24 (3), 2023, 859-866

Jurnal Pendidikan MIPA

e-ISSN: 2685-5488 | p-ISSN: 1411-2531

http://jurnal.fkip.unila.ac.id/index.php/jpmipa/

The Effect of Project Based Addictive Substance Learning on Critical Thinking Skills of Junior High School Students

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Abstract: Critical thinking is one of the 4C competencies that is important for students to master to support their success in the learning process. The purpose of this research is to determine the effect of the project based learning (PjBL) model on students' critical thinking skills. The method used is purposive sampling. This type of research is quasi-experimental with a nonequivalent control group design (pre-test and post-test). The average results of the two samples are known through the independent sample t-test. The difference in critical thinking skills scores between the control class and the experimental class will be known through a parametric independent sample t-test with a sig value. > 0.05 which means homogeneous. If tcount > table resulting from the right-sided t-test then it can be said that HO is rejected and Ha is accepted, meaning the learning model used in the experimental class has a significant influence. In the research that has been carried out, it is known that the project based learning (PjBL) model has a significant effect on students' critical thinking skills, which is known through the difference in the average scores of the control class and the experimental class.

Keywords: critical thinking skills, learning model, PjBL model.

Abstrak: *Berpikir kritis menjadi salah satu kompetensi 4C yang penting untuk dikuasai peserta didik agar menunjang keberhasilannya dalam proses pembelajaran. Tujuan dilakukannya penelitian ini untuk mengetahui pengaruh model pembelajaran project based learning (PjBL) terhadap keterampilan berpikir kritis peserta didik. Metode yang digunakan yaitu purposive sampling. Jenis penelitian ini yaitu kuasi eksperimen dengan desain penelitian nonequivalent control group design (pre-test dan post-test). Hasil rata-rata kedua sampel diketahui melalui independet sample t-test. Perbedaan skor keterampilan berpikir kritis antara kelas kontrol dan kelas eksperimen akan diketahui melalui uji parametrik independent sample t-test dengan nilai sig. > 0,05 yang berarti homogen. Jika thitung > tabel yang dihasilkan dari uji t-pihak kanan maka dapat dikatakan bahwa HO ditolak dan Ha diterima berarti model pembelajaran yang digunakan di kelas eksperimen memiliki pengaruh yang signifikan. Pada penelitian yang sudah dilakukan diketahui bahwa model pembelajaran project based learning (PjBL) berpengaruh dengan signifikan terhadap keterampilan berpikir kritis peserta didik yang diketahui melalui perbedaan rata-rata nilai kelas kontrol dan kelas eksperimen.*

Kata kunci: *model pembelajaran, model PjBL, keterampilan berpikir kritis.*

▪ INTRODUCTION

If the rapid development of science and technology is not balanced with a nation that is ready, the nation will certainly be left far behind other nations. The rapid development of science and technology in the 21st century requires teachers to be able to

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DOI: http://dx.doi.org/10.23960/jpmipa/v24i4.pp859-866
Received: 06 December 2023
Accepted: 24 December 2023
Published: 27 December 2023

keep up with these developments (Devanda et al., 2023). Education in the 21st century is an educational era that has rapid developments in technology and science. Critical and creative thinking skills are needed to enable students to solve the problems they face (Asman et al., 2022). The application of the PjBL model to creative thinking skills can train students to find multiple solutions to problems they face, find multiple ideas, and be able to explore these ideas in detail (Putri et al., 2021). One of the competencies in 4C is critical thinking. With the implementation of PjBL, students are able to be guided in solving learning challenges and given the opportunity to study various real-life issues and gain knowledge from multiple sources (Fiteriani et al., 2021). PjBL is also possible outside of the classroom environment, using a variety of equipment and technologies (Mihardi et al., 2013). With the use of PjBL, students can develop critical thinking skills and self-efficacy, allowing them to evaluate their own work and generate realistic criticism of the power of their own reasoning (Mutakinati et al., 2018). The importance of critical thinking skills is really needed by students to support success in understanding the material provided by teachers at school.

Teachers must always have a developing mind about technology and science. The development of the quality of human resources (HR) and the quality of education also requires intervention from teachers. Teachers must think critically and use it as a form of self-regulation in making rational decisions (judging), the results of which will be in the form of interpretation, evaluation, analysis and inference, which when provide a presentation or explanation using real and conceptual evidence, where these things become the basis for making a decision (Facione, 2015). On students' creative thinking skills, based on the research of Marivane de Oliveira Biazus and Sayidah Mahtari (2022), entitled "The Impact of Project-Based Learning (PjBL) Model on Secondary Students' Creative Thinking Skills" it was found that the implementation of PjBL had a significant impact on improving students' creative thinking skills in physics material. Students' critical thinking skills do not emerge from birth, there needs to be guidance and direction so that critical thinking exists. Until now, attention to developing critical thinking skills is still relatively low, so there are still opportunities to explore critical thinking skills and their development. The PjBL model can be used as an alternative learning strategy in high schools (Hanif et al., 2019).

Efforts that can be made so that students can have critical thinking are through the application of relevant learning models, one of which is project based learning (PjBL). Project-based learning (PjBL) is a learning model in which students act as subjects who have a fundamental role in their educational experience (Ansori et al., 2019). Students must be able to study independently, seek information, and have good competence (Azmi & Festiyed, 2023b). The PjBL learning model can measure and improve students' critical thinking skills and learning outcomes. The results of a study conducted by Andrini et al. (2019) on "The Effect of Flipped Classroom and Project-Based Learning Model on Students' Critical Thinking Ability" revealed that the use of the PjBL model in the learning process had an influence on the medium category (Andrini et al., 2019). In addition, students are allowed to build their knowledge independently through a process of inquiry and exploration, so that they can be encouraged to think more critically (Issa & Khataibeh, 2021). The process has an impact on improving students' design and production abilities, including student creativity (Lou et al., 2017).

Other researchers also explained that PjBL has an influence on students' critical and creative thinking abilities in the high category seen from the posttest results. Critical and creative thinking abilities for each indicator in the experimental class are higher than in the control class, therefore, educators are expected to be able to implement PjBL with the 5P approach well (Khafah et al., 2023). From the research results (Hikmah et al., 2023), it was found that the use of the project based learning (PjBL) model in science and physics learning has a significant influence on students' critical and creative thinking abilities. The application of the PjBL model based on educational level, showing the aspect of students' thinking skills, has a high influence on its application at the elementary school level and has a higher influence on its application at the junior high school to university levels.

In line with previous research, it can be concluded that the project-based learning model has a significant influence in improving students' critical thinking abilities. This is because the syntax in this learning model contains various activities that encourage students to think and play an active role (Nawangsari et al., 2022). From the results of previous research it is known that the PjBL model has been applied to physics materials and materials that require high levels of reasoning, so researchers then began to examine the application of PjBL to additive and addictive substances. This material is material whose concept requires understanding from students and requires students to actively read and discuss so that researchers hope to find the latest results from this research.

▪ METHOD

The research took place at SMP Negeri 5 Jember with a population of class VIII students for the 2023/2024 academic year. The sample was determined using the purposive sampling method which obtained two classes, namely control class VIII E and class VIII F as the experimental class. Purposive sampling is a method of determining and taking illustrations determined by researchers with certain considerations (Maharani, 2018).

The research began on November 14 2023. The research carried out was a quasi-experimental type of research with a non-equivalent control group design (pre-test and post-test). The experimental class is a class that is given treatment in the form of a project based learning (PjBL) learning model, while the control class is a class that is not given treatment, where the learning uses a learning design from the school.

The technique used in this research is a test in the form of multiple choice questions. The test is carried out twice at the beginning of learning (pre-test) and at the end of learning (post-test). The test uses questions created by the researcher himself, consisting of 18 multiple choice questions. This research uses critical thinking indicators from Facione (2015), namely Interpretation, Analysis, Evaluation, Inference, Explanation, Self-regulation. Each indicator represents 3 questions, both pretest and posttest.

The values obtained in both classes will later be tested parametrically via Kolmogorov-Smirnov followed by an independent sample t-test then at the end a right-sided t-test is carried out. Normality testing uses Kolmogorov-Smirnov, using pre-test and post-test value data in the control and experimental classes (Nuraini, 2018). The independent sample t-test aims to determine the significance of the dependent variable after treatment in the learning process. T test – right side, this test aims to identify the comparison in the value of students' learning outcomes by making them better in both classes.

▪ RESULT AND DISSCUSSION

The learning process was carried out in two different classes, namely class VIII E as the control class and class VIII F as the experimental class. In the experimental class the learning process is carried out using project based learning (PjBL) learning media. The learning process was carried out in six meetings, the first meeting was used for pre-test, the second to fifth meetings were used for teaching and learning where in each lesson there was a student worksheet (LKPD) that used PjBL syntax. Then, the sixth meeting was used for the post-test. Based on the results of the analysis carried out in the experimental and control classes, the lowest and highest scores in the pre-test and post-test were tested parametrically using the Kolmogorov-Smirnov normality test. The test results can be seen in table 1 as follows.

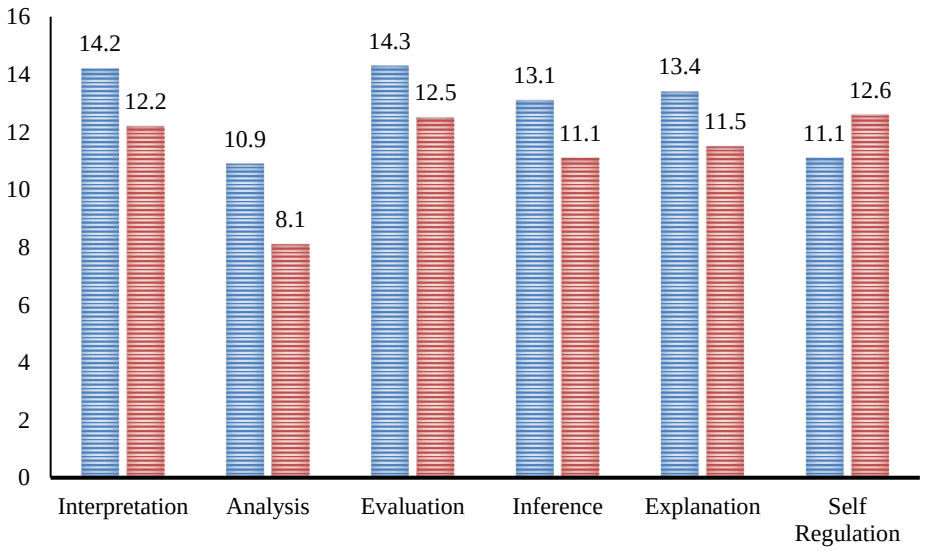

Figure 1. N-gain value for each indicator

The data results of students' critical thinking abilities in the experimental class were higher than the results of students' abilities in the control class. Based on the recapitulation of the average score of students' critical thinking abilities, the highest indicators are interpretation and evaluation, followed by indicators of explanation, inference, self-regulation and analysis. This condition is caused by the fact that during learning activities students are more careful in writing down answers that have been practiced and students understand how to interpret and evaluate the results that have been obtained during the learning process. Because with practicum students can easily understand and gain direct experience, this practicum also increases student participation both individually and in groups.

Table 1. Independent sample t-test results

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig	T	df	Sig (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Critical thinking	Equal variance assumed	.636	.428	4.569	62	.000	9.469	2.072	5.326	13.611
	Equal variance not assumed			4.569	49.496	.000	9.469	2.072	5.305	13.632

Based on the independent sample t-test data in table 1, it can be seen that there is a significant difference in critical thinking skills between the experimental class and the control class with a sig value of 0.428 > 0.05, which means the sig value is greater than 0.05. This indicates that the initial critical thinking abilities between the two groups are not homogeneous. Then, the sig (2-tailed) value on both sides is 0.000 < 0.05, which means that Ho is rejected and Ha is accepted. So, it can be said that critical thinking skills in the experimental class and the control class have significant differences. The next test is the right-sided t-test

Table 2. T-test results

Class	Average	t_{hitung}	t_{tabel}
Eksperimen	77	4,569	1,669
Kontrol	68		

Based on table 2, it is known that the experimental class has an average of 77 and the control class has an average of 68. The thitung obtained is 4.569 and ttabel is 1.669 which means that thitung > ttabel. It can be concluded that Ho is rejected and Ha is accepted, which means there is a significant difference in the experimental class and the control class.

The results of research conducted at SMPN 5 Jember in class VIII E as the control class and class VIII F as the experimental class. The experimental class is a class that is treated with the PjBL learning model. The Project-based learning (PjBL) model is an instructional model that allows teachers to manage classroom learning by engaging project work involving complex tasks based on problems (Pratiwi et al., 2019). By adopting one of the best learning techniques, such as PjBL, lecturers can offer students the tools to solve problems, make good decisions, and identify solutions for future learning experiences and professional careers (Dimmitt, 2017). The educational process in schools must be able to help and prepare students to face developments in the current era (Firda & Sunarti, 2022). This is very important to do to support the learning process, especially in science learning. Apart from that, there are also shortcomings in the PjBL model, namely the time required to complete the project is longer and students are less

active. However, these shortcomings can be overcome through the teacher's firmness in learning, so that students' time and activity will be better.

The PjBL model has steps or syntax, namely the first is a basic question where the teacher's task here is to convey the tips or material that will be taught that day, then the teacher gives a problem that must be answered by the students. Then the second step is designing a product plan where the teacher's task here is to divide students into small groups consisting of five to six people, each group will discuss the product plan to be made. The third step is to prepare a production schedule, here the teacher and students make an agreement on the project creation schedule. The fourth step is to monitor the activity and development of the project, the role of the teacher here is to monitor and guide students in making the project that has been carried out. The fifth step is testing the results where the teacher will measure the products that have been made by each student. The sixth step is evaluating the learning experience, the role of students here is to explain the report that has been made while other students respond which ends with a conclusion concluded by both the teacher and students.

Students' critical thinking skills can be supported through the PjBL learning model. The making of the project is able to cause students to be active in the learning process (Efendi et al., 2020). The implementation of the PjBL learning model is carried out in natural science (IPA) subjects regarding additives and addictive substances in class VIII F, odd semester for the 2023/2024 academic year with an Merdeka curriculum. The number of students in one class is 32 students with 20 male students and 12 female students. In table 3 it can be concluded that the project based learning (PjBL) model has an effect on students' critical thinking skills. It can even be said that there has been an increase in students' critical thinking skills which is known through the acquisition of pre-test and post-test scores. According to the findings of a study conducted by I Made Astra et al. (2019) named "Effect of Project-Based Learning Model Assisted by Student Worksheet on Critical Thinking Abilities of High School Students," the application of the PjBL model in learning physics can enhance students' critical thinking skills in the medium category (Astra et al., 2019).

▪ CONCLUSION

The results of the data obtained were then analyzed and it was concluded that the PjBL learning model had a significant effect on students' critical thinking skills. This is known through the right-sided t-test where thitung > ttabel which means Ho is rejected and Ha is accepted. Apart from that, there was an increase in scores on the pre-test and post-test, which means that the PjBL model was able to improve students' critical thinking skills.

It is hoped that this research will provide benefits for the development of educational science regarding the use of the PBL model, especially in science learning materials. The weakness of this research is that when students work on pretest and posttest questions, the teacher still does not supervise optimally, which will affect the score obtained.

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