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The Influence of Project-Based Learning in Improving Students' *Critical Thinking* Skills in Science Subjects in Elementary Schools

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Abstrak

Metode pembelajaran yang efektif berperan penting dalam mengembangkan keterampilan berpikir kritis siswa. Penelitian ini bertujuan untuk menganalisis pengaruh metode pembelajaran berbasis proyek terhadap kemampuan berpikir kritis siswa UPT SDN 8 Pinrang. Pendekatan kuantitatif dengan desain eksperimen digunakan dalam penelitian ini, melibatkan dua kelompok siswa, yaitu kelompok eksperimen yang menggunakan metode pembelajaran berbasis proyek dan kelompok kontrol yang menggunakan metode konvensional. Data dikumpulkan melalui tes berpikir kritis dan dianalisis menggunakan uji statistik. Hasil penelitian menunjukkan bahwa siswa yang belajar dengan metode pembelajaran berbasis proyek memiliki skor berpikir kritis yang lebih tinggi dibandingkan dengan kelompok kontrol. Hal ini mengindikasikan bahwa metode pembelajaran berbasis proyek dapat meningkatkan kemampuan berpikir kritis siswa dengan memberikan pengalaman belajar yang lebih aktif, kontekstual, dan kolaboratif. Dengan demikian, metode ini dapat menjadi alternatif yang efektif dalam meningkatkan kualitas pembelajaran di sekolah dasar.
Kata Kunci: *pembelajaran berbasis proyek, berpikir kritis, IPA, sekolah dasar.*

Abstract

Effective learning methods play an important role in developing students' critical thinking skills. This study aims to analyze the effect of project-based learning methods on elementary school students' critical thinking skills. A quantitative approach with experimental design was used in this study, involving two groups of students, namely the experimental group using project-based learning methods and the control group using conventional methods. Data were collected through critical thinking tests and analyzed using statistical tests. The results showed that students who studied with project-based learning methods had higher critical thinking scores compared to the control group. This indicates that project-based learning methods can improve students' critical thinking skills by providing more active, contextual, and collaborative learning experiences. Thus, this method can be an effective alternative in improving the quality of learning in elementary schools.
Key words*: project based learning, critical thinking, science, elementary school.*

Introduction

Education has an important role in the development of human resources. In the scope of basic education, critical thinking skills are a crucial aspect, especially in learning Natural Sciences (IPA), which is often considered difficult by students. Given that critical thinking has been recognized as an essential skill that students must master in the 21st century (Foo, 2021), the majority of educators agree that the development of critical thinking skills is one of the main goals of formal education. This is expected to give direction to each educational unit to realize the success of achieving core competencies. As explained in Government Regulation of the Republic of Indonesia Number 13 of 2015 concerning National Education Standards Article 77B regarding core competencies which is the level of ability to achieve graduate competency standards for students. This is expected to give direction to each education unit to realize the success of

achieving core competencies through the role of teachers.

Teachers have a crucial role in the success of education. Therefore, they need to master the various competencies that have been regulated in Law Number 14 of 2005 concerning Teachers and Lecturers (Karwono & Mularsih, 2017, p. 3). By mastering these competencies, teachers can understand the needs of students and deliver the material effectively. The learning process that is implemented is expected not only to equip students with knowledge, but also to shape them into a quality generation and able to think critically in responding to various information.

One of the skills that needs to be taught to students is the ability to think critically. According to Hayani (2019), in the 21st century, students are expected to have competencies that allow them to face various challenges in the future, one of which is the ability to think critically. Nasution (2018) Critical thinking skills are a thought process ability that allows a person to evaluate or investigate the evidence, assumptions, and logic that underlie other people's ideas. Critical thinking skills are important in the learning process because they provide opportunities for learners to learn through discovery. Critical thinking skills can be improved through the learning process, including in science subjects. From an early age, science learning provides knowledge, attitudes, and skills that can later be applied well in daily life. Science learning can improve students' critical thinking skills with the support of the teacher's role in the learning process. One of the strategies that teachers can apply is to choose a learning model that suits the needs of students and is able to attract their attention.

Based on initial observations in class V of UPT SDN 8 Pinrang, it was found that in the learning process, especially in science subjects, students still tend to be passive. This can be seen from the interaction during the question and answer session, where only a few students dared to answer the teacher's questions. The lack of courage for students to express their opinions is caused by the fear of making mistakes. In fact, the more often students face questions from teachers, the more their critical thinking skills will develop. One of the efforts that can be made is to implement a learning model. Octavia (2020) stated that the learning model is very effective in improving the quality of the teaching and learning process because it encourages students to play an active role and hone their high-level thinking skills. One model that can be applied is the project-based learning model. This model utilizes real problems faced by students as part of learning activities, thus training them to think critically in analyzing and solving problems. Project-based learning has various advantages, including: (a) increasing students' motivation in learning, (b) developing problem-solving skills, (c) strengthening teamwork skills, (d) providing a learning experience tailored to real-world situations, and (e) creating a more enjoyable learning atmosphere. This study aims to reveal facts in an experimental manner regarding whether there is an influence of learning models on students' critical thinking skills and learning achievement.

Method

The approach used in this study is quantitative. Quantitative research is research conducted with the study of scientific thoughts. This research method used is an experimental method because in this case the researcher uses a treatment to find out a result of the treatment. The research design of one group pretest-posttest is used to determine the effect of treatment (treatment) of course given to students in one group. experimental methods that aim to test the influence of free variables on bound variables after the use of project-based learning methods and experimental methods in science learning

Table 3.1 Research Design

Group	Treatment (treatment)	Post-test (evaluation of results)
A	X1	O1
B	X2	O2

Information:

X1 : action or treatment in the form of providing activities with a project-based method

X2 : action or treatment in the form of giving activities by experimental method

O1 : final measurement of science learning outcomes after being given by project-based learning method

O2: final measurement of science learning outcomes after being given by the experimental learning method.

Result and Discussion

This study reveals that the application of a project-based learning model contributes to improving students' critical thinking skills in science subjects. The effectiveness of the PjBL method is reflected in the improvement of students' critical thinking skills which are influenced by several factors. The project-based learning model (PjBL) has a positive impact on the development of critical thinking skills, independence, and student learning motivation. By emphasizing real, hand-picked problem-solving, PjBL helps students understand concepts in depth while honing their scientific skills. In addition, the project management process trains students in time management, resource allocation, and teamwork, which contributes to strengthening their independence and sense of responsibility. This approach also encourages the exploration of students' ideas and creativity, increasing their interest and motivation in learning. In addition, PjBL not only allows students to produce their own work, but also builds their confidence and integrity in completing assignments. Thus, the implementation of PjBL is an effective strategy in improving the quality of learning and developing students' essential skills.

Description of Research Data

Tabel 4.1 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test Eksperimen	20	50	58	54.15	2.277
Post-test Eksperimen	20	70	81	75.25	2.954
Pre-test Control	20	46	55	50.10	2.490
Post-test Control	20	52	61	56.75	2.653
Valid N (listwise)	20				

Based on these data, the significance value of the pretest in the experimental class was 0.200, while the posttest reached 0.200. Meanwhile, in the control class, the significance value of the pretest was 0.200 and the posttest was 0.200. Since the whole significance value is greater than 0.05, it can be concluded that the students' science process skills data are normally distributed.

Homogeneity test results

Tabel 4.3 Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Hasil berpikir kritis siswa	Based on Mean	.103	1	38	.750
	Based on Median	.042	1	38	.839
	Based on Median and with adjusted df	.042	1	35.723	.839
	Based on trimmed mean	.095	1	38	.760

The results of the homogeneity test on students' critical thinking skills showed a significance value of 0.760 Because the value was higher than 0.05 (0.760 > 0.05), it can be concluded that the data on students' critical thinking skills has a homogeneous nature.

Hasil uji Independent Sampel t-test

Tabel 4.4 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
Hasil berpikir kritis siswa	Equal variances assumed	.103	.750	20.838	38	.000	18.500	.888	16.703	20.297
	Equal variances not assumed			20.838	37.571	.000	18.500	.888	16.702	20.298

Based on the results of data analysis in Table 4.4, a significance value (tailed) of 0.00 was obtained, which is smaller than 0.05. This shows a significant difference in the average critical thinking ability between the control group and the experimental group. These findings confirm that project-based learning effectively improves students' critical thinking skills.

Discussion

The normality test was performed by applying the Kolmogorov-Smirnov test to one sample using SPSS software, which showed a significance value of 0.200 for the experimental class. In addition, the Shapiro-Wilk test yielded a significance value of 0.779. Because the two significance values are greater than 0.05, these results show that the data on students' critical thinking ability on the post-test in the experimental class is normally distributed.

The homogeneity test is carried out to determine whether the data used is homogeneous or not. By using the SPSS application, a significance value of 0.760 was obtained, which is greater than 0.05. Therefore, it can be concluded that the posttest data on students' critical thinking skills in the experimental class and the control class are homogeneous, i.e. they come from a population with the same variance. Furthermore, the results of the two-way hypothesis test using an independent sample t-test showed a significant difference between the students' critical thinking skills in the control class and the experimental class. Based on the analysis of the data in Table 4.4 through SPSS, a Sig.(2-tailed) value of 0.00 was obtained, which is smaller than 0.05. This result led to the null (Ho) hypothesis being rejected and supporting an alternative hypothesis. Thus, it can be concluded that the application of the project-based learning model has an effect on improving students' critical thinking skills.

Conclusion

The conclusion of the results of the research and discussion at UPT SDN 8 Pinrang, that based on the results of data analysis, the normality test with Kolmogorov-Smirnov and Shapiro-Wilk showed that the data on students' critical thinking skills in the post-test in the experimental class was distributed normally. In addition, the homogeneity test yielded a significance value greater than 0.05 indicating that the experimental class and control class data were homogeneous. The results of the hypothesis test using an independent sample t-test showed a significant difference between students' critical thinking skills in both classes, with a significance value of 0.00 which was smaller than 0.05. Thus, it is concluded that the application of the project-based learning model has a positive effect on improving students' critical thinking skills at UPT SDN 8 Pinrang.

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