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The Influence of Blended Learning Learning Model and Student Creativity on Science Learning Outcomes of Grade VII Students

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Abstract

Background: Background: This study aims to analyze differences in student learning outcomes between students whose learning uses a learning model (blended learning) and has high student creativity and students whose learning uses a learning model (discovery learning) and has high student creativity. **Method:** This study uses a quantitative method approach. This type of research uses a 2x2 factorial experiment method. The research population used was all students of class VII SMPN Labuan. **Result:** The results showed that: 1) There were differences in science learning outcomes between students whose learning activities used the blended learning model and students who used the discovery learning model. 2) There are differences in science learning outcomes between students with high and low creativity. 3) There are differences in science learning outcomes between students who use blended learning models and have high creativity and students who use discovery learning models and high creativity. **Conclusion**: There are differences in science learning outcomes between students who use the blended learning model and have low creativity and students who use the discovery learning model and have low creativity.

Keywords: Blended Learning Model; Creativity; Science Learning Outcomes

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Introduction

The current global digital era is full of opportunities and challenges for science to carry out daily life activities (Arnyana, 2018). Science has made a significant contribution to the development of technology (Damanhuri et al., 2013). Future learners must be critical, creative, competitive, and to solve problems. Global demands require the world of education to always and continuously adapt technological developments to improve the quality of education, especially adjusting the use of information and communication technology for the world of education, especially in the learning process (Haka et al., 2020).

Learning is a process of maturing young people who older adults try. The learning process will never be separated from the existence of an educational process (Iryanto, 2022). Learning is adding new information and abilities so students can learn easily and have fun, including in learning science. The learning process takes place continuously from time to time until the current digital era. The digital era in this century has influenced the world of education, especially in Indonesia (Widiara, 2020). The learning process often makes students less interested in learning due to the lack of variations in teaching. The quality of learning can be seen from the process and outcome aspects. During the Covid 19 outbreak, massive efforts were made to keep education on track. The need to use technology is the greatest effort to advance education in the world (Sukendro et al., 2020).

The learning process can be seen as successful if students show high learning activity during teaching and learning activities and are physically and mentally active. Learning

outcomes are a peak learning process and are usually indicated by the test scores given by the teacher (Dimyati & Mudjiono, 2009). School teachers most widely assess this ability because it can be used as an evaluation material and students' knowledge in mastering subject matter (Sudjana, 2009).

Interest in learning in students will arise if learning takes place in a fun way. Effective learning is needed to improve learning activities and student learning outcomes. One way is to use interesting learning methods, models, and media (Trianto, 2011). There are research results, namely by using learning methods to improve learning activities and student learning outcomes (Widodo & Widayanti, 2013). Several ways can be done to improve learning outcomes, one of which is to use a learning model that is as interesting as possible (Husamah, 2014). Student creativity is an important factor in determining the success of student learning. This fact aligns with what was stated (Stameto, 1995). That the student's creativity factor influences the learning outcomes achieved by students. According to (Hong & Song, 2020). Creativity has been considered key competency students need to prepare for the future and has recently been emphasized in school-based science education. Creative students have personalities such as learning to be more independent, responsible, hardworking, highly motivated, optimistic, curious, confident, open, tolerant, and rich in thoughts. (Sukmadinata, 2004). The pedagogical concept of blended learning can be described as a deliberate combination of online and classroom-based learning that activates and supports learning.

Using learning models is also an alternative to getting satisfactory learning outcomes. The blended learning model is very necessary. Blended learning combines face-to-face and computer-based learning (online and offline) (Husamah, 2014). In this pandemic era, it is strongly recommended that students study online or not face to face, so this learning model is very suitable for use. Blended learning solves the challenge of adapting learning and development to individual needs. Blended learning is an opportunity to integrate the innovative and technological advances offered by online learning with the best interaction and participation from traditional learning (Thorne, 2013). The main motivation for choosing a blended learning model is to increase student participation in their learning process rather than sitting quietly during discussions (Lapitan et al., 2021). Educational institutions have adopted blended learning for various reasons, such as providing more flexibility to meet students' learning needs and backgrounds or as an effort to reduce dropout rates (López-pérez et al., 2011).

Based on the observation results, students' interest is quite low in learning activities. At the time of learning takes place, students are not focused when the teacher explains the material. Students are lazy to record the material being explained by the teacher. They are not active in learning activities because the teacher still uses lecture and discussion methods in learning activities. This affects the creativity and learning outcomes of students who still get grades below the minimum completeness criteria. Environmental pollution is one of the materials in science learning for class VII SMPN 2 Labuan. In ecological pollution material, students experience difficulties understanding the mechanism of environmental pollution. Using blended learning models is suitable for creating creativity and more satisfying learning outcomes during this pandemic. Therefore, this research will prove the effect of blended learning and creative learning models on student learning outcomes. So the researchers were interested in researching the effect of blended learning models and student creativity on science learning outcomes for class VII students of SMPN 2 Labuan.

Metode

This study uses an experimental research method with a 2x2 factorial design because this research directly examines the effect of a variable on other variables in the control and experimental classes. The groups studied included blended learning models and study groups using discovery learning models.

Sample or Participant

The samples used in this study were class VII A and class VII B with 30 people in each class. Treatment class (learning model), then obtained experimental class A1 (VII A) and control class (VII B). to determine differences in the treatment group of student creativity (B). In contrast, the moderator variable or attribute in one class is tested. Then the variable attributes of high student creativity (B1) and low student creativity (B2) are obtained. In the experimental class with 30 students, 30 were taken for B1 and 30 for B2. Thus, there are 30 samples in the experimental and 30 in the control classes. So the number of research samples is 60 students. The type of sample used is purposive sampling (aiming technique), used to determine someone to be the sample (Sugiyono, 2016).

Instrument

The instrument used in this study was a learning achievement test for cognitive aspects with six aspects of cognitive levels, namely: remembering (C1), understanding (C2), applying (C3), analyzing (C4), assessing (C5), creating (C6), measured using a multiple choice test of 20 questions. This test was given before learning (pretest) and after learning (posttest) in the experimental and control classes. The next instrument is a test to measure student creativity. The type of instrument used to measure student creativity is a questionnaire with a five-point Likert scale response format ranging from 1 (very low) to 5 (very high) with a total of 20 questions, divided into 14 positive statements and six negative statements.

Procedure

The procedure for implementing the research to be carried out in schools is carried out in four stages, namely preparation, treatment, control, and evaluation.

Data analysis

A two-way analysis of variance (ANOVA) was used to analyze the data in this study. For hypothesis testing to be carried out, it is necessary to conduct a requirements analysis test, namely the normality and homogeneity tests. The normality test is used to determine whether the data is normally distributed. The normality test was carried out using the SPSS version of the 25 criteria program. If manual processing is used, the Chi-Square test (X^2) is used with a significance level of α = 0.05. To test the normality of the data, namely by using the Chi-Square formula (X^2) as follows (Riduwan, 2010):

$$X^2 = \sum \frac{(fo - fh)^2}{fh}$$

Table 1. Chi-Square Formula Information (X^2)

Chi-Square Formula (X^2)	Information
X^2	Chi-square value
fo	The value of the observations (observation frequency)
fh	Expected value (expected frequency)

Meanwhile, homogeneity testing was carried out using the SPSS for Windows ver 25 program. Homogeneity testing was carried out using the homogeneity test with the most significant variance compared to the most negligible variance or the F test with a significance level of α = 0.05 with the following formula (Sugiyono, 2013):

$$F_{count} = \frac{\text{Largest variance}}{\text{Smallest variance}}$$

By Criteria:

If $F_{count} < F_{table}$ then the data is not homogeneous

If $F_{count} > F_{table}$ then the data is homogeneous

Result

This study will be answered by testing the hypothesis. The hypothesis testing analysis is discussed in detail based on the results of the values obtained through calculations using SPSS ver.25.

Differences in Science Learning Outcomes Using the Blended Learning Model and the Discovery Learning Model

Table 3. Differences in Science Learning Outcomes

ANOVA					
LEARNING OUTCOMES	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	2535.000	1	2535.000	59.406	.000
Within Groups	2475.000	58	42.672		
Total	5010.000	59			

Based on the ANOVA table, Fcount is 59.406 with a significance level of 0.05, proving whether this test is significant or not, the F test is used. The significance test rules are:

If Fcount > Ftable, then Ha is accepted, meaning it is significant

If Fcount <Ftable, then Ho is accepted, meaning it is not significant

Significance level a = 0.05 and Ftable = 3.35, then:

Fcount > Ftable or 59.406 > 3.35, then Ha is accepted, meaning it is significant.

In this way, there are differences in student learning outcomes in the concept of environmental pollution where learning activities use the blended learning model, and students use the discovery learning model.

Effect of interaction between students using the blended learning model and creativity on science learning outcomes

Table 4. Effect of Student Interaction and Creativity on Science Learning Outcomes

ANOVA					
LEARNING OUTCOMES	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	6603.571	1	6603.571	125.193	.000
Within Groups	1371.429	26	52.747		
Total	7975.000	27			

Based on the ANOVA table, Fcount is 125.193 with a significance level of 0.05, proving whether this test is significant or not, the F test is used. The significance test rules are:

If Fcount > Ftable, then Ha is accepted, meaning it is significant

If Fcount <Ftable, then Ho is accepted, meaning it is not significant

Significance level a = 0.05 and Ftable = 3.39, then:

Fcount > Ftable or 125.193 > 3.39, then Ha is accepted, meaning it is significant.

That way, the learning outcomes of students who study with the blended learning model and high creativity are higher than those who study with the discovery learning model and lower student creativity.

Differences in science learning outcomes Students use blended and discovery learning models for highly creative students.

Table 5. Differences in Science Learning Outcomes with High Creativity

ANOVA					
LEARNING OUTCOMES	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	2112.500	1	2112.500	38.776	.000
Within Groups	1634.375	30	54.479		
Total	3746.875	31			

Based on the ANOVA table, Fcount is 38.776 with a significance level of 0.05, proving whether this test is significant or not, the F test is used. The significance test rules are:

If Fcount > Ftable, then Ha is accepted, meaning it is significant

If Fcount > Ftable, then Ho is accepted, meaning it is not significant

Significance level a = 0.05 and Ftable = 3.35, then:

Fcount > Ftable or 38.776 > 3.35, then Ha is accepted, meaning it is significant.

In this way, there are differences in student learning outcomes in science learning which have high creativity with the blended learning model, and students with high learning creativity with the discovery learning model.

Differences in science learning outcomes using blended learning models and discovery learning models for students who have low creativity

Table 6. Differences in Science Learning Outcomes with Low Creativity

ANOVA					
LEARNING OUTCOMES	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	700.137	2	350.069	14.677	.000
Within Groups	596.291	25	23.852		
Total	1296.429	27			

Based on the ANOVA table, Fcount is 14.677 with a significance level of 0.05, proving whether this test is significant or not, the F test is used. The significance test rules are:

If Fcount > Ftable, then Ha is accepted, meaning it is significant

If Fcount > Ftable, then Ho is accepted, meaning it is not significant

Significance level a = 0.05 and Ftable = 3.35, then:

Fcount > Ftable or 14.667 > 3.35, then Ha is accepted, meaning it is significant.

That way, there are differences in student learning outcomes in science learning with low creativity with the blended learning model and students with low learning creativity with the discovery learning model.

Discussion

Differences in Science Learning Outcomes Using the Blended Learning Model and the Discovery Learning Model

Giving tests to the experimental and control groups aims to determine the science learning outcomes of the two groups. The following data is obtained based on the calculation of the descriptive statistical test of the sample. The learning outcomes in the group using the blended learning model obtained an average score of 88.57, while the group using the discovery learning model obtained an average score of 75.50. In both models, there are differences in the science learning scores of SMPN 2 Labuan students. The results are higher in learning using the blended learning model than students using the discovery learning model.

Based on the results of data calculations using ANOVA as in table 4, 59,406 shows that Fcount > Ftable, or 59,406 > 3.35 at a significance level = 0.05, this is Ha accepted, which

means significant. These results indicate differences in learning outcomes between students using the blended and discovery learning models. In this study, conducted during the Covid pandemic, the time allocation for face-to-face meetings at school was minimal. The application of the discovery learning model requires quite a long time because the stages of this model are very complex and more effective when done face-to-face. So the learning outcomes obtained using the discovery learning model in the control class are lower than in the experimental class. The tendency of practical class students to learn using the blended learning model is very high because by using this learning model, students can do it online and face to face. This can be seen from the enthusiasm of students when learning activities use the blended learning model compared to learning using the discovery learning model.

In learning using the discovery learning model, students only link material in everyday life at the same time as learning. The discovery learning model takes up more time because it changes the way of learning that is usually used. Considering these data and the theories above, educators must be precise in choosing learning models appropriate to students' times, characteristics, and needs because the selection of learning models can improve student learning outcomes. Therefore, the learning model needed during the pandemic and to answer the challenges of the current industrial revolution is a learning model that provides training for students to think critically (Critical Thinking) and be creative and innovative. Learning does not only emphasize the transfer of knowledge but a learning process that produces creative students, critical in solving a problem (Rusdiana et al., 2020), so it can be concluded that the blended learning model gets higher learning outcomes compared to students whose learning activities use the discovery learning model. Thus, in the current new normal era, the online learning process must be carried out with many strategies and innovations in learning. Learning innovation essentially aims to be able to solve problems in education and to be able to produce graduates or students who can compete with the times. (Aritonang et al., 2021).

Effect of interaction between students using the blended learning model and Creativity on science learning outcomes

Based on testing the hypothesis of the effect of the interaction of blended learning models and creativity on science learning outcomes, data obtained with Fcount > Ftable or 3.781 > 3.35, then Ha is accepted, meaning it is significant. If the value of the determination of the independent and dependent variables is close to 1, it means that the correlation is strong. From the data obtained, it turns out that the value of the determination is 3,781, and this is close to 1, so the correlation is strong. This shows 3,781 > 3.35 interactions of blended learning models and creativity on science learning outcomes.

Based on observations in the field, blended learning model learning activities can improve student learning outcomes in science subjects. Besides that, this model can also assist students in increasing student creativity. So it can be concluded that using blended learning models with high creativity can improve student learning outcomes in science subjects. Creativity is indicated by the ability to solve problems faced by behavior (Hidayat et al., 2020).

Differences in science learning outcomes Students use blended and discovery learning models for highly creative students.

The following data is obtained based on the calculation of the descriptive statistical test of the sample used. Science learning outcomes for the group using the blended learning model and having high creativity obtained an average score of 90.94, while for the group using the discovery learning model having high creativity, an average score of 75.00 was obtained. There is a difference in the average score of the science learning outcomes obtained by the two groups, this indicates that the science learning outcomes using the blended learning model with high creativity are higher than those using the discovery learning model.

Calculating the data using ANOVA shows that Fcount > Ftable, or 38.776 > 3.35 at a significance level = 0.05. This is Ha accepted, which means it is significant. These results indicate differences in science learning outcomes using blended learning models with higher creativity than those using discovery learning models with high creativity. This is consistent with the hypothesis that there are differences in science learning outcomes using blended learning models with higher creativity than those using discovery learning models. Creativity is defined as the ability to solve problems. Creativity is a mental process to obtain new ideas. Creativity is creating new ideas that can be useful for many people (Fardah, 2012).

Creativity is used as a process to obtain flexible solutions. In this case, creativity has an important role in problem-solving. Learning activities using the blended learning model are very appropriate for science subjects. Blended learning models are a supplemental resource, with traditional approaches supporting virtual learning environments through an institution, deep learning designs at a time when levels of learning practice change, and the view that all technologies are used to support learning (Saefudin, 2012).

While learning activities that use the discovery learning model are learning activities whose stages are very complex, in learning activities with the discovery learning model, it takes quite a long time to achieve the desired target, creating a feeling of boredom in students so that their learning outcomes will be lower.

The research and discussion above show that science learning outcomes using blended learning models with high creativity are better than students using discovery learning models with high creativity.

Differences in science learning outcomes using blended learning models and discovery learning models for students who have low creativity

The following data is obtained based on the calculation of the descriptive statistical test of the sample used. Science learning outcomes for the group using the blended learning model and having low creativity obtained an average score of 87.86, while the group using the discovery learning model having low creativity obtained an average score of 57.14. There is a difference in the average score of science learning outcomes obtained by the two groups. This indicates that the science learning outcomes of SMPN 2 Labuan students who use the blended learning model with low creativity are higher than those who use the discovery learning model with low creativity.

Based on the results of data calculations using ANOVA, as shown in table 4.31, it shows that Fcount > Ftable, or 14.677 > 3.39 at a significance level = 0.05. This is Ha accepted, which means it is significant. These results indicate differences in science learning outcomes that use a blended learning model with lower creativity than those with a discovery learning model with low creativity. This is by the hypothesis formulated, namely that there are differences in science learning outcomes that use blended learning models with lower creativity are higher than those that use discovery learning models with low creativity. The blended learning model is very appropriate for use in science subjects in the pandemic era because it can integrate existing concepts so that students are more interested and enthusiastic compared to the discovery learning model, which takes up a lot of time, making students' interest decrease. By the results of the research and discussion above, it can be concluded that science learning outcomes using the blended learning model with low creativity are better because even though the creativity of the students is low, their academic ability is very high because of an interest in learning with the blended learning model which can be done independently. Independent and more relaxed done online or offline. In contrast to students who use the discovery learning model with low creativity, their interest in learning is lower because the stages of this model are very complex and more effective when done face to face.

Conclusions

The science learning outcomes of students using the blended learning model were higher than those using the discovery learning model. So blended learning models and creativity can increase science learning outcomes. Meanwhile, students who use the blended learning model and have high creativity are higher than students who use the discovery learning model and have high creativity. The students who use the blended learning model and have low creativity are higher than students who use the discovery learning model and have low creativity.

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Declaration statement

The authors reported no potential conflict of interest.

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