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The Effectiveness of The Blended Learning Model Application to Student Learning Outcomes in The Science Study for Elementary School

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Abstract: The purpose of this study was to determine the effectiveness of the application of the blended learning model on the learning outcomes of class VI students in science lessons. This research uses experimental research methods. The subjects in this study were students of class VIC Private Elementary School Nurul Huda Desa Katonsari Demak with a total of 28 students as the experimental class and Class VIA Public Elementary School No. 2 Sidomulyo Wonosalam Demak with 22 students as the control class. The results of the N-Gain score test showed that the experimental class (by applying the blended learning model) obtained an average N-Gain score of 71.88%, which was included in the 'Quite effective' category. Meanwhile, the application of the conventional model to the control class obtained an average N-Gain score of 39.30% in the category of 'Ineffective'. While the effectiveness test uses the paired sample t-test, it is known that the significance value (2-tailed) is 0.000 <0.05. In addition to the significance value, the value of t count> t-table is 26.002> 2.052. From these results, it can be concluded that the application of the blended learning model significantly impacts student learning outcomes in science lessons in grade VI elementary schools.

Keywords: Blended learning, student learning outcome, science study

1. Introduction

The Covid-19 pandemic has been the turning point in the start of a new lifestyle in a way that had not been previously imagined. The virus, known to have a very high transmission rate, has spread rapidly to almost all parts of the world and has caused death in more than 202 countries (WHO, 2020). This disease spreads quickly across the globe due to the unique nature of the virus, which is to have an extraordinary genetic diversity, making it highly contagious and easy to spread without being affected by the climate (MacKenzie & Smith, 2020).

During this pandemic, teachers tried to switch from face-to-face learning to online learning. However, there are several prerequisites for teachers in the online learning process, namely the availability of mobile phones, quotas and a stable internet network. Inhibiting factors or obstacles to implementing online learning include not all students having cellphones and many parents are still busy working (Putria, Maula, & Uswatun, 2020). Another weakness of online learning is the lack of student supervision during the online learning process (Ma et al., 2021). With this minimal interaction and supervision, the learning results obtained are less than optimal.

Learning with the blended learning model can be an alternative to face-to-face learning, which is still not been fully implemented during this pandemic. Along with the rapid development of technology in the world of education, a blended learning model can complement the deficiencies in face-to-face and online learning. Linking learning with technological developments is not easy. The use of technology in the learning process certainly must not leave the essence of learning itself. According to Sequeira (2012), the learning process is a system that involves a single component that is interrelated

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and interacts with each other to achieve an expected result optimally in accordance with predetermined goals.

In Indonesia, the blended learning model has begun to be widely applied. However, it is still challenging to find the research results that examine its application to elementary schools (Panjaitan, Murniarti, & Sihotang, 2021). A study on the blended learning model does not only apply the online learning model but integrates face-to-face learning. This blended learning model can be used to complement the deficiencies that exist in conventional learning and online learning. The blended learning model provides access to various learning resources (Usman, 2019). In addition, the conditions of the Covid-19 pandemic can also be the right momentum for teachers to be creative and innovative in applying learning models.

2. Literature Review

Kusuma, Murtono, & Utomo (2022) and Kundu (2018) states that Blended Learning is a learning process that utilizes various approaches and various media and technology. Learning with the blended learning model has three basic or brief stages in its application (Yelland, 2001). The three syntaxes are 1) Seeking information, which includes searching for information from various sources of information available online and offline based on relevance, validity, content reliability and academic clarity. Then, the teacher provides input for students to find effective and efficient information, 2) Acquisition of information; Students individually and in cooperative-collaborative groups try to find, understand, and confront them with ideas or ideas that already exist in students' minds. Then interpret the knowledge from various available sources until they can re-communicate and interpret their ideas and interpretations using facilities, and 3) synthesize knowledge. Finally, constructing or reconstructing knowledge through assimilation and accommodation starts with the results of analysis, discussion and formulation of conclusions from the information obtained.

Meanwhile, Taurina (2015) state that the factors that affect learning outcomes include 1) Internal factors in individuals who are learning. Internal factors include physical and psychological factors, and 2) External factors are outside the individual. External factors include family factors, school factors, and community factors. Therefore, in this study, the application of the blended learning model is expected to improve student learning outcomes, especially in science lessons.

A study by Untari & Millatussa'adiyyah (2020) states that combining conventional learning with communication media such as WhatsApp and Google Drive is one of the easy solutions to learning in the z-generation. Students accustomed to communicating using social networks can access materials and structured lesson plans for each meeting. So that they can read or prepare questions before learning begins. Meanwhile, in their research, Wahyudi & Winanto (2018) stated that the project-based Blended learning model is valid and practical in terms of learning aspects (face-to-face and online), learning media and teaching materials. This model is effectively used to increase student creativity in participating in learning. Moreover, they combined a project-based blended learning model. This research is a blended learning model in which practical activities are contained in the lesson plan syntax, namely the verification stage.

3. Methodology

The research approach used is quantitative. The quantitative approach is research whose data is in the form of numbers and statistical analysis (Sugiyono, 2015). In addition, this research uses experimental research methods. Experimental research is research that examines causal relationships. This research type is a true experiment with a pre-test and post-test control group design.

3.1 Data Source

According to Sugiyono (2017) population is an object or subject with specific qualities and characteristics in the generalization area, applied to be studied and then summarized by researchers. In this study, the population is all elementary schools in Demak Regency, amounting to 476 Public Elementary Schools and 147 Private Primary Schools. According to Sugiyono (2017), the sample is a population that has a share of the number and characteristics. The sample in this study was 28 students from SDS Nurul Huda, Demak District, Demak Regency and 22 students from SDN Sidomulyo 2, Wonosalam District, Demak Regency.

3.2 Collection Technique

a) Test - a multiple choice test totalling 30 questions,
b) Observation - observation instruments in the form of observation sheets totaling 20 instruments
c) Documentation - documentation (photos of activities, attendance list, daily journal, score list)

3.3 Test Analysis Techniques

3.3.1 Validity test

This research consists of validity, reliability, difficulty level, and differentiation test. The summary of the results of the validity of the items is as follows:

Table 1. Recap of the results of problem validity analysis

Criteria	Amount	Question Item Number
Invalid	0	-
Valid	30	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30

Source: Results of SPSS data processing 23

From Table 1, it can be seen that all test questions that will be used to measure the effectiveness of student learning outcomes are entirely valid. Thus, the questions that have been made and are valid can be used as assessment questions.

3.3.2 Reliability Test

The reliability test in the study obtained the following results:

Table 2. Question reliability test results

Reliability Test Results (Guttman Split-Half Coefficient)	Category
0.867	High

Source: Results of SPSS data processing 23

Table 2 shows that the statistical reliability value of the Guttman Split-Half Coefficient obtained is 0.867. Thus it can be concluded that the instrument with this type of multiple choice question is reliable because it has exceeded the benchmark value of 0.6.

3.3.3 Difficulty Level Test

The results of the difficulty level test are as follows:

Table 3. The results of analysis of problem difficulty levels

No.	Criteria	Item Questionnaire	Amount
1	Easy	1, 4, 6, 7, 8, 10, 15, 16, 17, 18, 19, 20, 21, 23, 25, 27, 28, 29	18 question items
2	Moderate	3, 5, 9, 11, 12, 22, 24, 26, 30	9 question items
3	Hard	2, 13, 14	3 item questions

Source: Results of SPSS data processing 23

Based on the analysis of the difficulty level, 18 items were classified as easy, nine items were classified as moderate, and three were classified as difficult.

3.3.4 Difference Power Test

Based on the calculation of distinguishing power, the following results are obtained:

Table 4. The different power test results

No.	Criteria	Question Number	Amount
1	Ugly	-	0
2	Enough	-	0
3	Good	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30	30
4	Very well	-	00

Source: Results of SPSS data processing 23

From the calculation results in Table 4, it is known that all the questions have distinguishing power, which is in the good category because the values are above the range of 0.41.

4. Results and Discussion

In this study, the experimental class used a blended learning model. This experiment was carried out in grade VI SD S Nurul Huda, Demak District, Demak Regency. Students in this experiment totalled 28 students. After the post-test was carried out, the value distribution of 30 multiple-choice questions was obtained. The results of this distribution conducted the descriptive analysis using statistical methods to obtain a pattern of several studies, summarizing them and continuing to present information in the desired form.

List of Frequency Distribution: From the results of the post-test, the following data were obtained:

Table 5. Results of post-test value in experiment class learning model of blended learning

No.	Score	Tabulation	Frequency	Value x frequency
1	70	/	1	70
2	73	//	2	146
3	77	/////	5	385
4	80	///// /	6	480
5	83	///	3	249
6	87	/////	5	435
7	90	//	2	180
8	93	//	2	186
9	97	//	2	194
Amount			**28**	**2325**

Mean, Median, and Mode: From the experimental class post-test data analysis.

$$\text{Mean} = \frac{amount\ of\ data}{amount\ of\ students\ follow\ test} = \frac{2325}{28} = 83{,}03 \quad (1)$$

Median = 81.5

Most mode or score = 80

Mastery learning: minimum completeness criteria science subject content is 70, meaning that students who get more or at least 70 scores are 28. This shows that all grade VI students of Private Elementary School Nurul Huda, Katonsari (experimental class) have reached the minimum completeness criterialimit.

$$Mastery\ learning = \frac{Amount\ students\ who\ pass}{Jumlah\ seluruh\ siswa\ yang\ tuntas}\ x\ 100\% = \frac{28}{28}x\ 100\% = 100\% \quad (2)$$

N-Gain Score Test: The calculation of the N-gain score test shows that the average N-gain score for the experimental class (blended learning model) is 71.8796 or 71.88%. Meanwhile, the average N-gain score for the control class (conventional method) was 39.3037 or 39.30%. To see the effectiveness of the application of the blended learning model, then the average N-gain score is classified according to its category.

Table 6. Recap of the N-Gain score test results for the experimental class and control class

No.	Class	Average N-Gain score (%)	Information
1	Experiment (using a blended learning model)	71.88	Effective enough
2	Control (conventional method)	39.30	Ineffective

Source: Results of SPSS data processing 23

From Table 6, it can be concluded that the application of the blended learning model in the experimental class (learning with the blended learning model) results in an average N-gain score of 71.88 or 71.88%, which is categorized as 'quite effective. Meanwhile, applying the conventional model in the control class obtained an average N-Gain score of 39.30 or 39.30% in the Ineffective category.

Analysis of the effectiveness test using the t-test on student learning outcomes in schools that apply the blended learning model with schools that do not involve the blended learning model with the following hypothesis.

Ha: There is a significant difference between learning that applies and that does not involve the blended learning model.
Ho: There is no significant difference between learning that applies and that does not apply the blended learning model.

The test criteria used is if the significance value <0.05, then Ha is accepted, and Ho is rejected. Significance value >0.05, then Ha is rejected, and Ho is accepted. Apart from using the significance value, a comparison between the calculated t value and the t table is also used. If the value of t-count> t-table, then Ha is accepted, and Ho is rejected. If the value of t-count <t-table, then Ha is rejected, and Ho is accepted. The results of data analysis on the test of the effectiveness of applying the blended learning model in science learning can be presented in Table 7.

Table 7. Test results paired sample t-test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Mean Error	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre Test Class Experiment - Post Test Class Experiment	43.429	8.838	1,.670	40.002	46.855	26.002	27	.000

Source: Results of SPSS data processing 23

Based on the results of the t-test analysis, it was found that the significance value of the two experimental schools was 0.000. This significance value is less than 0.005. Thus the t-test results with paired sample t-test show a significance value of 0.000 <0.005. Referring to the testing criteria, if the significance value <0.05, then Ha is accepted, and Ho is rejected. This means that Ha in this study is accepted, and Ho is rejected. Meanwhile, the t count in this study obtained a value of 26.002. Furthermore, the t table value is searched based on the df (degree of freedom) value. The df value from the table can be seen at 27, so the t table value is 2.052. Thus, the value of t-count> t-table is obtained, namely 26.002> 2.052.

5. Conclusions and Recommendations

This study concludes that the effectiveness of this blended learning model can be seen from the results of the N-Gain score test, which results in experimental class (by applying the blended learning model), the average N-Gain score is 71.88% in the category of 'Fairly effective. Meanwhile, the application of the conventional model to the control class obtained an average N-Gain score of 39.30% in the category of 'Ineffective'. While the effectiveness test uses the paired sample t-test, it is known that the significance value (2-tailed) is 0.000 <0.05. The results of the t-count in the experimental class 1 and 2 also showed a value greater than the t-table, and the t-count obtained 26.002> 2.052. These results indicate that Ha is accepted and Ho is rejected, which means a significant difference between student learning outcomes in the pre and post-test. So from these results, it can be concluded that the application of the blended learning model significantly impacts student learning outcomes in science lessons in grade VI elementary schools.

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Conflict of Interest

The authors declare no conflicts of interest.

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