



Blended learning strategies through guided inquiry learning settings to increase learning acquisition of concepts and procedures in biology subjects

Lilan Dama*, Nurrijal

Biology Education, Faculty of Mathematics and Natural Science, Universitas Negeri Gorontalo, Indonesia

*Corresponding author: lilandama@ung.ac.id

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ABSTRACT

The application of blended learning strategies through guided inquiry learning arrangements aims to increase the acquisition of students' learning concepts and procedures on the material of the body's defense system. The purpose of this study was to examine the effect of blended learning strategies with guided inquiry learning settings on the acquisition of learning concepts and procedures in biology subjects in high school. This test was carried out using a pre-experimental one group pre-test and post-test design, in this design: a) measurement of dependent variables from one group of subjects (pretest), b) subjects were given treatment for a certain period of time (exposure), c) the second measurement (posttest) was carried out on the independent variables, and d) comparison of the results of pretest and posttest measurements. This study involved 36 students of second grade of Science class 3 of Public Senior High School 3 Gorontalo, consisting of 22 women and 14 men. The results of this study are; (1) Provide scientific experience so that it can become the best practice for fostering student teacher candidates. (2) Contribute directly to schools through teacher partnerships in finding the right learning mode. (3) The blended learning strategy of guided inquiry learning settings is very good in giving effect to increase the acquisition of learning concepts and procedures of students on the material of the body's defense system in Biology subjects in high school.

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INTRODUCTION

The blended learning strategy is an innovation due to disturb that occurs in the world of education. Blended learning combines face to face and online learning which has a more flexible time (Su, 2019). This strategy emerged as a response to current technological advances. In line with these advances, encouraging construction to innovate in learning. Both related to the way teachers teach and how students learn can also influence it. According to (Gillespie et al., 2007) information and communication technology has changed rapidly so that teachers are asked to develop new and innovative ideas from ICT for learning. One of these innovations is virtual learning. So in this situation, the teacher must be truly independent in determining the right way of teaching so that students can find a way of learning that is in accordance with the expected skills and abilities.

Several things that are needed by education today namely skills, knowledge and good attitudes, as well as good mastery of information and communication technology in accordance with the times. In addition, students are prepared to face global challenges so that higher order thinking skills (HOTS) are needed or in other words education must be able to prepare an educated generation that can compete in the world of work. The application of technology is part of a strategy in learning that can be developed through problem solving, collaboration, creativity, communication, and critical thinking skills. This means that building a virtual learning environment can stimulate higher order thinking skills (HOTS) in students. So what is needed is a combination of learning settings that integrate technology (Dewi., 2019; Yusuf., & Widyaningsih, 2022).

Students make information and communication technology in the form of smartphone use often used only for playing social media, games or watching movies. The solution to this problem is to utilize technology into learning settings that package interesting and fun learning models so that they can make student learning outcomes increase. One of the learning models that can affect and increase the learning process of students is the inquiry learning model.

The advantages of guided inquiry learning are approaches that are closely related to the examples assigned to be studied (Spector et al., 2014). The use of guided inquiry models in the learning process can assist students in solving a problem, because through this model students can find information on their own through discovery so that the understanding of the material that students get will be more meaningful and easily absorbed by students. As explained by Duffy (2009) in (Alfieri et al., 2011), inquiry is a constructivism that emphasizes student motivation and tends to provide guidance or feedback. So that investigation will point to several questions to ask and answer (Botturi & Stubbs, 2008). An inquiry approach to teaching science in the classroom can assist students in developing critical reasoning capacities effectively, including the ability to ask scientific and investigative questions, record and interpret results accurately in order to relate their findings to growing scientific knowledge (Sutman et al., 2008). Therefore, guided inquiry plays an important role in mastery of learning that affects the learning process of students. This inquiry tends to affect the acquisition of learning concepts and procedures through HOTS skills, namely; Critical Thinking and Problem Solving Skills, Communication Skills, Creativity and Innovation, and Collaboration (Islami., & Fitri, 2021). So that utilizing a virtual learning environment (online) is very possible to develop mastery of HOTS.

In learning biology, the acquisition of learning concepts and procedures is very important. Because concept strengthening is a means to support the acquisition of learning procedures. Mastery of procedures in biology subjects is a concrete learning activity on biological concepts. The results of observations of biology subjects in high school show that biology learning activities have not been carried out and have achieved their goals optimally. Material the body's defense system is material that is difficult for students to learn because the subject matter is quite complicated. The difficulties experienced by students are due to the material being studied tends to be abstract.

This material requires a higher understanding than the previous material. Many new terms that must be understood by students. In addition, students tend to find it difficult to understand the formation of immunity in the body and the immune processes that occur in the body. This is evidenced by the learning outcomes of students, where not all students achieve the KKM (Minimum Completeness Criteria) so that students who do not pass must take remedial courses. In fact, such problems are converging on the acquisition of learning concepts and procedures.

Based on the description of the problem above, the solution to be applied is to create a virtual learning environment that combines technology into a guided inquiry learning setting. Such a

combination is the application of the blended learning strategy of guided inquiry learning settings to the acquisition of learning concepts and procedures in biology subjects. The learning setting places blended learning into a strategy that plays a role in regulating the acquisition of learning concepts and procedures.

METHODS

Research Design

This study was designed using a pre-experimental one group pre-test and post-test design, in this design are: a) the measurement of dependent variables from one group of subjects (pretest), b) the subject is given treatment for a certain period of time (exposure), c) the second measurement (posttest) was carried out on the independent variables, and d) comparison of the results of pretest and posttest measurements.

Population and Samples

This study involved 36 students of second grade of science class 3 of Public Senior High School 3 Gorontalo, totaling 36 people consisting of 22 women and 14 men.

Instrument

The instrument applied aims to measure the acquisition of learning concepts and procedures in the subject of biology in the body's defense system material. The instrument in question is the acquisition of learning outcomes in the form of an acquisition test of learning concepts and procedures consisting of the ability to understand and use concepts and procedures. The test developed to measure the learning achievement is a essay. The concept understanding test is to determine the understanding of biological concepts with indicators of knowledge of Bloom's Taxonomy revised by Anderson and Krathwohl, including ability; (1) remembering (remember); (2) understanding (understand); (3) applying (apply); (4) analyzing (analyze); (5) evaluating (evaluate); and (6) create. Procedure text is a text that contains a method, a goal to make or do something step by step in an appropriate sequence so as to produce a desired goal. This text is classified into three types, namely text that contains how to use tools, objects, or the like, text that contains how to do an activity, and text that contains certain habits or characteristics. Procedure text aims to help students understand how to do or make something right (Table 1).

Table 1.

Research Instrument

Concept Learning Acquisition Test	Procedure Text
1. Essay Test / Description The concept understanding test is to find out the understanding of biological concepts	1. The text contains how to use tools, objects, or the like 2. The text contains how to do an activity 3. text that contains certain habits or characteristics

Procedure

The research procedure carried out on the research subjects included giving a pretest, giving treatment and then doing a posttest after all meetings were carried out. The experimental procedure was arranged starting from the pre-experimental one group pre-test and post-test design as shown in the following Figure 1.

The One-Group Pretest-Posttest Design

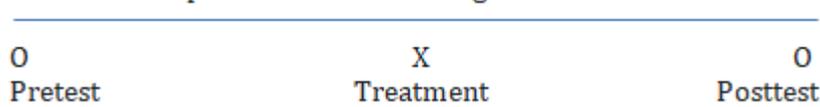


Figure 1. One-Group Pretest-Posttest Research Model

Information:

O = Observation of pretest results

O = Observation of posttest results

X = learning strategy blended learning guided inquiry learning setting

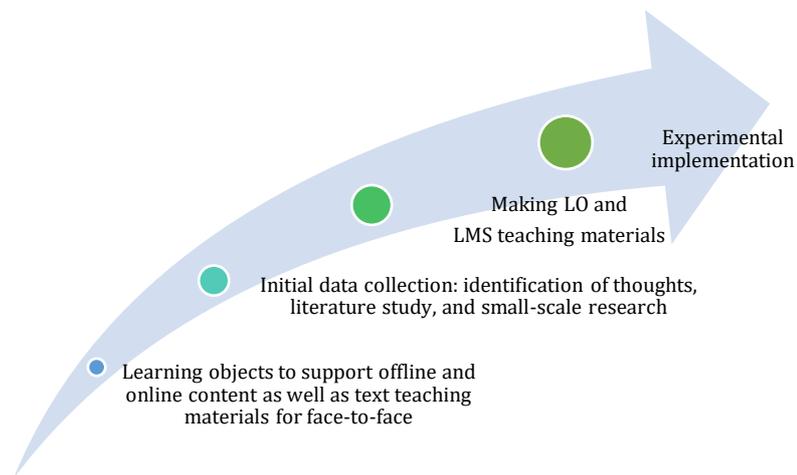


Figure 2. Stages of research procedures

Data Analysis Techniques

Testing the independent variables on the dependent variable using the T-test through the SPSS application. The steps taken in the technique are;

a. Normality test

The normality test using is Kolmogorov-Smirnov using SPSS. The hypotheses in this test are as follows:

H₀ : Data is normally distributed

H_a : The data is not normally distributed

If the Kolmogorov-Smirnov significance is more than ($\text{sig} > 0.05$), then H₀ is accepted so that it can be stated that the data is normally distributed.

b. Homogeneity Test

The homogeneity test was conducted to determine whether the respondent groups taken had the same variance. Homogeneity test using Levene's with $\alpha = 0.05$ and assisted by the SPSS program. If the significance value of F is greater than ($\text{sig} > 0.05$), then H₀ is accepted so that it can be stated that the group of respondents whose variance is homogeneous.

c. Hypothesis testing

Based on the formulation of the problem, what is meant by influence is a change from the initial condition and the final condition in this case the final condition is better than the initial condition. That is, the effect test is the same as testing whether the final condition is higher than the initial condition after the application of the blended learning learning strategy in guided inquiry learning settings, the posttest score is better than the pretest. The hypothesis test used aims to test the comparative hypothesis between two different variables, namely between the ability of students to acquire learning concepts and procedures before and after applying the blended learning strategy in guided inquiry learning settings. To find out this value, using a statistical test in the form of a paired t-test (Two Paired Samples Test) in the SPSS program. The hypothesis used is as follows:

H₀: There is no effect of the blended learning strategy of guided inquiry learning settings on the acquisition of learning concepts and the acquisition of learning procedures.

H_a: There is an effect of the blended learning strategy of guided inquiry learning setting on the acquisition of learning concepts and the acquisition of learning procedures.



Figure 3. The stage of carrying out the experiment

RESULTS AND DISCUSSION

The results of statistical tests that simultaneously test whether there is an effect on the acquisition of learning concepts and the acquisition of learning procedures on the material of the body's defense system by applying the blended learning strategy of guided inquiry learning settings produce statistical tests with probability values or Sig. The values of the body's defense system are Sig. 0.000 which turns out to be much smaller than the criteria for determining the level of significance ($\alpha = 0.05$), in connection with which it is stated that there is an impact between learning strategies and the acquisition of learning concepts and the acquisition of learning procedures for system materials body defense. The conclusion of the test results indicate that the independent variable learning strategy has a strong effect on the two dependent variables simultaneously.

a. Concept Learning Acquisition

The average value of concept learning acquisition before and after applying the guided inquiry learning setting blended learning strategy, more details as shown in the following [Table 2](#).

Table 2.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Test	55,97	36	10,199	1,700
	Post Test	74,83	36	14,236	2,373

The output above shows a pretest score of 55.97 and a posttest of 74.83 from 36 student respondents. The average value of learning outcomes in the pretest < posttest, so there is a difference in the average learning outcomes of the concept. This proves a really real (significant) difference. The results of the paired sample t-test are presented in [Table 3](#).

Table 3.

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre Test & Post Test	36	,173	,312

The output above explains the results of the correlation test or the relationship between the two pretest and posttest variables. Where it is known that the correlation coefficient is 0.173 with a significant value of 0.312 > 0.05 probability. So it can be stated that there is no relationship between the pretest and posttest variables for the acquisition of concept learning ([Table 4](#))

Table 4.

Paired Samples Test

		Paired Differences		t	df	Sig. (2-tailed)
		Mean	Std. Error Mean			
				95% Confidence Interval of the Difference		
	Std. Deviation			Lower	Upper	

Table 4.
Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre Test - Post Test	-18,861	16,011	2,668	-24,278	-13,444	-7,068	35	,000

Based on the output above, it is known that the value of Sig. (2-tailed) is $0.000 < 0.05$, this means that H_a is accepted and hypothesis H_0 is rejected. That means there is an influence of the blended learning strategy of guided inquiry learning settings on the acquisition of students' concept learning in the body's defense system material.

b. Procedure Learning Acquisition

Based on the results of the second hypothesis test regarding the effect of the blended learning strategy of guided inquiry learning settings on the acquisition of learning procedures, the average value of the acquisition of learning procedures before and after applying the blended learning strategy of guided inquiry learning settings is shown, in more detail as shown in [Table 5](#).

Table 5.
Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Test	56,92	36	8,044	1,341
	Post Test	81,19	36	9,704	1,617

The output above shows the pretest value of the learning procedure 56.92 and the posttest score of 81.19 from 36 students. The average value of learning outcomes in the pretest < posttest, so there is a difference in the average learning outcomes of the procedure. this proves a real (significant) difference. while the results of the paired sample t-test are presented in [Table 6](#).

Table 6.
Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre Test & Post Test	36	,296	,079

The output above explains the results of the correlation test or the relationship between the two pretest and posttest variables. Where it is known that the correlation coefficient is 0.296 with a significant value of $0.079 > 0.05$ probability. So it can be stated that there is no relationship between the pretest and posttest variables for the acquisition of learning procedures below ([Table 7](#)).

Table 7.
Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre Test - Post Test	-24,278	10,612	1,769	-27,868	-20,687	-13,727	35	,000

Based on the value of Sig. (2-tailed) is $0.000 < 0.05$, this means that the hypothesis H_0 is rejected and H_a is accepted. Therefore, it can be concluded that there is an average difference between the results of learning procedural gains in the pre-test and post-test, which means that there is an impact of the blended learning strategy learning setting guided inquiry learning on the acquisition of

students' learning procedures on the material of the body's defense system. Research results show that there are differences in the acquisition of learning concepts and procedures of students, in the body defense system material taught before and after using the blended learning strategy in guided inquiry learning settings. By calculating the descriptive test, average score of the acquisition of learning concepts and procedures is higher when compared before using the strategy blended learning learning setting guided inquiry learning. This means that the application of blended learning learning strategies in guided inquiry learning settings has a better influence on the acquisition of learning concepts and procedures of students on the material of the body's defense system. These findings prove that the classroom by implementing a blend of learning strategies through the best elements (blended learning) has effectiveness when compared to stand-alone learning strategies (Graham, 2004; Halverson et al., 2017; Hrastinski, 2019).

CONCLUSION

Based on the analysis of the research data, it can be concluded that 1) There is a difference in the acquisition of learning the concept of the body's defense system between before and after using the blended learning learning strategy in guided inquiry learning settings. The use of blended learning learning strategies in guided inquiry learning settings is significantly better in increasing the acquisition of learning concepts than before the implementation of the learning strategy; 2) There is a difference in the acquisition of learning procedures for the body's defense system between before and after using the blended learning learning strategy in guided inquiry learning settings. The use of the blended learning learning strategy in guided inquiry learning settings was significantly better in increasing the acquisition of learning procedures than before the implementation of the learning strategy.

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