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The influence of blended learning-based learning model in invertebrate animal taxonomy course on learning outcomes

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ABSTRACT

Blended Learning brings a paradigm shift in education, both for students and educators. This research will help identify the challenges and opportunities associated with implementing Blended Learning, so that it can be better adopted and adapted to enhance learning in the future. This study aims to determine the effect of the blended learning-based learning model on learning outcomes in the Invertebrate Animal Taxonomy course in semester 2 students of the biology education study program for the 2022/2023 academic year. The research method in this study was a quasi-experimental method, taking samples using a simple random sampling technique. The sample of this research was students in semester 2 of class A as an experimental class who were treated with a learning model based on blended learning and students in semester 2 of class B were given a conventional approach. The results of the research in this study are the learning outcomes of the Experiment class of 84 and the Control class of 70. The results of the t-test in this study obtained a t_{count} of 2.99 and table at a significant level of 5% of 2.00, then $t_{count} > t_{table}$ based on this shows that the Blended Learning-Based Learning model influences student learning outcomes in the Invertebrate Animal Taxonomy course.

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INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, society, nation, and state (Ferwati, I Nyoman, Winarsih et al., 2021). Contained in Law no. 20 of 2003 Article 1 concerning the National Education System. Education will make a person able to face the changes that occur in life (Yuningsih, 2021). Therefore, problems in the world of education need attention and handling in order to improve the quality and quantity of the learning process (Kurnia, 2020). Learning is a process in which there is interaction between students and the environment. The environment in question is the school environment, family environment, and community environment

(Purwatiningsih & Soelistyowati, 2021).

One of the problems in the world of education is that using online learning and e-learning is very useful for improving learning (Ho et al., 2023). The learning media used are very diverse, one of which is the use of Android in learning so that it can improve student learning outcomes (Aiding & Nomenclature, 2022). However, the use of smartphones in learning also hurts students, including the lack of student focus on learning, including the YouTube application, and similar applications that can interfere with student concentration in learning (Gui, Gerosa, Argentin, & Losi, 2023). Factors that affect the quality and quantity of the learning process both from within and from outside. Developments in the world of technology today can also be a source of learning for students. The internet can be utilized in the world of education (Samsinar, 2020).Therefore, the use of Internet technology in the world of education can be utilized optimally, one of which is as a source of learning. One of the uses of the Internet in education is blended learning which combines face-to-face and online learning (Suryani, 2021).

Mixed learning is one of the Blended Learning learning models. However, the blended learning learning model has not been widely used in the learning process in biology education study program, Al Washliyah Labuhanbatu University. Based on the conditions in the field, the use of learning technology in the form of blended learning is still underutilized in supporting lectures on low-level (Invertebrata) animal taxonomy. Results of initial observations and interviews that have been conducted with the head of the Department of Prog. In the Biology Education Study, it was found that student learning outcomes were still low, seen from the results of the evaluation of Low-Level Animal Taxonomy learning in the last three years (2019, 2021, 2022) with an average score of A (3%), B (17%), C (43) and no passed (37%). The decline in learning achievement will decrease so that it will have an impact on the quality of education.

Based on discussions and interviews with lecturers for the Low-Level Animal Taxonomy course, it was shown that one of the reasons for the less optimal implementation of the learning process for the Low-Level Animal Taxonomy course was due to insufficient time in discussing lecture material due to the wide coverage of Low-Level Animal Taxonomy material and the absence of media based on e-learning in helping the learning process. Several studies that support the importance of blended learning in the learning process are seen from the research results (Khader, 2016) suggesting that the blended learning model is more effective and flexible when it comes to classical learning where learning material can be enriched with various learning sources including multimedia quickly updated by the lecturer.

Blended learning is a learning model used to describe subjects that try to combine face-to-face learning with online learning (Miranda, Uda, Wijaya, & Sariyatno, 2021). In addition to blended learning, there are terms used by educators, including blended learning, which is a hybrid learning model. These terms contain the same meaning, namely blend, mix, or combination of learning (Syahrin, 2015). Blended Learning is a second face-to-face and online learning modelle arning is a system that is mutually correlated (Khaira, Susilawati, & Iskandar, 2019). The characteristics of the Blended Learning Learning Model can be seen as follows: (1) it involves a combination of virtual environment, physical environment and technology(Handoko & Waskito, 2018), (2) having independent learning activity settings (Utomo & Wihartanti, 2019), (3) students can complement their face-to-face learning by additionally taking online learning(Ekayana, 2022).

Based on these problems, it is necessary to develop a learning model that can be alternative learning for students and that is in accordance with current conditions, therefore the purpose of this study is to: find out the differences in learning outcomes between students who are taught blended learning compared to students who are taught conventional learning (Fu, Wang, & For, 2023). The theoretical benefit of this research is that it is hoped that it can be used as a reference or reference for students. Can enrich scientific repertoire, especially innovation in learning resources. Practical Benefits: a) For Al Washliyah Labuhanbatu University, research results can add to the reading list and bibliography as a reference in improving learning in Plant Physiology courses. b) For students:

the results of this research are expected to be a source of learning for students so that they are more motivated and interested in participating in the lecture process and the results of this research are expected to further develop student learning flexibility optimally. c) For lecturers, the results of this development research are expected to be able to provide innovation for lecturers in carrying out effective, efficient, and interesting learning. d) For Researchers, namely providing opportunities for researchers to apply theory, contributing to the thinking of researchers in broadening the horizons of scientific thinking in the field of education.

The implementation of Blended Learning in biology education can have several significant implications for student learning outcomes. Following are some of the simplicity of Blended Learning on learning outcomes in biology education: 1) Increasing Student improvement: Blended Learning allows the use of various learning resources such as videos, simulations, and interactive courage. 2) More Flexible Access to Learning Materials, 3) More Interactive Delivery of Materials, 4) Differentiated Learning: Blended Learning enables differentiation learning, namely providing different content and assignments according to the needs and abilities of each student, 5) Through Blended Learning, students will become familiar with the use of technology and increase their digital literacy, 5) Blended Learning can enable students to deal with situations and tasks that demand problem-solving in the context of biology, 6) Evaluation and Monitoring of Progress: Blended Learning also allows the use of tools and applications that allow teachers to carry out evaluate and monitor student progress in real-time. With this data, teachers can provide feedback more quickly and precisely to students, thus helping them to continue to improve their understanding and learning achievement.

RESEARCH METHODOLOGY

This research is a type of quantitative research with a quasi-experimental approach, namely the quasi-experimental research method with the design of the experimental group and control group but does not affect the implementation of experimental activities (Sudijono, 2014). Population is the subject of research (Hujjatusnaini, Corebima, Prawiro, & Gofur, 2022). The population in this study were second-semester students in class A which was the experimental class and second-semester students in class B which was the control class. Both classes must come from a homogeneous population, this is shown from the results of the pretest homogeneity. The sample is partly representative of the population to be studied (Munastiwi, Saputro, Fatonah, & Suhendro, 2022). The sampling technique was carried out by random sampling, that is, the sampling was carried out randomly (Munastiwi et al., 2022). Class selection is done randomly. The research design carried out can be seen in the table below:

Table 1.
Pretest score data

Data	Pretes	treatment	Postes
Experimental class	Q1	X1	Q2
Control class	Q3	X2	Q4

Information:
Q1 and Q3 = the results of the pretest
Q2 and Q4 = result of the protest
X1 = treated with a blended learning model
X2 = treated with a conventional learning

This study involved two variables, namely the experimental variable and the dependent variable. As for the experimental variable, it is the treatment variable for the experimental class,

namely blended learning for the control class which is used as a comparison, namely conventional learning. While the dependent variable is student learning outcomes. The data collection technique in this study was in the form of written tests given to students before and after treatment in both classes. The validity of the instruments in this study included the validity of the rational judgment, namely by consulting the instrument with experts, in this case, the competent permanent lecturers of the Biology Education Study Program by being asked for their opinions about the instruments that had been prepared.

After the instrument has been consulted and meets the requirements, the next step is to conduct field trials to obtain construct validity. After the data is obtained and tabulated, the construct validity test is carried out by factor analysis, while the data analysis technique is carried out by t-test and homogeneity test. The procedure for conducting this research is divided into three stages; a) research preparation stage. this stage in the form of observation, permitting correspondence, making a grid of pre-test and post-test questions, and conducting test questions; b) research implementation stage; c) The final stage of the research, this stage analyzes the data on the learning outcomes of the two classes and then proceeds with concluding the results of the research.

RESULTS AND DISCUSSIONS

The research data obtained and the provisions in this study were test data on learning outcomes for the second semester of the Invertebrate Taxonomy course, Biology Education Study Program, Al Washliyah Labuhanbatu University. Value data was obtained from the Experiment class and the control class. The instrument used is in the form of 20 multiple-choice questions that have been tested and analyzed. Before treatment of the experimental class and control class, each class was given a pre-test first. This serves to see the extent of students' initial knowledge of the subject of Invertebrate Animal Taxonomy. The results of the calculation of the initial test data are as follows:

Table 2.
Pretest score data

Data	Experimental class	Control class
N	20	20
highest score	60	50
lowest score	20	15
average	35,14	34,98
SD	11,87	10,50

The minimum completeness criteria (KKM) set in the Biology Education Study Program to get a B grade must get a score in the range of 70-85. Based on the results of the pretest in table 1. Experiment class student learning outcomes with an average 35,14 And the control class with an average 34,98 from these data it can be concluded that in terms of students' understanding of the subject of Invertebrate Animal Taxonomy is still low. This is very reasonable because there are no learning activities regarding lecture material. Based on the results of the hypothesis using a significance level of 0.05, it was found that there were differences in learning outcomes between students who were taught blended learning compared to students who were taught conventional learning. The results of the t-test in this study obtained t_{count} of 2.99 and t_{table} at a significant level of 5% of 2.00, then $t_{count} > t_{table}$ based on this shows that the Blended Based Learning model has an influence on student learning outcomes in the Invertebrate Animal Taxonomy course.

The learning outcomes of the Experiment class were 84 and the Control class was 70. Thus it can be concluded that the application of the Blended Learning learning model has succeeded in increasing learning outcomes. Based on the results of the above research which showed an increase in learning outcomes for classes that received blended learning model treatment. This blended learning model is a learning method by combining face-to-face learning in the classroom and also online or distance learning (Lim, Wang, & Graham, 2019). This shows that blended learning has

many types used in this study, namely flipped, this model is implemented in that students are given teaching materials first to be studied at home before entering class and activities in class, namely strengthening material that is not yet understood and doing exercises (Jong, 2023).

The advantages of blended learning are: more effective, more flexible, and save energy because students get the freedom to find out for themselves sources of information that can be discussed during class (Xie, Huang, Luo, Bai, & Qiu, 2023). The increased learning outcomes are relevant to the research conducted by (Sjukur, 2013), and research conducted by (Yang, Cai, Hao, & Wang, 2023) where student learning outcomes both cognitive, affective and psychomotor can be improved by using blended learning. The contribution of Blended Learning research to biology learning outcomes in the subject of Low-Level Animal Taxonomy is very valuable in several important aspects: 1) Deeper Understanding of Concepts: Research on Blended Learning in biology learning can prove its effectiveness in increasing understanding of biological concepts in more depth. 2) Increased Student Confidence and Motivation: Blended Learning offers a more interesting and interactive learning method, which can increase student engagement in learning. 3) Application of Differentiated Learning: Through Blended Learning, teachers can provide a variety of learning content and assignments according to the needs and abilities of each student. 4) Development of Technology Skills: Research on Blended Learning in biology can contribute to the development of students' technological skills. 5) Performance Evaluation and Measurement: Through Blended Learning, teachers can use tools and applications to evaluate and measure student performance more efficiently. Blended Learning research in biology learning makes many positive contributions to improving student learning outcomes and presenting learning experiences that are more interactive, effective, and relevant. With a deeper understanding of the benefits of Blended Learning, educational institutions can better integrate technology into the learning process and improve the quality of education in biology and other disciplines.

CONCLUSION

Based on the results of the research that was presented in the previous chapter, it can be concluded as follows: there are differences in learning outcomes between students who are taught blended learning compared to students who are taught conventional learning. This means that blended learning has a positive influence on student learning outcomes, especially in the taxonomy of invertebrate animals so that lecturers or teachers can use the Blended Learning learning model to control face-to-face and online learning processes so that student activities can be identified and remain under the supervision of lecturers. In implementing the blended learning model, the University should facilitate facilitating lecturers and students so that they can carry out face-to-face and online combination learning. Blended Learning requires adequate technological infrastructure and good management to ensure that learning runs smoothly and efficiently. The future of education must include developing technology infrastructure, providing equal access for students of all backgrounds, and implementing strict data security and privacy policies. Research on the effect of Blended Learning on learning outcomes provides an optimistic outlook for the future of education. However, the successful implementation of Blended Learning depends on collaboration between various stakeholders, including the government, educational institutions, teachers, and the community. With commitment and joint efforts, Blended Learning can become the main pillar in creating relevant, innovative, and high-quality education for future generations.

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