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Application of Project-Based Learning Methods to Improve Critical Thinking

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Abstract: The monotonous learning process and ignoring the active participation of students is one of the causes of low critical thinking skills. This study aims to describe the learning process using a project-based learning model and describe the improvement of critical thinking skills through its use. The method used is descriptive qualitative with a literature review approach. The Project-Based Learning Method (PBL) is implemented to help students think critically about the problem at hand. Project-Based Learning focuses on learning that exposes students to collaborative problems. These problems are unstructured, thus presenting unique challenges for students. When implemented in the classroom, students are required to be active and responsive to the problems presented. With PBL learning, students will remain motivated to continue learning and hone their problem-solving skills. The implementation of this method cannot be separated from positive and negative impacts. The positive impact is to help students process information better and help them learn to think critically when faced with problems. However, the negative impact generally arises from the fact that the implementation of this method requires high costs for teaching aids and the long time required from concept preparation to implementation.

Keyword: Critical Thinking, Project Based Learning, Literature Review Approach.

INTRODUCTION

Critical thinking is one of the most important cognitive skills that is currently required to be developed by the industrial sector. This critical thinking is very necessary in solving complex problems and to give birth to an innovation that is used to create advantages in the era of global competition as it is happening today. In the face of global competition in today's era, practitioners in the field of education are simultaneously starting to focus their attention on student learning strategies that can help to foster effective critical thinking.

Critical thinking or commonly called high-level thinking is also a thinking skill of processing all the information, observations and problems obtained, by making decisions about what to do accompanied by logic. This makes thinking an important thing, especially in the learning process. A person in thinking is basically based on curiosity, right or wrong thinking process. Jaya, Swasono, Baswir, and Prijambada (2015) revealed that critical thinking is part of a high-level thinking skill or ability. Critical thinking is important to be applied, not only memorizing theories that are easy to forget but also being able to analyze and understand their meaning and acquire skills that are useful for life in the community. According to Tinio (in Wahyuni, 2011), one of the skills needed to face challenges in the future is critical thinking skills or higher order thinking skills. The importance of developing critical thinking skills should be carried out from early education to higher education, even though it is still needed. This reason makes it necessary for learning to involve more thinking learning processes.

This condition is quite ironic because there is still no awareness that leads to the application of critical thinking. One of the many learning methods that have been proven by several expert studies to foster critical thinking in students is through Problem-Based Learning. This learning is often known as Project Based Learning which is an approach to learning which is student-centered and faces a problem in students that encourages students to collaborate together in solving given problems where the problem is still unstructured.

Problem Based Learning, which is often abbreviated as PBL, refers to a curriculum using a constructivist approach that emphasizes more on assisting students to solve their problems as an experience that can be solved by fostering activeness in the classroom to solve actual cases that occur in real life. Most educators or teachers and managers of educational institutions in Indonesia are reluctant to apply the PBL method because of the pattern of educators in Indonesia. Indonesia tends not to do learning that activates critical power. Many educators in Indonesia still use traditional memorization methods and use a direct teaching approach rather than centralized methods such as the PBL method.

METHOD

The research method used in this article is a descriptive qualitative method with a literature study approach. This method was chosen because the writing of the article is carried out by collecting data from various sources and analyzing information from various journals, scientific articles, and research sources related to "Application of Project-Based Learning Methods to Improve Critical Thinking" The data obtained in this article through various sources such as journals, books, articles and literature study techniques, namely by the method of reading, understand, and compare some of the results of previous research that discuss how students can think critically. The data analysis technique is carried out descriptively by describing the research results that have been obtained, then rearranged into a more systematic and easy-to-understand discussion. Through this method, students can explain the application of the Project-Based Learning Method to improve critical thinking based on the results of literature review without conducting direct field research.

RESULT AND DISCUSSION

Education is the main means of expanding insight and knowledge, both through formal and non-formal education, in order to create quality individuals. To achieve the expected quality, proper planning and learning strategies are needed. The purpose of education plays an important role in determining the success of the learning process in producing superior human resources. In today's era of globalization, the challenges in the world of education are increasingly complex, requiring individuals who have the ability to think critically, innovatively, and creatively in order to compete in various fields.

Definition of the PjBL (Project Based Learning) Method

According to John, project-based learning focuses on solving problems that are relevant to the real world through hands-on learning experiences that involve active community participation. Meanwhile, Arends stated that this method is also known by various other terms, such as authentic learning, experiential learning, and project-based learning. Gijbels added that project-based learning encompasses a variety of more contextual learning approaches, where the learning and teaching processes are placed in appropriate situations. This approach emphasizes the specific problems that are the main triggers in the learning process, which is the main essence of project-based learning. Based on the various opinions that have been expressed, it can be concluded that Project-Based Learning (PjBL) is a learning method that is centered on problem solving and oriented towards hands-on learning experiences. This approach emphasizes authentic and contextual learning, so that it can improve students' critical thinking skills, collaboration, and skills in solving problems effectively. This learning is able to attract the enthusiasm of students who were initially not enthusiastic about learning to become enthusiastic because of the demand to take part in this PjBL learning.

Project-Based Learning (PjBL) is a learning model that utilizes projects or activities as the main means in the learning process. In this method, the teacher acts as a facilitator who assigns tasks to students to produce various forms of learning output. This approach uses problems as a starting point for students to gather and connect new knowledge based on hands-on experience in real activities. With the right implementation, PjBL has great potential in creating a more interesting and meaningful learning experience for students.

The Project-Based Learning (PjBL) model is based on constructivist learning theory, where students actively build knowledge, understanding, and skills based on their experiences. Constructivism creates a learning atmosphere that requires students to plan learning activities, carry out projects collaboratively, and produce work products to present. On the other hand, teachers play the role of facilitators who oversee the process of knowledge formation to be more effective and directed.

Empirically, PjBL has been proven to have a positive influence on learning because this method allows students to experience a more meaningful learning process. Learning in this model is developed based on the principles of constructivism, which emphasizes that knowledge is formed by individuals through interaction with the environment. In its application in the classroom, PjBL encourages students to be actively involved in learning, both individually and in groups. Teachers play a role in providing guidance and opportunities for students to express their ideas and ideas, so that problem-solving skills can develop more optimally. According to Made Wena (2014:147), the Project-Based Learning (PjBL) method has several advantages and disadvantages in its application in the world of education.

One of the main advantages of this method is its ability to increase students' motivation to learn. By presenting challenges in the form of projects, students become more interested and excited in completing the assigned tasks. In addition, PjBL also contributes to honing problem-solving skills, because students are faced directly with real problems that they have to solve. This method also encourages more effective teamwork, giving students the freedom to strategize and make decisions in project completion. In addition, PjBL trains students to think critically in managing the various resources they need during the learning process. Thus, this method not only improves academic understanding, but also builds better resource management skills.

However, behind its advantages, PjBL also has several challenges that need to be considered. One of them is the time required in the implementation of a project that is quite long, considering that each project requires complex stages to be completed properly. In addition, this method also requires a deep understanding of the material, so students must be able to think creatively in designing and developing their projects independently. Another

disadvantage is the need for a variety of equipment and supporting materials, which often cost quite a bit. This can be an obstacle, especially for schools with limited resources. Therefore, in the implementation of PjBL, careful planning is needed so that this method can run effectively and still provide maximum benefits for students.

Translation Procedures in the Project Based Learning Method

The learning model is basically a form of learning that is drawn from beginning to end presented by educators such as approaches, methods, strategies, and learning techniques that have become a whole unit.

The learning model is a very important component in the teaching and learning process. Not all characteristics of the learning model are in harmony with the characteristics of the students. The characteristics of the Project Based Learning learning method are as follows:

1. It presents a problem that is still unstructured and has not been found a solution before.
2. Learners act as process designers to achieve learning objectives.
3. Students are given the responsibility to get and manage the information obtained.
4. Always conduct evaluations of every program or activity that has been carried out continuously.
5. Students are given the opportunity to review what they have done in the learning.
6. Evaluate the product or the final result of the activity.
7. Creating an atmosphere of tolerance in the teaching and learning environment that is created to accept mistakes and correct them.

In the preparation of learning with the PBL method, the steps that must be considered by practitioners or teachers include the following:

1. Determine the project or problem to be raised
2. Designing the steps that will be taken to solve the problems raised.
3. Prepare schedules in terms of project planning.
4. Completing projects or problems given to students who are monitored by the teacher.
5. Reporting and presenting the results obtained on projects or problems as a form of implementation of the PBL program.
6. Evaluate activities by reviewing the results obtained from the practice.

Principles of Project Based Learning Method

The principle of the Project Based Learning Method is a complex effort in which in each process it is necessary to analyze the problem that has been planned in advance. The procedures used in this method are planning, identifying problems, confronting new information with previous experience, processing, implementation. The principles that exist in the Project Based Learning learning method include:

1. **Motivating Principles** In the context of providing learning to students, project work focuses more on providing questions or case studies that can encourage students to struggle more in getting concepts that are used as solutions or answers to questions or case studies. So this project can awaken the motivation of students to become more independent in doing the tasks given by the teacher.
2. **Centralist Principle** This learning model is the center of learning where students learn the core things of the discipline using the PBL method.
3. **The Principle of Autonomy** This principle can be interpreted as the independent attitude possessed by each student in carrying out every activity that is included in the learning process with the Project Based Learning method. In this principle, students are more emphasized to be free to make their choices, and to be responsible for their choices as well. Therefore, student worksheets are a form of application of project learning.

Application of Project Based Learning Method

In implementing this Project Based Learning program, it uses discussion or raising a problem with the classification of animals based on their habitat or place of life, type of food, and body covering. The author Rineksiane, N.P (2022) compiled a learning scenario by dividing into several activities, which are as follows:

1. Initial Activities:

In the initial activity, the author did the following things, including:

- a. Provide motivation to students by inviting students to watch short videos about animals and their habitats that are tailored to the topic. This is done with the aim of fostering students' curiosity in learning the problems given by the teacher.
- b. Exploring students' knowledge.
- c. From the two intros, the learning objectives were then conveyed. The learning objectives are conveyed after the viewing of a short video with the aim of giving students the opportunity to think broadly about what they learn next.

2. Core Activities:

- a. The teacher divides the students into small groups where each group consists of 4-5 people.
- b. Each group was given an Activity Sheet containing the classification of animals.
- c. Students are directed to read in detail the instructions written in the Activity Sheet.
- d. Students are guided to work on the questions in the Activity Sheet by observing pictures and collecting data as well as classifying animals based on the similarity of their characteristics such as the tempt of life and type of food.
- e. Each group is directed to have a discussion with their group mates by discussing the results of the Student Activity Sheet that has been carried out by each student.
- f. The teacher appoints one of the students to read the results of the work and the results of the discussion with his classmates, while the other group is given the opportunity to listen and also respond to the reading of the results.
- g. The teacher confirms the answers that have been read by the students if the results read by the students are still not appropriate.
- h. The teacher gave an opinion reinforcement to the results of the group that answered correctly. Teachers also provide motivation to students whose answers are still not correct.
- i. The teacher guides the students to conclude the learning that has been done.
- j. Students are directed to reflect with full guidance by the teacher. This is done by asking students to mention what things are taught, students are also directed to express their opinions about what they like or dislike, and what they want for further learning.
- k. Students take the final written test to measure the level of proficiency in the application of the PBL method.
- l. Students receive follow-up to retrieve information about the classification of animals based on how they move and how they reproduce.
- m. The teacher ended the learning activity with a prayer and a closing greeting.

Meanwhile, according to Rani, H. (2021), it can be concluded that the learning scenario of the Project-Based Learning method can be divided into several activities, namely as follows:

1. Start with the Essential Question
 - a. Activity Details: Learning begins with a stimulus in the form of a challenging question or a real problem related to historical material (e.g., about the glory, collapse, or heritage of Islamic culture).
 - b. Objective: To spark students' curiosity and relate academic material to a real context so that they are motivated from the beginning of the meeting.
2. Design a Plan for the Project
 - a. Activity Details: The teacher and the students develop a project creation plan collaboratively. This includes determining the rules of the game, selecting activities that support project completion, and selecting the tools and materials needed.
 - b. Objective: Provide space for students to pour out creative ideas and design problem-solving strategies independently.
3. Create a Schedule
 - a. Activity Details: Teachers and students agree on a timeline for project work. This step describes the deadline for collecting intermediate targets (milestones) until the deadline for project submission.
 - b. Objective: Train students' time management skills and responsibilities because working on PjBL projects usually takes a relatively long time.
4. Monitor the Students and the Progress of the Project
 - a. Activity Details: The teacher acts as a facilitator who monitors the progress of the project. Students do the work, either individually or in groups, while the teacher actively guides, directs, and assists if students encounter technical or conceptual obstacles.
 - b. Objective: To ensure that the activities carried out by students remain on the right track and in accordance with the essence of the subject matter.
5. Assess the Outcome
 - a. Activity Details: Once the project is completed (whether in the form of clippings, historical infographics, mockups, mini-dramas, or digital reports), the work is presented or tested in front of the class. The teacher assesses the quality of the product and the understanding of the concepts that students have achieved.
 - b. Objective: To measure the extent of the achievement of the competency standards of the subject matter and provide feedback on the results of student work.
6. Evaluate the Experience
 - a. Activity Details: At the end of the learning process, the teacher and the students reflect on all the activities that have been carried out. Students express their impressions, the obstacles they faced, and how they solved the problem during the project work.
 - b. Objective: To correct the weaknesses of the process for future projects, as well as to strengthen students' critical understanding of the material they have learned through hands-on experience.

Project Based Learning Method Assessment System for Implementation in the Teaching and Learning Process

After practicing in the application of the Project Based Learning method carried out between teachers and their students, the next procedure carried out by teachers is to assess the process in which the process is observed and conclude how the results are obtained. After that, an assessment of the results or products of learning practices with the PBL method was obtained from the holding of a cognitive written test. And the third is attitude assessment by fostering a sense of responsibility and cooperation in students.

Analysis of the Results of the Application of the Project-Based Learning Method

Based on the results of Winarti's research, N, et al., the application of the Project Based Learning (PjBL) learning model was effectively able to improve students' critical thinking skills which had been researched directly on grade III students at SD Negeri Rambay. Students' low critical thinking skills are initially triggered by a monotonous learning process and lack of active participation, as seen from the pre-cycle average score of 53. Through the design of Kurt Lewin's Classroom Action Research (PTK) model, the PjBL model is applied in two cycles that include the planning, action, observation, and reflection stages. The results showed a significant increase in teacher and student activities, where the average score of critical thinking skills increased to 68 in the first cycle and reached 82 in the second cycle.

The application of this model has been proven to train students in critical thinking indicators such as the ability to ask questions, answer questions, analyze arguments, and evaluate results. Although the indicators of solving problems and drawing conclusions still show a slight increase and require further guidance, the PjBL model is still considered superior in increasing motivation, confidence, and collaboration between students. Overall, the integration of real problems in project creation helps students reconstruct knowledge and practice their thinking skills in more depth.

The application of the Project Based Learning (PjBL) model in classroom action research proves that the paradigm shift from teacher-centered to student-centered learning is crucial to stimulate high-level cognitive abilities. The data show that the PjBL model provides a systematic framework for students to actively engage in observation, reasoning, and communication through six main syntax, ranging from the determination of fundamental questions to experiential evaluation. The increase in the average value from 53 in the pre-cycle to 82 in the second cycle confirms empirically that the integration of real-life problems into the project is able to strengthen the critical thinking indicators, especially in the aspects of asking and analyzing arguments.

It should be noted that despite significant successes, challenges in the indicators of solving problems and drawing conclusions indicate that students still need more intensive scaffolding from teachers during the learning process. These findings emphasize that the PjBL model not only serves as a tool to improve learning outcomes quantitatively, but also as a means of character development such as independence, responsibility, and collaboration skills that are the foundation of 21st century competencies. Therefore, this research is an important reference for education practitioners to continue to optimize guidance strategies at each stage of the project to ensure that all dimensions of students' critical thinking develop in a balanced manner.

Advantages and Disadvantages of Project Based Learning

Project-based learning is a comprehensive approach that provides instruction for learners, works individually or in groups, and relates to real-world topics. The implementation of good project-based learning can provide useful abilities for students. The success of project-based learning occurs when students get high motivation, feel active in their learning, and produce high-quality work results. Here are some of the advantages of the project-based learning approach (Purnawan, 2007):

1. Motivate students by involving them in their learning, letting them know their interests, answering questions and making decisions in the learning process.
2. Provide learning opportunities for various disciplines.
3. Help with the connectedness of life outside of school, pay attention to the real world, and develop real skills.
4. Provides unique opportunities as educators build relationships with learners, as trainers, facilitators, and co-learners.

5. Provides opportunities to build relationships with large communities.
6. Make students more active and successfully solve complex problems.
7. Encourage learners to develop and practice communication skills.
8. Provide learners with learning and practice experience in organizing projects, and allocate time and other resources such as supplies to complete tasks.
9. Provide learning experiences that engage learners in a complex manner and are designed to evolve according to the real world.
10. Making the learning atmosphere fun, so that students and educators enjoy the learning process.

Project-based learning does have many advantages, but on the other hand, project-based learning like this also has disadvantages. The disadvantages of project-based learning include requiring a lot of time to solve problems, requiring quite a lot of money, many educators are comfortable with traditional classes, where educators play a leading role in the classroom, the amount of equipment that must be provided, students who have weaknesses in experimentation and information collection will experience difficulties, there is a possibility that some students are less active in group work, When the topics given to each group are different, and it is feared that students will not be able to understand the topic as a whole.

CONCLUSION

Conclusion From the problems that have been explained above, it can be concluded that this Project Based Learning Method is being held intensively in order to grow students in Indonesia to think critically. This is focused on now because in the future these students will become the takeover who runs the wheel of government and become the hope of the Indonesian nation. In today's time, critical thinking is very necessary because of the challenges of the development of the times that are increasingly sophisticated every day. If the generation of the nation's leaders cannot think critically about every problem faced, then it will not be able to bring Indonesia to the progress of the times. As a result, Indonesia will be far behind other countries. The formation of critical thinking is not instantaneous, requires a long process and also the provision of infrastructure facilities which are quite expensive. Therefore, the Project Based Learning learning model is applied since basic education so that from an early age students have been embedded in thinking critically in solving every problem. Suggestions for the implementation of this Project Based Learning Model in learning in schools should be intensified. In addition to students, teachers also need to be re-educated to be able to become good facilitators who can channel the teaching to the maximum. The need for re-education to teachers is due to the fact that most teachers are still comfortable with traditional conditions in learning, which if the common thread is drawn, it will gradually not be relevant to the changes in today's sophisticated times. After the education of teachers is held, the government should enact a new curriculum that requires the PBL learning method to be able to level the quality of students throughout Indonesia.

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