Application of Game-Assisted Problem-Based Learning to Improve Critical Thinking Skills and Learning Motivation of Students

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ABSTRACT

The majority of student learning processes in schools have not encouraged students to improve critical thinking process skills. In fact, it is important for students to have these skills to deal with complex problems in the future, so that learning strategies are needed to improve these skills. This classroom action research aims to improve students' critical thinking skills and learning motivation in game-assisted PBL learning. This research consisted of two cycles consisting of the planning, implementation, and reflection stages. The research subjects were 27 students of class X-11 State Senior High School 1 Batu. The data were obtained from the results of the pre-test and post-test for each learning cycle. The treatment in this study was the PBL learning model with the help of games. The dependent variable used was critical thinking skills and student learning motivation as measured using the critical thinking indicator guide according to Anderson. The results of this study indicate an increase in students' critical thinking skills and learning motivation obtained from the analysis of test results and observations. This shows that PBL is effectively implemented and can equip students with certain skills.

Keyword: Critical thinking skills, Games learning, Learning motivation, PBL

INTRODUCTION

Critical thinking skills are one of the 21st-century skills important for students. The 21st century relies on knowledge and skills that play a role in 21st-century learning (Mardhiyah *et al*, 2021). An increasingly complex and multidimensional life becomes a challenge for students to equip them in living their daily lives or after graduating from school. These 21st-century skills include critical thinking and problem-solving, creativity and innovation, communication, and collaboration.

The development of 21st-century skills can be carried out in all disciplines (Redhana, 2019). Seven skills are increasingly needed by students to face life in the world of work and everyday life in the 21st century: critical thinking and problem-solving, collaboration and leadership, agility and adaptability, initiative and entrepreneurial spirit, and communication effectively, both orally and in writing, able to access and analyze information and have curiosity and imagination (Mardhiyah *et al*., 2021; Asrizal et al., 2022). For this reason, teachers should be able to develop 21st-century skills in learning.

21st-century skills are a provision for students to have competitiveness and a prominent

character in dealing with developments in technology and science (Mashudi, 2021). Besides thinking skills, students' learning motivation must also be improved to integrate critical thinking processes. Improving critical thinking skills and student learning motivation can be applied by teachers during the learning process in class. Critical thinking skills are very important abilities to support the success of student understanding so that they will impact student learning outcomes (Pamungkas *et al.*, 2019). Learning that involves solving problems in the real world as a context can train students to learn about critical thinking and problem-solving skills and acquire knowledge or important concepts from the learning material.

The application of thinking skills in Indonesia is quite sub-optimal. This is evidenced by the results of Arif's (2019) research which states that the level of students' critical thinking skills is still relatively low. The cause of low critical thinking skills can be due to students' lack of training in analyzing a problem or a fact happening around them. Students are said to have critical thinking skills because students are considered able to choose the right way or solution to solve problems systematically (Suriati *et al.*, 2021).

In learning biology, understanding concepts involves a contextual scientific way of thinking so that students will get meaningful learning. Understanding the concepts of a good biology subject will make students store the material in the long-term memory system. It can be used to improve critical thinking skills, such as analyzing a problem and finding a solution to the problem. This follows the opinion of Ristiasari (2012), which states that problem-solving can create a teaching and learning atmosphere more effectively influencing students' critical thinking skills. Problem-solving can improve critical thinking skills, which are very meaningful; students become more critical in issuing opinions, asking questions, identifying, and solving existing problems (Yustina *et al.*, 2015). Therefore, the role of the teacher is very important to plan good learning so that students gain certain insights and skills.

State Senior High School 1 Batu is one of the schools in Batu City, East Java, with high student academic ability. Based on the results of observations made by researchers, the learning process carried out by some teachers has implemented increased critical thinking skills. However, some teachers have not implemented learning strategies that have not encouraged and trained students to think critically. This causes the material delivered by the teacher to students not to be optimal and cannot be understood by students, so many students do not understand the subject matter (Ristiasari *et al.*, 2012).

The strategies and methods used by the teacher during the learning process determine the interest and motivation of student learning in improving critical thinking skills. The strategy of using learning methods has a significant effect on the quality and learning outcomes (Zaifullah *et al.*, 2021). Learning should provide facilities for students to be active and use critical thinking skills, and this is a challenge for teachers to design good and optimal learning strategies (Sutama *et al*, 2014). One of the learning models that teachers can use in the learning process and is considered to provide optimal results is the Problem Based Learning (PBL) learning model.

Problem-Based learning is a learning model that uses real-world problems as a context for students to learn about critical thinking and problem-solving skills and acquire essential knowledge and concepts from the subject matter (Maryati, 2018). This learning model is important for improving students' skills, especially in the current era of globalization (Hotimah, 2020). The first stage in problem-based learning is that students are given a problem to be able to analyze and solve the problem. Solving problems by providing the right solutions is a real form of applying critical thinking.

Critical thinking skills include students' skills in using logical thinking to collect and analyze information, design and test solutions to problems, and formulate plans (Arnold & Wade, 2015). Critical thinking is useful for adapting and modifying information, and there is good cooperation in everyday life (Pennycook *et al.*, 2015). Application of problem-based

learning models can also be improvised by giving games in learning. Several related studies have proven that giving games in the learning process can improve skills and student's ability to understand the material, and there is an increase in learning motivation (Kilauwati, 2018; Priyanto, 2021; Riskayani, 2022; Widiana, 2022).

Classroom action research using the PBL learning model has been carried out by several researchers in various regions and shows an increase in critical thinking and learning outcomes in high school-level students (Nafiah, 2017; Pamungkas *et al.*, 2019; Syawaly & Hayun, 2020). In addition to critical thinking skills, research by Syawaly (2020) proves that the Problem Based Learning (PBL) model significantly improves students' analytical thinking skills in certain Basic Competencies at the secondary school level. This proves that applying the PBL learning model can improve students' skills in certain abilities.

Classroom action research has actually been carried out by several researchers in various regions, but so far, no research has been conducted in the Kota Batu area, East Java. Many previous studies also use critical thinking instruments that do not meet standards. In addition, most research that has been carried out does not involve increasing student motivation, especially by providing games in the learning process. This study aims to improve students' critical thinking skills and student learning motivation at State Senior High School 1 Batu by applying a problem-based learning model (PBL) by using a game. This research is important to provide information on the effectiveness of implementing the PBL model and become a teacher's recommendation in determining appropriate learning strategies to improve students' skills.

METHODS

This type of research was Classroom Action Research which was conducted in two cycles. Each cycle consisted of the stages of planning, implementing, observing, and reflecting. One cycle consisted of one meeting. This study provided a pre-test before treatment and a post-test after treatment. The treatment applied was learning biology on virus material with the Problem-Based Learning model. The special treatment given was by giving games in each learning cycle.

The research subjects in this study were students in class X-11 at State Senior High School 1 Batu in the odd semester of 2022/2023. The selection of this class was based on the results of observation and study of documents that informed problems related to the low critical thinking skills of students in that class. The independent variable in this study was the problem-based learning (PBL) model, with the dependent variable critical thinking skills and students' learning motivation.

The research was carried out following the PBL model syntax assisted by games. There were five stages of the PBL model applied in this CAR. First, organize students on the problem. In learning, students were oriented to find real-world problems in everyday life. Second, organizing students to learn. In this stage, students were organized in groups to carry out investigations. Third, guiding group investigations. In this stage, groups of students carried out investigations according to the chosen research topic. Fourth, presenting the work. Student groups presented the results of the investigations that had been carried out. Fifth, analyze and evaluate the problem-solving process. In this last stage, the teacher provided reinforcement and correction of the results of student investigations. CAR was carried out in two cycles, namely cycle 1 and cycle 2. In cycle 1, critical thinking skills and learning motivation were measured. The results of cycle 1 were evaluated and made improvements. Improvements in the application of the PBL model assisted by games were applied in cycle 2. Measurement of critical thinking skills and learning motivation with the same indicators was carried out in cycle 2.

The data obtained in this study were in the form of assessment questionnaires and observations of students' learning motivation and assessment of critical thinking skills. The research data was taken through tests of critical thinking skills using critical thinking indicators by Anderson. Critical thinking skills tests were held at the beginning and end of each cycle. Data analysis in this study used qualitative descriptive data analysis techniques; namely, the data analyzed were not data in the form of numbers or statistical calculations but in the form of words, sentences, or paragraphs expressed in narrative form.

RESULTS AND DISCUSSION

Results

Based on the results of research conducted in class X-11 State Senior High School 1 Batu in biology learning cycles 1 and 2 with the application of the Problem-Based Learning (PBL) assisted game, the resulting data are presented in Table 1 and Figure 1 as follows.

Table 1. Data on Critical Thinking Skills Assessment Results

Aspects of critical thinking skills	Cycle I	Cycle II	Description
	%	%	
Elementary clarification (give a simple explanation)	46,9	78,9	Increase
Basic support (build basic skills)	90,6	57,9	Decrease
Inference (make a conclusion)	40,6	89,5	Increase
Advanced clarification (make further explanation)	84,4	63,2	Decrease
Strategies and tactics (make estimates and integration)	34,5	42,1	Increase
Average	**59,4**	**66,3**	**Increase**

The results of the assessment of critical thinking skills in the form of diagrams are presented in Figure 1 as follows.
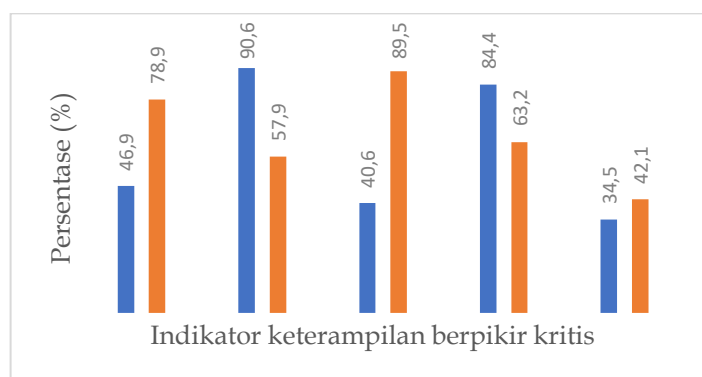

Figure 1. Diagram of Critical Thinking Skills Assessment Results

The results of the research presented in Table 1 concerning the assessment of students' critical thinking skills in class X-11 obtain the assessment results in cycle 1, an average of 59.4%. In cycle 2, an average of 66.3%, so between the two cycles showed an increase. The value of students' thinking skills is obtained from the results of students' cognitive learning assessments in the form of multiple-choice tests integrated with critical thinking skills

indicators.

Table 1 and Figure 1 show that applying the learning model of problem-based learning using games helps students improve their analytical skills, solve a problem, and find a solution to the problem. Based on the results of Qomariyah's (2017) research, there are differences in the results of critical thinking skills between learning using problem-based learning model and conventional learning model.

The results of observations on the learning motivation of class X-11 students of State Senior High School 1 Batu are presented in Table 2 as follows.

Table 2. Observation Data on Student Learning Motivation

No	Parameter	Cycle I	Cycle II	Description
1	The number of students	35	35	
2	Highest score	99	99	Increase
3	Lowest score	0	5	
	Average	**72**	**74**	Increase

Based on the results of student learning observations, it is found that the results of observations of student learning motivation show an increase, namely in the first cycle of learning as many as 72 and in the second cycle of learning as many as 74.

The results of the questionnaire work related to the learning motivation of class X-11 students of State Senior High School 1 Batu are presented in the following table.

Table 3. Data Hasil Angket Motivasi Belajar Siswa

No	Parameter	Cycle I	Cycle II	Description
1	The number of students	35	35	
2	Highest score	100	100	Increase
3	Lowest score	47	70	
	Average	**79**	**83**	Increase

Based on the results of distributing student learning motivation questionnaires, the results of learning motivation also increase, namely from learning cycle 1 with a score of 79 and learning cycle 2 with a score of 83. Tables 2 and 3 show that giving games can help increase student motivation in learning and assist in understanding the material presented. According to Rahmawati (2019), applying TGT (Team Game Tournament) in learning can be used as a strategy to help activate students who experience communication barriers in class so that students can mingle more with peers.

Data Analysis of the Results of the Application of Problem-Based Learning

The problem-based learning (PBL) model has been carried out in class X-11 State Senior High School 1 Batu on virus material. The results of the assessment of critical thinking skills in learning cycles 1 and 2 have increased. The application of PBL using games helps students improve their analytical skills, solve a problem, and find a solution to the problem. Based on the results of Qomariyah's (2017) research, there are differences in the results of critical thinking skills between learning using problem-based learning and conventional learning models. The results of this study indicate alignment with other studies that also apply problem-based learning methods. Those students present the increase of student abilities, thinking skills, ability to remember learning material, and student understanding between cycle one and cycle two (Hajar, Darmono, & Budiati, 2016; Hotimah, 2020; Nafiah, 2017; Rahmadani, 2019).

Data Analysis of Critical Thinking Skills Results

The learning process by using a problem-based learning model is directed at students being able to analyze material about viruses more deeply by relating it to everyday life. When studying virus material, students can understand the concept of viruses, so students can participate in overcoming problems caused by viruses (Aida *et al.*, 2015). Students are instructed to determine a good solution to prevent the spread of a virus that can cause disease. The process of analyzing and connecting viral material with students' daily lives can have meaningful experiences so that students' thinking skills will be formed and improved during the learning process. According to Rusman (2014), through PBL learning, students' thinking skills are optimized through a systematic group or teamwork process so that students can empower, hone, test and develop their thinking skills continuously.

Data Analysis of the Results of Game Application in Increasing Student Learning Motivation

Giving games can increase student motivation in learning and assist in understanding the viral material presented. Implementing game-assisted learning models also trains students to collaborate with groups to answer a question. According to Rahmawati (2019), applying TGT in learning can be used as a strategy to help activate students who experience communication barriers in class so that students can mingle more with peers. This follows the classroom conditions when the game is implemented; some students who initially tend to be passive and sit still can be more active in class and participate in game activities. Students take turns answering questions provided by the teacher in front of the class. Thus, students are eager to answer questions correctly and quickly so that group collaboration also occurs optimally for each group member.

Discussion

By increasing student learning motivation, student learning activity will be moved and shown by the attitudes and behavior of students in learning (Setiawan *et al.*, 2021). According to Sardiman (in Nasrah, 2020), indicators of learning motivation include (1) diligently facing assignments; (2) being tenacious in the face of difficulties; (3) showing an interest in various problems for people. The TGT (Team Game Tournament) is a type of cooperative learning that is easy to implement, fun, involves the activities of all students without any status differences, involves the role of students as peer tutors and contains elements of play and reinforcement (Widhiastuti, 2014). According to Rahmawati (2019), applying TGT in learning can be used as a strategy to help activate students who experience communication barriers in class so that students can mingle more with peers. Based on the results of the average assessment shows an increase; this is following several studies which prove that the application of games in learning can increase the activity and learning abilities of students (Anwar *et al.*, 2022; Hartanti, 2019; Puspitasari, 2019; Widya, 2021)

Based on the findings and discussion, the application of Game-assisted PBL is proven to improve critical thinking skills and student learning motivation. However, this research also has several limitations: the results of students' thinking skills are only analyzed based on test results, so it requires several other methods to determine the development of students' critical thinking skills so that the data obtained is more representative.

CONCLUSION

Based on the research results, it proves that there is an increase in students' critical thinking skills in applying problem-based learning models using games. The study also shows an increase in learning motivation obtained from the results of tests and observations of students' learning processes in the classroom. The application of PBL trains students to

improve their ability to solve a problem and provide the right solution. Students will use these skills to deal with everyday problems and a more complex future life. The results of this study can be a recommendation for further research to examine the application of certain learning models that can improve 21st-century skills, especially critical thinking. So, further research is expected to provide information and recommendations for teachers in determining appropriate learning strategies.

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