and build students' own understanding (Mahardi, 2019). The emphasis in scientific learning is on providing direct experience to develop skills in studying and understanding the natural environment scientifically. Science learning aims to explore (find) and act (do) so that it can help students understand more deeply about the nature around them (Indrawan, 2022). The way the teacher leads the class has a strong influence on the success of learning science subjects. However, the reality is that teachers pay less attention to aspects of learning thinking skills. Students only find the teacher's explanation and the small notes he made.

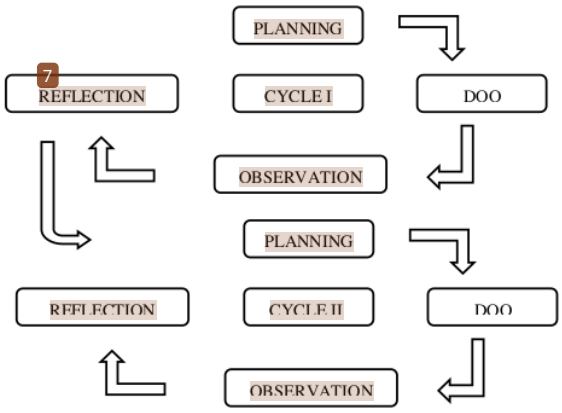
According to (Novita, 2019)) learning outcomes are learning experiences possessed by students. Learning outcomes are an effort made to obtain a new change in behavior as a result of the individual's experience due to internal interaction environment (Slameto, 2018). The standard measure of student achievement is learning completeness. In this study, what is meant by science learning outcomes is the value obtained by students after completing one basic competency as a result of science learning activities. The success of learning is not only reflected in the results of the final exam after completing learning, the skills of students during learning are equally important. As a teacher, one must be able to guide and empower students, among others, to improve students' critical thinking. The success of learning science is greatly influenced by the way the teacher manages the class (Pulungan, 2019). However, the reality is that teachers still pay less attention to aspects of thinking skills in learning. Students are only faced with the teacher's explanations and the small notes they make. Learning activities are expected to obtain learning outcomes in cognitive, affective and psychomotor aspects. Achievement of learning is not only seen from the result of the final evaluation after learning is complete, but what is no less important is the abilities of students during the learning process.

The teacher as a facilitator must be able to guide and empower students, including to improve students' critical thinking skills (Daga, 2021).

The project-based learning model is a learning model that involves students directly in solving problems that are highlighted according to the learning material. The teacher guides students to build their own knowledge through basic questions that guide students to design projects that will help them answer questions thoroughly (Al-Idrus S. W., 2021). Students are given the opportunity to actively collect new information based on their experiences and integrate it into real-life activities through project activities. Project-based learning is suitable for concept reinforcement principles and materials. One of the materials developed using the project learning model is ecology and biodiversity. Most of the ecological and diversity material taught by the teacher is only explained verbally so that students do not understand the material (Erwanto, 2020). With the help of project- based learning, students can find their own understanding of the material through projects carried out under teacher guidance and student support assignments. According to (Anggraeni, 2019) the steps for implementing project-based learning are (1) providing essential questions. (2) design the project. (3) determine the project schedule. (4) carry out the project. (5) assessment of student work. (6) evaluation and reflection. Based on research conducted by (Mawardi & Sari, 2019) the Project Based Learning model is able to improve students' critical thinking skills. The science learning process at SMP Negeri 1 Bagor shows that learning is not optimally centered on students. Learning is still often dominated by the teacher and does not provide opportunities for students to develop independently by discovering their thought processes. Students only listen to the material given by the teacher and then write down what is written on the blackboard. Students cannot write their own sentences, they can only copy what the teacher has written on the blackboard. During the learning process, students are not able to collect knowledge or information from teaching materials. They don't work systematically when solving problems, because they answer questions directly by writing formulas and then solving them. This shows that students lack critical thinking.

METHOD

Classroom Action Research (PTK) is used as a design in research. In accordance with the predetermined research plan, activities are carried out through activity cycles in which each cycle contains predetermined steps, namely: planning (planning), action (doo), and reflection (Astutik, 2021). This research was carried out using 2 cycles in which each cycle consisted of 2 meetings. If in cycle 1 the learning outcomes obtained are not optimal, then the research will continue in cycle 2, but if in cycle 1 the learning outcomes have reached the classical completeness criteria, then the implementation of cycle 2 will still be carried out as strengthening. The class action research cycle can be seen in figure 1



Picture 1. Classroom Action Research Cycle (Purba, 2023)

This research was conducted at SMP Negeri 1 Bagor located in Banarankulon Village, Bagor District, Nganjuk Regency. The subjects in this study were 31 students in class VII D at SMP Negeri 1 Bagor in the even semester of the 2022/2023 academic year. The selection of this subject was based on the results of observation and analysis, because the condition of students in class VII D was heterogeneous, both in terms of gender and level of academic achievement. This research was carried out from the 3rd week to the 5th week of March 2023 for material on ecology and biodiversity contained in the learning outcomes of students identifying interactions between living things and their environment, and being able to design efforts to prevent and overcome pollution and climate change. The methods used in this research are observation, tests, and documentation. The analysis of the observation data used in this study is a quantitative descriptive analysis, which tries to explain the data obtained from the results of the implementation of actions which include the processes and impacts that occur from a cycle as a whole (Jayasuman, 2020). Critical thinking activities of students in the inquiry-based learning process when group discussions take place can be seen from observation activities using observation sheets of critical thinking activities. The formula used to obtain the final score for critical thinking skills is :

$$Final\ Score = \frac{Total\ score\ obtained}{Score\ max}\ x\ 100\%$$

Formula obtains final score for critical thingking skills (Maulida, 2023)

Table 1. categories of critical thinking skills

Acquisition Scale	Category
81,25% < X ≤ 100%	Very critical
62,50% < X ≤ 81,25%	Critical
43,75% < X ≤ 62,50%	Less
25,00% < X ≤ 43,75%	Very less

(Hidayah, 2019)

The success criteria is based on improving students' critical thinking skills after achieving a certain minimum level of success, namely 75% of students who participate in learning achieve a score of > 70 according to the minimum perfection criteria.

RESULTS AND DISCUSSION

Students' Intial Abilities

Before conducting classroom action research activities, it is necessary to know in advance the students' initial abilities in determining the level of completeness of learning outcomes and students' difficulties in solving science subject questions. The results of learning science subjects for class VII D students before taking action can be seen in the table 2:

Table 2. Initial ability of students' critical thinking skills

No	Completeness	KKM	Frequency	Percentage
1	Completed	70	11	35%
2	Not completed	70	20	65%

Based on the table 2, out of 31 students, 11 (35%) students get a complete score and 20 (65%) did not get a complete score . So it can be concluded that critical thinking skills in science learning are lacking.

Description of Cycle 1

Cycle 1 was held on Wednesday, 15 and 16 March 2023 with an allotted time of 4 hours of lessons or 4x40 minutes. The material presented was about food webs using the Project Based Learning (PjBL) learning model. Details of the actions in cycle I, namely

a) Stage Plan (Planning)

At the planning stage, everything necessary for implementation is prepared. Activities carried out during planning are

1. Making a Learning Implementation Plan (RPP) using the Project Based Learning (PjBL) learning model which is complemented by student assessments and assignments
2. Compiling questions for the posttest
3. Forming heterogeneous student study groups
4. Prepare observation and assessment sheets for the implementation of cycle I learning

b) Stage Do (Doing)

First Meeting

activities carried out in the first cycle of learning are in accordance with the design of the lesson plans that have been prepared at the planning stage. Details of the stages of implementing learning in cycle I, namely

1. Preliminary activities

   In the preliminary activity, the model teacher first leads the prayer before learning is carried out. Then the teacher checks attendance, readiness and makes an agreement with students to take part in learning. Furthermore, the model teacher provides appreciation and motivation and provides trigger questions to students. Then the model teacher conveys the learning objectives that students must achieve.
2. Core activities

   In the core activities, the model teacher instructs students to join their respective groups. The model teacher distributes worksheets to each group. The model teacher gives problems that must be solved by students. The model teacher guides students in designing a project to make food web dioramas that will be carried out and answer questions on the LKPD. Students determine the project implementation schedule starting from dividing tasks to preparing the tools and materials needed for the project.
3. Closing activities

In closing activities, students and the model teacher conclude learning together. Then do reflections so that the model teacher knows about students' feelings after participating in learning. Before closing the lesson, the teacher notifies the follow-up of today's lesson. The teacher provides material reinforcement,
affirmation, and mentions again the tools and materials that students must prepare for implementing the diorama project. The teacher closed the lesson by praying and greeting

Second Meeting

1. Preliminary activities
   In the preliminary activities, the model teacher leads a prayer before starting learning. Then the teacher checks attendance, readiness and makes an agreement with students to take part in learning. Furthermore, the model teacher provides motivation and reviews yesterday's learning activities which will be continued in today's learning to students.
2. Core activities
   In the core activities, the model teacher instructs students to join their respective groups. Students prepare tools and materials to be used to make food web dioramas. The model teacher guides students to carry out a project of making food web dioramas according to the designs made in the previous meeting. Then students presented the results of the project from each group. The teacher gives an evaluation of the results of the diorama project made by the students.
3. Closing activities
   In the closing activity, students and the model teacher conclude learning together. After concluding students carried out a post test to determine the critical thinking skills of students after the first cycle treatment.
   Then do reflections so that the model teacher knows about students' feelings after participating in learning. Before closing the lesson, the teacher notifies the follow- up of today's lesson. The teacher closed the lesson by praying and greeting.

c) Stage See (Seeing)
The reflection stage is carried out with group mates and the tutor. The results of the reflection activity are the feelings of the model teacher when carrying out a little learning nervous, the challenges that arise are time management and also providing motivation at the beginning of learning. Based on the results of this reflection, the following follow-up plans are obtained

1. More time management when implementing learning
2. Giving motivation to students at the beginning of learning

The results of students' critical thinking skills in class VII D in cycle 1 can be seen in the following table

Tabel 3. Table of results of critical thinking skills cycle 1

No	Completeness	KKM	Frequency	Percentage
1	Completed	70	15	48%
2	Not completed	70	16	52%

Based on the table above, there are 15 (48%) students who complete and 16 (52%) who do not complete. So it can be concluded that critical thinking skills in science learning are incomplete because they do not meet the minimum standard of completeness.

Description of Cycle 2

Cycle 2 was held on March 29 and 30 2023 which held 2 meetings with a allotted time of 4x40 minutes. The material presented is regarding the water cycle using the Project Based Learning (PjBL) learning model with the practicum method. Details of the actions in cycle II, namely

a) Stage *Plan* (Planning)

At the planning stage, everything needed for the application of learning is prepared. The activities carried out at the time planning were

1. Making teaching modules using the Project Based Learning (PjBL) learning model with practical methods supplemented by assessments and LKPD. The practicum that will be carried out is about the occurrence of the water cycle using simple tools. Next make a poster project about the water cycle.
2. Make questions for the posttest.
3. Form heterogeneous student study groups
4. Prepare observation sheets and assess the implementation of cycle II learning

b) Stage *Do* (Doing)

The learning activities carried out are in accordance with the teaching modules that have been prepared at the planning stage. Details of the stages of implementing learning in cycle II,

First Meeting

1. Preliminary activities

   In the preliminary activities, the model teacher first leads the prayer before learning is carried out. Then the teacher checks attendance, readiness and makes an agreement with students to take part in learning. Furthermore, the model teacher provides appreciative and motivational and provides trigger questions about the water cycle to students. Then the model teacher conveys the learning objectives that students must achieve.
2. Core activities

   the core activities, the model teacher instructs students to join their respective groups. The model teacher provides problems that must be solved by students regarding the water cycle. The model teacher distributed worksheets and materials in the form of beaker glass, plastic, rubber, hot water, and ice cubes for practicum to each group. The model teacher guides students to. Do practical work on the water cycle. Students put hot water into the beaker glass and then covered it with plastic and glued it using rubber. Next put the ice cubes on the plastic. Students observe what happens in the beaker glass which is a picture of the water cycle. Then the students answered the questions on the LKP about the practicum that had been carried out. Then carry out the design of the water cycle plaster manufacturing project. Next, students arrange a project implementation schedule starting from the division of tasks to preparing the tools and materials that will be needed during the project.
3. Closing activities

   In closing activities, students and the model teacher conclude learning together. Then do reflections so that the model teacher knows about students' feelings after participating in learning. Before closing the lesson, the teacher notifies the follow-up of the project to be carried out. The teacher closed the lesson by praying and greeting.

Second activities

1. Preliminary activities
   In the preliminary activities, the model teacher leads a prayer before starting learning. Then the teacher checks attendance, readiness and makes an agreement with students to take part in learning. Furthermore, the model teacher provides motivation and reviews yesterday's learning activities regarding the practicum that has been carried out and explains the project activities that must be carried out by students.
2. Core activities
   In the core activities, the model teacher instructs students to join their respective groups. The teacher checks the tools and materials that will be used to make a water cycle project for each group. The model teacher guides students to carry out a project of making posters about the water cycle. Then students presented the results of the project from each group. The teacher gives an evaluation of the results of the project that has been implemented.
3. Closing activities
   In closing activities, students and the model teacher conclude learning together. After concluding, students carry out a post test to determine the critical thinking skills of students after cycle II treatment. Then do reflection so that the model teacher knows about the feelings of students after participating in learning. Before closing the lesson, the teacher notifies the follow-up of today's lesson. The teacher closes the lesson by praying and greeting.

c) Stage see (seeing)

The reflection stage is carried out with group mates and the tutor. The result of the reflection activity is that the model teacher's voice when teaching is not loud enough. Based on the results of these reflections, a follow-up plan is obtained when carrying out further learning practices, the voice issued by the model teacher must be loud.

The results of students' critical thinking skills in class VII D in cycle 2 can be seen in the following table:

Table 4. Table of results of critical thinking skills cycle 2

No	Completeness	KKM	Frequency	Percentage
1	Completed	70	26	84%
2	Not completed	70	5	16%

Based on the table 4, there are 26 (84%) students who complete and 5 (16%) who do not complete. So it can be concluded that there is a significant increase in students' critical thinking skills and have met the maximum standard of completeness.

Learning activities using the Project Based Learning (PjBL) learning model with the practicum method are able to improve students' critical thinking skills in science learning in class VII D of SMP Negeri 1 Bagor in the 2022/2023 academic year. The increase in students critical thingking results can be seen cycle 1 and cycle 2. The application of the Project Based Learning (PjBL) learning model with the practicum method is able to make students not feel bored when participating in science learning activities at school. This can happen because using the PjBL model and practicum makes students do a lot of activities that can increase their understanding of Ecology material. Students look more enthusiastic and enthusiastic when participating in learning activities such as observing, practicing, discussing, carrying out projects, presenting project results and conveying responses aimed at groups that are making presentations. Based on the actions taken in cycle I where the level of students' critical thinking

skills was 15 (48%) students who completed and 16 (52% did not complete so it was still categorized as moderate. After continuing with class action cycle II there was an increase in results where the level of completeness became 26 (84%) students who completed and 5 (16%) students did not complete. By looking at the increase in research results from cycle I and cycle II, it shows that there was a significant increase in the critical thinking skills of class VII D students of SMP Negeri 1 Bagor for the 2022/2023 academic year.

CONCLUSION

Based on the results and discussion of this study, it can be concluded that there is a significant increase in students' critical thinking skills through the application of the Project Based Learning (PjBL) learning model with practical methods in class VII D SMP Negeri 1 Bagor academic year 2022/2023 by 48% students who completed in cycle 1 and increased to 84% in cycle 2.

SUGGESTION

As a follow-up to the research that has been carried out, the researcher provides the following suggestions: (1) to improve critical thinking skills students can use the Project Based Learning (PjBL) learning model with the practicum method in science learning, (2) students should be more active and enthusiastic when participating in learning.

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