e-ISSN 2528-7303
Jurnal Ilmiah Edutic : Pendidikan dan Informatika /Vol.11, No.1, Nopember 2024
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Improving the Learning Outcomes of Class VIII Students Through the Implementation of the Project-Based Learning (PjBL) Model in Science Learning

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DOI : https://doi.org/10.21107/edutic.v11i1.20141

Abstract

This research aims to improve the learning outcomes of junior high school students in science learning.This research is a type of classroom action research carried out in one of the public junior high schools in the Madiun district. The study population was class VIII with class VIII E samples. The data analysis technique used was to compare learning outcomes in the pre-cycle to the next cycle. The results of the analysis showed that the project-based learning (PjBL) learning model was able to improve the cognitive learning outcomes of junior high school students. The success indicator of the study was seen in the improvement in cognitive learning outcomes of students who achieved a minimum completeness criteria (MCC) score of 75. While the tang performance indicator used in this study is the success rate of cognitive learning outcomes up to 75%, in the pre-cycle, as many as 71.43% of the total students have not reached the specified minimum completeness criteria (MCC). While the remaining 38.10% have reached minimum completeness criteria (MCC). The implementation of the project-based learning (PjBL) learning model shows an increase in student success in learning. In cycle I, the percentage of student success reached 61.9%. In the second cycle, the percentage of student success reached 76.1%, so there was an increase of 33.4%.

Keywords: science learning, learning outcomes, project-based learning (PjBL) model.

INTRODUCTION

The natural sciences are one of the most important fields of science in human life because they contribute to understanding natural phenomena and surrounding life. Kementerian Pendidikan dan Kebudayaan (2017) states that as a subject in schools, science aims to help students understand the basic principles of the natural sciences and encourage them to develop critical thinking, creativity, and problem-solving skills. In addition, science learning in schools must also include an understanding of the nature of science, which includes three components: scientific products, scientific processes, and scientific attitudes (Ziliwu, 2022)

In practise, science learning is still faced with various challenges, such as a lack of student interest in this subject, a teacher's inability to deliver material well, and limited resources and facilities that support learning. This will certainly have an impact on student learning outcomes, which are also low, especially in the cognitive realm. According to the explanation by Qorimah and Sutama (2022), learning outcomes pertain to the competencies acquired by students subsequent to their engagement in the educational journey and exposure to various learning encounters. Arikunto (2017) explained that there are three aspects of student learning outcomes that can be known after learning takes place: cognitive, affective, and psychomotor aspects. However, in this class action study, researchers will focus on the cognitive aspects only. This is because data collection is carried out only focusing on the learning outcomes of cognitive aspects.

The results of observations in the field stated that the learning outcomes of grade VIII students at one of the junior high schools in Madiun district had not been maximised. This is based on the average pretest results given in the class, showing that as many as 71.43%, or 15 students out of a total of 21, have not reached the specified minimum completeness criteria (MCC). While the remaining 38.10%, namely 6 students, have reached minimum completeness criteria (MCC). This is in accordance with research conducted by Setyawati et al. (2019), which showed that only 25%, or 4 people out of a total of 16 students, had reached the specified minimum completeness criteria (MCC), which is 72. The remaining 75%, or as many as 12 students, have not been able to fulfil the minimum completeness criteria (MCC). This is because science learning in the classroom is still dominated by teachers, low student activity, and students who act as listeners. So that it has an impact on low student learning outcomes when given cognitive tests (Setyawati, Kristin, & Anugraheni, 2019). Therefore, innovation in science learning is needed to increase the effectiveness of learning and overcome these problems.

One of the learning innovations that can improve the effectiveness of science learning and overcome various challenges is project-based learning. Through project-based learning, students can learn in a more active, creative, and hands-on way about real-world problem solving (Siregar & Harahap, 2020). Project-based learning allows students to engage directly in real-world problem solving, thereby enhancing their critical thinking, creativity, and collaboration skills (Morgan & McLean, 2019). In addition, the Project-Based Learning (PjBL) approach also has the goal of producing a work or product that students are expected to create (Farcis, Budi, & Wijayanti, 2022).

Results of research conducted by Pinandoyo (2022) revealed that the use of problem-based learning models in learning can increase student perseverance during learning; the learning atmosphere becomes more pleasant because students are directly involved in learning; students' ability to manage projects is honed; student communication increases; and students' collaborative attitudes in the classroom can be trained. Meanwhile, research conducted by Muliaman and Mellyzar (2020) shows that project-based learning models can improve learning outcomes. This is evidenced by the difference in pre-test and post-test results, namely that the post-test increased by 76.19% of students who completed it from the previous 38.09%, which proves that the project-based learning model makes learning successful. In addition, research conducted by Nisah (2021) shows that the project-based learning model is able to improve student learning outcomes in science learning. This is reinforced by his findings, which show that through this learning model, students are encouraged to work independently on solving

problems through developed projects. Students also become active learners. As a result, students showed improvement in their learning outcomes.

Based on this presentation and this article, researchers conduct research in the classroom collaboratively to determine the improvement of student learning outcomes in the classroom. The research conducted was on science subjects, light matter, and optical instruments. The results of the research are expected to be a solution to problems in learning, especially in science subjects.

METHOD

The research conducted is a type of classroom action research (PTK). This research was carried out in one of the public junior high schools in Madiun district in the even semester of the 2022–2023 academic year and aims to improve the learning outcomes of junior high school students in science learning. The population used in the study was grade VIII students in junior high school. While the sample used in this study was class VIII E with 21 students,

This study also used the Kemmis and McTaggart model of classroom action research (PTK). The flow of classroom action research (PTK), according to Kemmis and McTaggart (in Made et al., 2022), includes planning, implementation, observation, and reflection activities. The research that has been done occurs in two cycles. Each cycle consists of two meetings and is adapted to the Kemmis and McTaggart research model.

This research data collection technique uses observation and written tests. While the instruments used are RPP, LKPD, and cognitive assessment instruments consisting of grids, assessment rubrics, and cognitive test sheets, data on students' cognitive learning outcomes is taken from written test scores. The test is conducted before learning (pre-test). Then, at the end of each learning cycle, students are given another written test (a post-test). So that with the comparison of these values, it can be known the increase in student learning outcomes.

The data analysis technique used is to compare learning outcomes in the pre-cycle to the next cycle. The success indicator of the study was seen in the improvement in cognitive learning outcomes of students who achieved a minimum completion criteria (MCC) score of 75. Meanwhile, the performance indicators used in this study are adjusted to the opinion of Made et al. (2022) in the form of the success rate of student cognitive learning outcomes to reach 75%.

RESULTS AND DISCUSSION

Based on the results of the research conducted, there is an increase in expected learning outcomes for students. It is based on findings from cycles I to II by applying the project-based learning (PjBL) learning model. At the end of each learning cycle, students are asked to answer assessment questions to measure cognitive learning outcomes in science learning. Student learning outcomes in each cycle can be seen in the table below.

Table 1. Cognitive Learning Outcomes of each Cycle

Aspects	Pre Cycle	Cycle I	Cycle II	Improvement from pra-cycle to cycle II
Number of students	21	21	21	-
Average rating	62	73	78	16
Students with a score of ≤ 75	15	8	5	10
Students with a score of ≥ 75	6	13	16	10
Percentage of success	28,5%	61,9%	76,1%	47,6%

Based on Table 1, it appears that there are only 28.5%, or 6 students, who get an average score exceeding the minimum completeness criteria (MCC). In cycle I, there was an increase, which was

61.9% of all students, or as many as 13 students, who obtained scores above 75. In the second cycle, as many as 76.1%, or as many as 16 students, obtained learning outcomes that exceeded the minimum completeness criteria (MCC). Based on these findings, there was an increase of 47.6% from pre-cycle to cycle II. This shows that student learning outcomes can improve through the implementation of the project-based learning (PjBL) model.

Based on the table of observations, before being given action in the form of applying the learning model, students' cognitive learning results showed that there were still many students who obtained scores below the minimum completeness criteria. Learning outcomes in Cycle I increase after action. This can be seen from the results of the evaluation given: students experience a significant increase in cognitive learning outcomes. However, this improvement in learning outcomes still does not meet the predetermined threshold. So there needs to be follow-up action to meet this threshold. In cycle II, students' cognitive learning outcomes also improved. The increase is indeed not too significant because it only experienced a slight increase from cycle I. However, the action in cycle II makes cognitive learning outcomes increase so that they can reach the specified threshold, in accordance with the opinion of Made et al. (2022).

Classroom action research conducted using the project-based learning (PjBL) model is carried out in two cycles, which include the stages of planning, implementation, observation, and reflection. The planning stage in Cycle I begins with determining the basic competencies to be used. Next, determine the goals to be achieved in the learning to be applied. The planning stage is continued by preparing a learning implementation plan that applies the project-based learning (PjBL) learning model, preparing learning resources and learning media, and preparing evaluation tests that will be used as a means to collect student learning outcome data.

The implementation stage (action) in cycle I is carried out with adjustments to the RPP that has been prepared. The implementation of learning is carried out in three (3) activities, which include introduction, core, and closing activities. The preliminary activity on each cycle, begins with students answering greetings from the teacher. Then students answer the news and respond to attendance checks carried out by the teacher, as well as pay attention to the perceptions given by the teacher and express gratitude according to their respective religions and beliefs, according to the teacher's guidance. Furthermore, the core learning activities are carried out in several stages that are adjusted to Raini's opinion (2022), which include asking basic questions, preparing project plans, preparing schedules, monitoring project progress, testing results, and evaluating experience. At the first meeting in cycle I, the stages of project-based learning carried out only included asking basic questions, preparing project plans, and preparing schedules. While the stages of monitoring project progress, testing results, and evaluating experience are carried out at the second meeting.

The core activity in cycle I at the first meeting began by asking the basic questions that the teacher had related to the material to be studied, namely about optical instruments. The teacher asked questions about optical instruments that were once created by humans and are often encountered by students in their daily lives. Then they were given the challenge of making one of the optical instrument products that they thought was easy to make. The activity continued with the preparation of a project plan. At this stage, the students in the class are grouped randomly. Then the teacher distributes student worksheets (LKPD) to students and guides them to discuss the product to be made. Students are directed to identify the tools and materials they will use appropriately and easily. The activity continued with the compilation of a project creation schedule. Together with the teacher, students agree on the timing of implementation and collection of products resulting from the projects they have made. Then students explain the results of their discussions and agreements with their groups.

At the second meeting in cycle I, core activities are carried out by continuing project activities in the form of monitoring project progress. This activity is carried out by making products that have been agreed upon with group friends and teachers, namely a camera obscura. At this stage, students and their

groups work together to make a camera obscura product to explain the shadow formation resulting from the product. During the implementation of the project, students are also directed to discuss problems that arise during the manufacture of the product. Next, students test the resulting product. At this stage, students test the camera obscura they produce by observing objects through the product and writing down what they observe on the LKPD. After that, with the guidance of the teacher, students present the results of their observations and discussions, to which students from other groups respond. The core activities at the second meeting ended with the evaluation stage of the learning experience. At this stage, students reflect on learning experiences such as difficulties experienced and how to overcome them, as well as feelings when finding solutions to the problems they face.

The closing activity at the first meeting in cycle I, was carried out by reflecting on the things that have been learned and planned on this day directly without giving a *post-test*. Then, the teacher gives directions to the students to study the material at the next meeting and ends the lesson by praying and saying greetings. While the closing activity at the second meeting was carried out by giving a post-test to find out the increase in understanding after participating in learning activities. Then, students listen to the information conveyed by the teacher regarding the next learning activity. The teacher closes the learning activity by greeting.

The observation stage in cycle I is carried out after learning activities are carried out, both at the first and second meetings. This stage is carried out by observing the learning outcomes that have been obtained by students after participating in learning using the project-based learning (PjBL) model. The observation stated that as many as 61.9% of students had achieved the minimum completeness criteria. Based on observations made on student learning outcomes in cycle I, it appears that there has been an increase in the percentage of student success by 33.4% from pre-cycle. The increase in the percentage of student success is due to the time of the learning process in cycle I, when students are formed in groups to complete project activities that require them to work together, so they become more creative in finding and designing the products they must make. This is in accordance with Natty's (2019) opinion that by implementing a student-oriented model through groups, it will increase student creativity in learning. shows that project-based learning models are able to improve student learning outcomes. Wiranto (2022) revealed that the project-based learning model is effective in significantly improving student learning outcomes. But it has not reached the specified threshold, which is 75%. So it is necessary to add cycles, namely in cycle II.

The reflection stage in the class action research flow is carried out after the first cycle has been completed. Reflection activities are activities to review what has been done on research subjects and has been recorded in observation (Jusita, 2019). Findings in the field stated that during the implementation of learning in the first cycle there were several obstacles, including that students did not really understand the instructions for making projects and filling in LKPD, some students preferred to be silent when discussing making projects, and some students did not really understand the learning material so that it affected their learning outcomes. So to improve this, the researcher—in this case, the teacher—needs to make an improvement plan that will be implemented in cycle II. The improvement plan that will be carried out is that teachers need to provide more detailed information related to instructions for making projects and filling in LKPD so that students do not feel confused in doing so; teachers need to be more active and pay attention to students so that they have learning motivation; record important material or points so that students better understand the information conveyed; and teachers need to monitor students to actively participate in discussions and cooperate with members. The group, so that the group can complete the project according to the agreed schedule and plan, and the teacher provides explanations and reinforcement to students so that they really understand the material.

In cycle II, the planning stage is carried out the same as in cycle I, namely by determining the learning objectives to be achieved and preparing learning tools, which include lesson plans, LKPD, media, and assessment instruments. The device that has been compiled is certainly accompanied by the

necessary improvements. The implementation stage (action) in cycle II is also not much different from cycle I. The model used also uses a project-based learning (PjBL) model. At the stage of giving basic questions, the teacher gives questions about the sense of sight and disturbances in the sense of sight. Then students are asked to gather with their groups and design products to solve problems related to efforts to overcome disturbances in the sense of sight and compile a schedule for making these products. At the stage of monitoring the activeness and development of the project, the teacher is more active in providing direction so that each member collaborates with his group. Then, in the closing activity, the teacher provided material reinforcement to students with the help of PowerPoint media. The teacher also provides motivation and asks students to note the important points of the explanation of the material given. This is done so that students can better understand the material taught. Then the teacher also provides a post-test to find out the increase in his understanding after participating in learning activities.

The observation stage in cycle II is carried out after learning activities are carried out, both at the first and second meetings. This stage is carried out by observing the learning outcomes that have been obtained by students after participating in learning using the project-based learning (PjBL) model. The observation stated that as many as 76.1% of students had reached the minimum completeness criteria. That is, after the application of the project-based learning model, student learning outcomes amounted to 14.2% of the first cycle, which only obtained a success percentage of 61.9% of students who succeeded. Increased learning results occur because, during the learning process, students have been able to understand the instructions presented through LKPD. Students are also able to work in groups without having to be guided in the process of making and completing projects. Students also seem happy about completing the project at hand, so they become active learners. In accordance with the statement of Utama and Sukaswanto (2020), through the project-based learning (PjBL) model, students are encouraged to solve the project design problems given so that they become more active during learning. Based on predetermined thresholds, learning using the project-based learning (PjBL) model is said to be able to improve students' cognitive learning outcomes. This expression is reinforced by research by Liana and Hamzah (2022), which states that the use of a project-based learning model can improve learning outcomes in students, with the results showing that 68.57% of students were declared successful in cycle I. As for the second cycle, 97.14% of students have reached minimum completion criteria (MCC). It also shows that overall, the use of the project-based learning (PjBL) model has proven to be effective and has a positive effect on student learning outcomes (Fadillah, et al., 2021).

The reflection stage carried out in cycle II is carried out by evaluating all learning implementations that have been carried out during the cycle. Some things that can be reflected in the implementation of learning include whether students have understood the instructions for making projects and filling out LKPD. This is supported by more intense teacher guidance carried out during the implementation of learning. Students who initially prefer to be silent when discussing project creation become willing to ask questions and participate in product creation. However, the participation of students shown is not entirely of their own will. However, under the guidance and direction of the teacher, in this case, the teacher's role is to facilitate students' carrying out projects. So they became active in the completion of the project.

The application of the project-based learning (PjBL) model in science learning conducted on grade VIII students of one of the public junior high schools in Madiun district has achieved predetermined results. The success indicator for learning outcomes has reached the specified minimum completion criteria (MCC). This means that the confluence of cycles has increased. Based on these results, the cycle of learning is stopped until cycle II.

Increased student learning outcomes because students have felt comfortable carrying out learning. Students do not feel forced into carrying out projects. This is also a result of the application of the project-based learning (PjBL) model, which is relevant to research conducted by Muliaman & Mellyzar (2020), which states that the learning process carried out by implementing project-based learning (PjBL)

feels more pleasant for students and teachers, so that students do not feel forced or quickly bored in teaching and learning activities. Making products through projects that have been carried out by students during the learning process makes them gain hands-on experience in managing time, the distribution of tasks in groups, and the equipment they provide. This statement is in accordance with research conducted by Raini (2022), which states that the project-based learning model allows students to gain experience and practise in organising projects and arranging the allocation of time, learning resources, and learning equipment media to complete tasks, resulting in 80% of student learning outcomes increasing. Research conducted by Nisah (2021) states that the project-based learning model provides several advantages, such as increasing student motivation and encouraging their ability to carry out important tasks. So that their learning outcomes increase with these activities. This is also reinforced by Dharmayani's research (2021), which states that project-based learning can also be said to be effective in improving student learning outcomes.

CONCLUSIONS

The research found an increase in expected learning outcomes for students through the implementation of the project-based learning (PjBL) learning model, with 61.9% of all students obtaining scores above 75 and 76.1% obtaining learning outcomes that exceeded the minimum completeness criteria. The implementation of learning in cycle I is carried out in three activities: introduction, core, and closing activities. Core activities include asking basic questions, preparing project plans, scheduling, monitoring project progress, testing results, and evaluating experience. At cycle I, students participate in core activities such as monitoring project progress, making a camera obscura product, and testing it. At the end of the cycle, students reflect on their learning experiences and give a post-test. 61.9% of students achieved the minimum completeness criteria.

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