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The Effect of Problem Based-Learning Based on Science Edutainment on Students' Critical Thinking and Learning Outcomes

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ABSTRACT

This study aimed to examine the effect of the problem based-learning based on science edutainment in scientific content on students' critical thinking and learning outcomes. The type of research used in this study was quantitative. This study had conducted in class V of 48 students at SD Negeri 12 Buay Pemaca. Data collection techniques included interviews, observation, documentation, and tests. The result showed that based on the independent sample t-test on the learning outcomes ability variable obtained a significance of 0.000 > 0.05, which means that problem based-learning model based on science edutainment had affected the increase in students' learning outcomes. Based on statistical tests, the independent sample t-test showed a significant value of 0,000 > 0,05, meaning that the science edutainment problem based-learning model had influenced students' critical thinking. This study concluded that a problem-based learning model based on scientific learning affected students' critical thinking and learning outcomes.

Keywords: Critical Thinking, Learning Outcomes, Problem-Based Learning, Science Edutainment

INTRODUCTION

Problem-Based Learning is learning performed by students dealing with real problems in daily life so that students can arrange their knowledge in solving problems and striving for different solutions. (Purnamaningrum et al., 2012). In the Problem-Based Learning Model, the teacher acts more as a supervisor and facilitator, so students learn to think and solve their problems (Suami, 2018).

There are many ways for a teacher to convey content that can make students happy; one is by associating the Problem-Based Learning Model with fun learning. Using a suitable model helps the learning process be fun and get good results. Teachers promote the spirit of learning students and are obliged to create more exciting and innovative learning, encourage optimum learning, and to be able to develop thinking capacity (Ratnaningsih, 2016). Learning using an edutainment approach can improve the students' outcomes (Abdan, 2015). Edutainment Learning offered students opportunities to be actively involved and to enjoy learning activities.

Edutainment in Science Learning is known as Science Edutainment Taufiq et al., (2014) argued that learning based on the Science Edutainment approach invited students to perform learning activities through educational games to make learning more fun. Indriati (2012) stated that learning science edutainment introduces a way to learn nuances from entertainment/pleasure but by staying within the learning objectives. Through learning activities with nuances from entertainment, students are expected to learn directly in a learning atmosphere without pressure (Ardianti et al., 2017). Fun learning can encourage classroom activities,

so learning becomes more exciting, and students learn in new ways.

Implementing the Problem-Based Learning Model based on Science Edutainment can improve students' cognitive learning outcomes, social attitudes, and skills better than conventional learning (Fauzan et al., 2017). Learning outcomes or performance can be influenced by various factors, including ourselves and students' environments. Learning outcomes are influenced by factors resulting from students, namely learning motivation and learning styles. In contrast, environmental factors are the school's academic environment, teachers' leadership during the learning process, and the intensity of learning (Sulistiyarini & Sukardi, 2016). Learning was a process of gaining knowledge. Students' interest is significant in education, and enjoyment also plays an essential role in developing students' thinking skills (Kusmaryati & Amertaningrum, 2017).

Learning outcomes changed student behavior after class participation due to the learning environment intentionally created by the teacher through the learning model chosen and used in a lesson (Nuraini & Kristin, 2017). The Problem-Based Learning model based on Science Edutainment is expected to affect improving learning outcomes. Applying science edutainment-learning can positively enhance students' learning outcomes in understanding the concept of science (Indriati, 2012). Problem-Based Learning Model based on Science Edutainment besides building skills in solving problems, solving problems became a fun activity in learning. Based Learning is a learning model that trains and develops the ability to solve problems aimed at the authentic issues of students' real life to stimulate them to think at a high level, namely critical thinking (Kumala et al., 2018).

Critical thinking skills are essential things that students should have in stimulating cognitive reasoning and building knowledge (Adeyemi, 2012). Teachers can shape critical thinking skills by offering learning that encourages students to think critically and needs effective teaching strategies, and critical thinking ability can be increased through problem-solving (Umuroh & Agoestanto, 2016). Critical thinking skills should be used during the learning process so students can solve their problems (Haryanti, 2017).

This study was a research development of (Islam et al., 2018) exploring the application of the Problem-Based Learning Model. This research also builds on the study of Chusniyah et al., (2016) on the effectiveness of science-based learning in edutainment. The difference wa in the research material and research topics. This research added as a research topic in the form of Problem-Based Learning based on science edutainment and uses Theme 8 material in grade V of primary school. This research analyzed the effect of increasing learning outcomes and critical thinking skills. This research was motivated by the need for more innovation in using learning models. According to Islam et al., (2018), three indicators of critical thinking did not experience a significant increase. It proved that the Problem-Based Learning Model usually applied in the classroom had yet to be maximized. This research provided empirical data using the Problem-Based Learning Model based on science edutainment for the science learning process. Based on observations about the learning process that takes place in the classroom, researchers found several problems in science learning; there were: 1); teachers were less innovative in choosing learning models, so students still do not understand the material 2); students' achievements are considered to need to improve in science learning. 3); students cannot conclude when the teacher presents questions and problems requiring critical thinking skills; and 4) students need a fun learning model as a supporting factor for understanding the material in the scientific learning process.

Based on the description above regarding the importance of students' critical thinking skills and improving student learning outcomes, problem-based learning based on

science edutainment had applied in science classes. Therefore, researchers were interested in working on research titled The Impact of Problem-Based Learning Model Based on Edutainment on Students' Learning Outcomes and Critical Thinking Skills.

MATERIALS & METHODS

According to Sugiyono (2016:14), the research method used in this study was quantitative. Type this research was a quasi-experimental study. The research design used in this study was a Non-equivalent Control Group Design. This study used two class groups there were the experimental class and the control class groups. The experimental class groups had treated using a Problem-Based Learning model based on science edutainment, and the control class groups used Problem-Based-Learning.

The study had conducted in the Buay Pemaca district, South OKU regency. The population used in this study was fifth-grade students of SD Negeri 12 Buay Pemaca. The sample used was the entire class five of SD Negeri 12 Buay Pemaca, as many as 48 students, namely 25 students of class V A as the control class and 23 students of class V B as the experimental class.

The data collection techniques for this study were interviews, observation, documentation, and test. The data collection instruments in this study were interview sheets, observation sheets, and tests. The data analysis technique used in this study was a required test analysis to determine the normality and variance homogeneity using the normality and hypothesis test using Two Way ANOVA.

RESULT

Required Analysis Test

a. Normality Test

This normality test had performed to verify that the experimental class and control class had a normal data distribution. The normality testing used the Kolmogorov-Smirnov test using SPSS 16.0 for windows. The results of the normality analysis test of students' critical thinking and learning outcomes had presented in the table below.

Table 1. Results of the Normality Test of Learning Outcomes

Class		N	Kolmogorov-Smirnof Test	Asymp Sig.	Level of Significance	Annotation (Sig>0,05)
Initial	Experimental	23	0,172	0,081	0,05	Normal
	Control	25	0,121	0,20	0,05	Normal
Final	Experimental	23	0,168	0,095	0,05	Normal
	Control	25	0,143	0,20	0,05	Normal

Based on Table 1 it showed that Asymp. Sig. Value in the experimental class was 0,081, while the Asymp. Sig. Value in the control class was 0,20. The results indicated that the Asymp. Sig. Value in both classes was more significant than 0,05. It means that the students initial learning outcomes had a normal data distribution. The Asymp. Sig. Value in the experimental class was 0,095, while the Asymp. Sig. Value in the control class was 0,20. The results showed that the Asymp. Sig. Value in both classes was more significant than 0,05. It concluded that the student's initial learning outcomes had a normal data distribution.

Table 2. Results of the Critical Thinking Normality Test

Class		N	Kolmogorov- Smirnof Test	Asymp Sig.	Level of Significance	Annotation (Sig>0,05)
Initial	Experimental	23	0,120	0,200	0,05	Normal
	Control	25	0,136	0,200	0,05	Normal
Final	Experimental	23	0,158	0,118	0,05	Normal
	Control	25	0,131	0,200	0,05	Normal

Based on Table 2, it had discovered that the Asymp. Sig. Value in the early experimental class was 0,200, while the Asymp. Sig. Value in the control class was 0,200. The results showed that the Asymp. Sig. Value in both classes was more significant than 0,05. It means that data on the students' initial critical thinking ability had a normal data distribution. The Asymp. Sig. Value in the final experimental class was 0,31, while the

Asymp. Sig. Value in the last control class was 0,200. The result showed that Asymp. Sig. Score in both classes was more significant than 0,05. It means the final students' critical thinking data had a normal distribution.

b. Homogeneity Test

The homogeneity test had performed to verify whether the data obtained from the pre-test and post-test results in the experimental and control classes had the same variants or homogeneous data. The homogeneity test in this study used the Levene Statistical test using SPSS 16.0 for windows. The results of the analysis of the homogeneity test of learning outcomes and students' critical thinking ability had presented in the table below.

Table 3. Results of the Learning Outcomes Homogeneity Test

Class		Lavene Statistic	df1	df2	Sig.	Level of Significance	Annotation (Sig>0,05)
Initial	Experimental and Control	0,042	1	44	0,845	0,05	Homogenous
Final	Experimental and Control	2,729	1	45	0,115	0,05	Homogenous

Based on Table 3, it had discovered that the Sig. Score in the initial experimental and control classes was 0,845. The results showed that the significance value was more significant than 0,05. It showed that the initial students' learning outcomes had the same data variants or were homogenous. The Sig. value of the experimental and control classes was 0,115. The results showed that the significance value was more significant than 0,05. It showed that the final students' learning outcomes had the same data variant or homogeneity.

Table 4. Results of Critical Thinking Homogeneity Test

Class		Lavene Statistic	df1	df2	Sig.	Level of Significance	Annotation (Sig>0,05)
Initial	Experimental and Control	0,417	1	45	0,532	0,05	Homogenous
Final	Experimental and Control	0,163	1	45	0,617	0,05	Homogenous

Based on Table 4, it had discovered that the Sig. Value in the initial experimental and control classes was 0,532. The results showed that the significance value was more significant than 0,05. It showed that the initial students critical thinking had the same data variant or homogeneous. While the Sig. Score in the experimental and control classes was 0,617. The results showed that the significance value was more significant than 0,05. It showed that the final students critical thinking ability had the same data variant or homologous.

The Results of the Effect Problem-Based Learning Model Based on Science Edutainment in Improving Learning Outcomes

The purpose of testing the learning outcomes hypothesis was to determine whether a Problem-Based Learning Model was affected based on Science Edutainment in improving students learning outcomes. After the prerequisite test had been performed with the normality and homogeneity tests, the hypothesis was tested using the Independent Sample T-test using SPSS 16.0 for Windows. The independent sample t-test learning outcomes had presented in Table 5 below.

Table 5. Results of Independent Sample T-test Learning Outcomes

		Levene`s Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error	95% Confidence Interval of the Difference	
									Lower	Upper
Learning Outcomes	Equal variances assumed	.833	.366	8.843	46	.000	16.922	1.194	13.070	20.774
	Equal variances not assumed			8.859	45.918	.000	16.922	1.910	13.077	20.767

It had discovered that the significance value of the final students' learning outcomes of the experimental class was 0.000. These results indicate that the significance value was less than 0.05, so Ho rejected and Ha accepted, which means that the problem-based learning model based on science edutainment influences learning outcomes.

The Results of the Effect Problem-Based Learning Model Based on Science Edutainment in Improving Critical Thinking Ability

The aim of testing the critical thinking ability hypothesis was to determine whether there was an influence of the Problem-Based Learning Model Based on Science Edutainment in improving students' critical thinking ability. After the prerequisite tests had been performed with the normality and homogeneity test, the hypothesis was tested using the Independent Sample T-test using SPSS 16.0 for Windows. The results of the learning outcomes hypothesis test in the experimental and control classes had presented in the table below.

Table 6. Results of Independent Sample T-test Critical Thinking

		Levene`s Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error	95% Confidence Interval of the Difference	
									Lower	Upper
Critical Thinking	Equal variances assumed	.417	.533	4.420	46	.000	19.110	4.324	10.406	27.813
	Equal variances not assumed			4.490	42.359	.000	19.110	4.256	10.524	27.696

It had discovered that the significance value of the final students' critical thinking ability was 0,000. These results indicate that the significance value was less than 0.05, so Ho rejected and Ha accepted, which means that the problem-based learning model based on science edutainment influences critical thinking ability.

DISCUSSION

The Effect of Problem-Based Learning Model Based on Science Edutainment in Improving Learning Outcomes

In these sessions, to determine the effect of the Problem-Based Learning Model Based on Science Edutainment on improving learning outcomes, it was necessary to have a testing instrument validated and used before treatment (pre-test) and after treatment (post-test) will have given. The data obtained from the pre-test and post-test results were then analyzed through statistical tests using SPSS 16.0 for windows. The data obtained from the pre-test and post-test results were then analyzed through statistical tests using SPSS 16.0 for windows.

Based on the data from the pre-test, students' learning outcomes in both classes had normal and homogeneous data distribution. So that the analysis of the similar average test is performed by parametric statistical tests using an independent sample t-test by looking at the Equal variances Assumed value. The analysis showed that the significant value was 0.000> 0.05, meaning there were differences in learning outcomes between the experimental and control classes. This analysis concluded that the two classes had the same pre-test learning outcomes, so they were worth using as research subjects.

Concerning the hypothesis test of students' post-test learning outcomes with parametric analysis that used an independent sample t-test showed no influence of the Problem-Based Learning Model Based on Science Edutainment in improving students' post-test learning outcomes. It is indicated by a significance value of 0.000> 0.05. In

contrast, to determine the value of students' post-test learning outcomes by comparing the average acquisition between the experimental and control classes. In the experimental course, the average value of the students' learning results reached 86.52; in the control class, the average value of the student's learning outcomes advanced to 69.60. The results of the data analysis showed that the average value of the final learning outcomes in the experimental class was higher than in the control class. It concluded that the experimental class had better learning outcomes than the control class.

The findings of this study indicated an impact on the Science Edutainment Problem-Based Learning Model in improving student learning outcomes; according to (Lestari et al., 2015), students love innovation in learning, especially those prioritizing direct engagement with experience. Problem-Based Learning Based on Science Edutainment using a smart card, according to (Umar et al., 2016), Problem-Based Learning can bring up knowledge and increase student learning success. Student learning outcomes are characterized by learning achievements or whether the learning objectives are not achieved (Sahronih & Sumantri, 2020). This learning experience can increase students' abilities (Alten et al., 2019).

Based on the results of this study, the Problem-Based Learning Model based on Science edutainment significantly affects student learning outcomes. It showed an increase in mean N-gain between experimental classes. The N-Gain score reached 0.71 with a high category, indicating that the Problem-Based Learning Model Based on Science Edutainment in the water cycle of science learning material could improve students' learning outcomes. Learning about the water cycle provided learning that required students to explore knowledge (Senen et al., 2021). Problem-Based Learning offers activities for students to explore and solve authentic and meaningful problems (Malmia et al., 2019). The teacher's presentation of fundamental problems in a lesson will create a severe and fun learning environment (Hadi et al., 2019). Skilled children acquire learning outcomes after completing learning activities (Ahmadi et al., 2018). Learning outcomes are essential to understanding (Martínez-Nada & Bosch, 2021). The existence of change that occurs in students after gaining their learning experience is referred to as learning outcomes (Ulandari & Surya, 2017).

Based on the explanation above, it concluded that the Problem-Based Learning Model based on Science Edutainment could improve students' learning outcomes because it offered opportunities for students to be actively independent in solving problems presented by the teachers in learning activities. So that students feel more confident and ensure the best learning results when performing assignments from the teacher.

The Effect of Problem-Based Learning Model Based on Science Edutainment in Improving Critical Thinking Ability

In this discussion, in determining the effect of Problem-Based Learning based on Science Edutainment in improving critical thinking ability, a test instrument is needed that is validated and given before treatment (pre-test) and after treatment (post-test). The data obtained from the pre-test and post-test results were then analyzed through statistical testing using SPSS 16.0 for windows.

Based on the initial data of students' learning outcomes (pre-test) in both classes, data obtained have a regular and homogeneous distribution. So the mean similarity test analysis is performed through parametric statistical tests using an independent sample t-test by looking at the value of Equal Variances Assumed. The analysis results indicated that the significance value was $0.000 > 0.05$, meaning there was a difference in critical thinking skills between the experimental and control classes. This analysis concluded that the two classes had the same initial essential thinking skills so that they could be used as research subjects.

For the final learning outcomes hypothesis test (post-test) of students with parametric statistical tests using an independent sample t-test showed no effect of the Problem-Based Learning Model based on Science Edutainment on students' final critical thinking skills. It had indicated by a significance value of 0.000 >0.05. Meanwhile, determine students' final critical thinking skills by comparing the average acquisition between the experimental and control classes. In the experimental course, the average value of the student's learning outcomes reached 81.87; in the control class, the average value of the student's learning outcomes advanced to 62.76. From the data analysis results, it had discovered that the mean value of the final critical thinking ability in the experimental class was higher than in the control class. It means the experimental class had better critical thinking skills than the control class.

The finding results of increasing critical thinking can be judged from various things, such as children can define and group the reading topics, consider the learning results, answer the statement of the reading topics, and analyze opinions about the activities. Students can be able to answer the question related to the water cycle. Activities to find out problems related to the water cycle have been carried out during the discussion activity. This test required students to critically thinking when analyzing and considering the problem-solving process. The findings of this study showed the influence of the Problem-Based Learning Model based on Science Edutainment in improving students' critical thinking skills. The problem-based learning model becomes a model to stimulate students to increase their critical thinking ability (Nugraha et al., 2017).

Someone thinking ability can influence learning capabilities, speed, and effectiveness of learning. Therefore, thinking skills are associated with the learning process. Students who are trained to think showed a positive effect on the development of their education (Lutfianasari et al., 2018). Preparing for education success can be focused on developing critical thinking skills. Through this ability, students will be ready to think critically and analytically, communicate effectively, and solve problems efficiently (Živkovic, 2016). Critical thinking is helped Someone to solve problems creatively and actively (Jeronimo et al., 2020). Critical thinking skills are essential things that students should have in stimulating cognitive reasoning and building knowledge (Adeyemi, 2012). Therefore, students critical thinking development should be increased as early as possible.

Based on the findings, the Problem-Based Learning Model based on Science Edutainment significantly influences students' critical thinking ability. It showed from the increasing N-gain average between the experimental and control classes. The N-gain score reached 0.67 with the moderate category, which showed that the Problem-Based Learning Model based on Science Edutainment in scientific learning of water cycle material could improve students' learning outcomes. Critical thinking skills were essential to develop so students could see, observe, and solve different problems (Dewi et al., 2018). Someone's thinking ability can affect learning capabilities, speed, and effectiveness of learning. Therefore, thinking skills are associated with the learning process. Students who are trained to think positively impact the development of their education (Liu et al., 2015). Problem-Based Learning is based on problems and events surrounding the student environment. Teaching materials based on issues in the student environment could make students interested and more enthusiastic (Mahanal et al., 2019).

Based on the explanation above, it concluded that the Problem-Based Learning Model based on Science Edutainment better contributed to improving students' critical thinking. Because Problem-Based Learning model based on Science Edutainment with facilitating learning steps and the ability to develop students to solve problems in learning, all of which ensures that students

have to think critically about the issues presented by the teacher in the learning process

CONCLUSION

Based on the results and discussions described, it concluded that the Problem-Based Learning Model based on Science Edutainment in science learning affects student learning outcomes and critical thinking skills. It is based on a statistical test using the independent sample t-test, which showed that the significance value of learning outcomes was 0.000 > 0.05. In addition, the problem-based learning model based on Science Edutainment affects students' critical thinking; it is based on statistical tests using the independent sample t-test, indicating the significance value of the critical thinking ability was 0.000 > 0.05.

This study discovered that the Problem-Based Learning based on Science Edutainment requires a relatively long time and requires the skills of the teacher who can perform these learning steps, so better preparation is needed before they are optimal and follow the Learning Syntax.

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