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Project Based Learning Model on Critical Thinking Ability Seen from Cognitive Style in Elementary Schools

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Abstract: The ability to think critically in the 21st century is very important for developing children's thinking ideas. This ability is very likely to be empowered intentionally through the educational process. In this century it is very influential in human life, especially in the field of technology and knowledge. However, students' critical thinking skills are still low, with one of the factors being the learning model which is still considered monotonous. Therefore this study aims to determine the effect of the project based learning model on critical thinking skills seen from cognitive style. The type of research used is quantitative research with research methods using tests and observations, the subjects of this research are 5th grade elementary school students. With the method of data analysis using the normality test, homogeneity and ANOVA hypothesis testing. The data was analyzed quantitatively. The results of this study indicate that there is an influence of the project based learning learning model on students' Critical Thinking abilities in science subjects at SDN Gaungan 02. The project based learning model emphasizes that student activities are in the form of collecting information and using it to produce something useful for the lives of students themselves or for other people, but still related to basic competencies in the curriculum.

Keyword : project based learning model, natural science, problem solving, empirical, cognitive style.

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Introduction

Critical thinking is an important and vital topic in modern education, critical thinking as a component in the process of higher-level thinking uses the basis of analyzing arguments and bringing up insights into each meaning and interpretation to develop patterns of logical reasoning. This critical thinking ability can be developed through physical learning in schools that focuses on concepts, principles and elements. One way is through learning science (IPA).

In science learning students are taught to gain knowledge through collecting data with experiments, observations and communication to produce a credible explanation. In addition, the purpose of training students' critical thinking skills is to prepare students to become critical thinkers, able to solve problems, and become independent thinkers, so that they can face life and make decisions appropriately and responsibly (Zumisa in Khairiyah, 2019; redhana & liliasari , 2008). Efforts to instill and train

students' thinking skills are very important to note in the school curriculum. But in reality, there are still very few learning processes in Indonesia that deliberately direct students to improve higher-order thinking skills. As a result, the quality of education in Indonesia is still quite low.

Based on the 2018 PISA (Program For International Student Assessment) results released on December 3 2019, Indonesia's 2018 PISA ranking has dropped compared to the 2015 PISA results. This study compared the math, reading, and science performance of each child. Likewise the results of a survey by The Global Creativity Index in 2015, showed that Indonesia was ranked 115th out of 139 countries (Dewi et al, 2017). Furthermore, in the same year the TIMSS (Trend In International Mathematic and Science Study) research results also showed that Indonesia was in 69th place out of 76 countries (Khoiriyah, 2018). From the observation results also show the low ability of students' critical thinking which is due to the tendency of students not to pay attention to the explanations given by the teacher so that students cannot answer the questions given.

Memorized material is indeed quite easy for students to understand and students can also explain material fluently, but it is different when given group assignments to study material, students tend to explain again not with their thoughts but with sentences that are almost exactly the same as those in the source book they are reading. use. At the end of learning students also have not been able to conclude from any subject matter that has been studied. At the end of the lesson the teacher tries to ask what conclusions can be drawn from the material, students cannot mention and students can only repeat a few sentences containing the material just presented. But it is not a conclusion, only a repetition. Such a learning process shows that there are problems in learning that cause students' low critical thinking.

Therefore the use of appropriate learning models needs to be done, according to the opinion of the grant; utomo states that the project based learning model is an appropriate learning model used to develop critical thinking skills. Project based learning is a thinking activity that can improve higher-order thinking skills (Rahayu et al, 2017). The PjBL model, which is a learning model that uses projects or activities as a learning tool. This model also has enormous potential to make learning experiences more interesting and meaningful to improve student learning outcomes and positively affect student learning motivation (Astuti et al., 2019; Kristiyanto, 2020).This statement is supported by research conducted by Sularmi et al (2018) which concluded that applied project based learning can improve students' critical thinking skills. Critical thinking plays an important role in creating quality, competitive and innovative human resources. With the existence of these critical thinking skills, it can be seen how students' cognitive styles in learning, whether students think independently/weakly or vice versa students can think independently without the influence of friends or their environment. thus critical thinking is very important to

assess cognitive style. Research on critical thinking skills has been widely carried out but critical thinking skills seen from cognitive style are still rarely carried out. Therefore this research has an update, because this research is looking for the effect of project based learning on critical thinking skills seen from cognitive style.

Methodology

1. Research Model

This study used an experimental design with a quantitative approach. The experimental method used was a quasi-experimental (Quasi-Experimental). Pseudo-experimental (Quasi-Experimental) is a design to reveal a causal relationship involving one control group and one experimental group. This study will compare the effect of the Project Based Learning learning model and the conventional learning model on the critical thinking skills of fifth grade elementary school students, with the belief that these two types of learning have a different effect on students' critical thinking skills in terms of students' cognitive style.

Model pembelajaran/ motivasi belajar	Berbasis *Project Based Learning* (A1)	Berbasis Konvensional (A2)
Tinggi (B1)	A1B1	A2B1
Rendah (B2)	A1B2	A2B2

Berdasarkan tabel desain di atas dapat dijelaskan bahwa terdapat dua kelas dalam pembelajaran IPA yaitu, kelas yang belajar dengan model pembelajaran berbasis *Project Based Learning* (A1) dan kelas yang belajar dengan model berbasis konvensional (A2). Dalam masing-masing kelas terdapat dua kelompok yaitu siswa dengan kategori motivasi belajar tinggi (B1) dan siswa dengan kategori motivasi belajar rendah (B2). Kelas yang menggunakan model pembelajaran berbasis *Project Based Learning* dan memiliki kelompok siswa dengan motivasi belajar tinggi (A1B1) sedangkan siswa yang memiliki kolompok siswa dengan motivasi belajar rendah (A1B2). Kelas yang menggunakan model pembelajaran berbasis konvensional dan memiliki kelompok siswa dengan motivasi belajar tinggi (A2B1) sedangkan siswa yang memiliki kelompok siswa dengan motivasi belajar rendah (A2B2).

2. Partcipant

The population in this study were all fifth grade students at SDN Gayungan 02 Surabaya which consisted of 2 classes. While the sample is a part of the population to be studied and which is considered to be able to describe the population. In this study, the sample was taken by taking two classes,

namely the experimental class and the control class which was carried out to all class V with a total of 60 student, starting from class VA with a 30 student and VB with a 30 student. The class that became the experimental class was VA class and the control class was VB.

3. Data Collection Tools

This research instrument uses an assessment sheet that aims to assess the ability to think critically in students who have been validated as experts with the following indicators: 1. Formulate the main issues; 2. Reveal existing facts; 3. Choose a logical argument; 4. Detect bias with different viewing angles; 5. Draw conclusions. (fatmawati et al. 2014; Ennis 1996).

4. Data Collection Process

Data analysis techniques were carried out to find out how effective the use of the project based learning model was on critical thinking skills in grade 5 SD Gayungan 02 Surabaya. Decision making is whether there is an effect of using the model by testing the hypothesis using the ANOVA test. But before testing the hypothesis, it must fulfill the prerequisite analysis test, namely by means of the normality test and homogeneity test. Data analysis was carried out using the SPSS 25 application.

Result and Discussion

1. Finding

Based on the results of research that has been done at SDN Gayungan 02 Surabaya. Research on the Effect of Project Based Learning Models on Critical Thinking skills seen from Cognitive style. This study uses two classes, namely class 5A and class 5B. in class 5 A as the experimental class and class 5B as the control class. There are various things that will be studied based on the results of research on the Effect of Project Based Learning Models on Critical Thinking skills seen from Cognitive style. The research results are described as follows.

Tabel 2. Data uji normalitas

		Unstandardized Residual
N		25
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	6.47268347
Most Extreme Differences	Absolute	.144
	Positive	.107
	Negative	-.144
Test Statistic		.144
Asymp. Sig. (2-tailed)		.196[c]

Based on the normality test data above, it is known that the significance value of Asiym.Sig (2-tailed) is 0.196, which is greater than 0.05. So according to the basis for decision making in the Kolmogorov-Smirnov normality test above, it can be concluded that the data is normally distributed. Thus the normality assumptions or requirements in the regression model have been fulfilled.

Tabel 3. Data homogenitas

		Levene Statistic	df1	df2	Sig.
kemampuan berfikir kritis	Based on Mean	.644	1	48	.426
	Based on Median	.570	1	48	.454
	Based on Median and with adjusted df	.570	1	44.830	.454
	Based on trimmed mean	.672	1	48	.417

Based on the table above, it is known that the significance value (Sig.) of the results of the critical thinking ability of class A and class B students is 0.426. Because the value of Sig. 0.426 > 0.05, as the basis for decision making in the homogeneity test above, it can be interpreted that the variance of students' critical thinking ability data in class A and class B students is the same or homogeneous.

Tabel 4. Hasil pengujian Anova

Tests of Between-Subjects Effects					
Dependent Variable: kemampuan berfikir kritis					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	659.948[a]	3	219.983	4.370	.009
Intercept	380184.495	1	380184.495	7552.555	.000
Kelas kontrol	385.811	1	385.811	7.664	.008
cognitivestyle	221.821	1	221.821	4.407	.041
kelas eksperimen * cognitivestyle	.097	1	.097	.002	.965
Error	2315.572	46	50.339		
Total	387014.000	50			
Corrected Total	2975.520	49			
a. R Squared = .222 (Adjusted R Squared = .171)					

Based on table 4 of the Two Way Anova test results, the following results are obtained: (1) Learning Model: Whether or not the learning model influences critical thinking is indicated by the significant value, from the table above the sig value is 0.008 or the value (0.008 <0.05) in this case means that the learning model of Project Based Learning has a significant effect on critical thinking. (2) Cognitive Style: Whether or not Cognitive Style has an effect on critical thinking is marked by a significant value, from the table above the sig value is 0.965 or the value (0.965 > 0.05) in this case means that Cognitive Style does not have a significant effect on critical thinking. (3) Cognitive Style Learning Model: This aims to find out whether there is a significant relationship between the 2 factors, in this case we will test whether or not there is an interaction between the learning model and the ability to think critically.

The results of the hypothesis based on table 4 and the description above can be concluded that there is a significant influence of the Project Based Learning learning model on critical thinking skills in science subjects. While on the cognitive style factor, it can be seen if cognitive style has an influence but not significantly. This shows that the Project Based Learning learning model that is given is more influential when compared to the cognitive style factor.

2. Discussion

The results showed that the post-test scores showed the students' initial abilities in the experimental class and the control class were relatively the same. After going through the learning process, it can be seen that there is an influence of the project based learning model on students' critical thinking skills. Developing students' critical thinking can be done through the use of appropriate learning models. Grant states that the appropriate learning model used to develop critical thinking skills is project based learning Grant, in utomo (2019). This is also in line with several research results which suggest that learning using the project based learning model students can be more active and successful in solving complex problems, increasing collaboration, encouraging students to develop and practice communication skills (Widiasoro in Santoso 2022).

From various previous studies, strengths and weaknesses can be found. The advantage is that it uses two classes as samples so that it can be compared between the experimental class which is given treatment with the project-based learning model and the control class is given treatment using another model. However, the weakness in previous research results of students' critical thinking skills after going through project-based learning is still low.

If you look at the results of the experimental research, it can be seen that student learning activities show that the learning model of Project Based Learning and conventional learning differs significantly in the achievement of learning outcomes. The learning outcomes of students who follow the Project Based Learning learning model are higher than the learning outcomes of students who use conventional learning models. When the treatment or learning uses the Project Based Learning model, students look more active and interested in the project they are making. In this study it was also found that the average posttest results were greater than the pretest results.

The results of this study provide an indication that the Project Based Learning learning model has advantages compared to conventional learning models in terms of improving students' critical thinking skills and these findings provide implications for the need to apply Project Based Learning learning models. This finding is supported by the results of research conducted by Developing students' critical thinking can be done through the use of appropriate learning models. Grant states that the appropriate learning model used to develop critical thinking skills is project based learning Grant, in Utomo (2019). This learning model has advantages, increasing motivation, increasing problem solving skills, increasing

collaboration, and increasing the ability to manage resources (Dewi, 2021). In critical thinking we can also apply such as the project based learning model.

Conclution

Based on the results of the research on "The Influence of the Project Based Learning Model on Critical Thinking Ability seen from the Cognitive Style of the Elementary Science Maple" and to answer the problem formulation described in the previous chapter, the researcher can conclude after carrying out the research process that there is a significant influence of the Project model Based Learning on critical thinking skills seen from cognitive style. This is shown by the activeness of students in learning. In addition, there is the effectiveness of the Project Based Learning model for critical thinking skills in terms of cognitive style. This is indicated by the observation results which state that children tend to be more FI (field independent) than FD (field dependent).

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