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Improved Understanding of Biodiversity Concepts through Environmentally Based Biology Learning Models

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Abstract

Background: Indonesia has abundant biodiversity. The concept of biodiversity was chosen because there are still places that must be known that students can use as learning resources. The learning innovation carried out is the application of environment-based knowledge to improve students' understanding of the concept of biodiversity. **Method:** This study used a pretest-posttest group design, 105 students of class X SMA Negeri Asera. The research sample consisted of 2 classes, namely the experimental and control classes. The experimental class uses environment-based learning and the control class uses conventional learning. The data was obtained through a test of understanding the concept of biodiversity and interviews. Data analysis was carried out by descriptive analysis and inferential statistics. Hypothesis testing through t-test using SPSS 20.0 program. **Result:** There is a difference in values between the experimental and control classes, where the experimental class values are higher than the control class values with that = 10,899. **Conclusion:** The application of this environment-based learning can affect student learning outcomes of SMA Negeri Asera.

Keywords: biodiversity; environment-based learning model; understanding of the concept

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Introduction

Education is the most important component in developing individual potential. With the provision, students can change in a better direction by learning. Learning is an effort by a learner to build his entire personality, both physical and psychic (Sunarsih et al., 2020). Learning activities, commonly called learning activities, can produce learners who have good cognitive, affective, and psychomotor abilities. Students do a lot of learning activities, one of which is biology learning.

Biological learning emphasizes providing hands-on learning experiences through the use and development of skills and attitudes toward scientific processes (Irmadora et al., 2020). Biology is one of the subjects of science that explains the existence of life. According to Taiwo & Emeke (2014); Kareem (2018), biology subjects expose students to the world of self-knowledge and the surrounding environment. Learning in an out-of-school environment will foster a deep understanding; teachers can engage students by utilizing the environment as a learning resource to provide deep knowledge of biodiversity.

Biodiversity in Indonesia is very abundant. According to Bruyn et al., (2014); Rintelen et al., (2017). The Indonesian archipelago consists of 17,000 islands with various types of habitats and a very complicated geological history. Biodiversity consists of the diversity, abundance, and identity of its species, genes, and ecosystems and supports ecosystem services essential for human health and well-being (Marselle et al., 2021). The concept of biodiversity was chosen because, in the research site, there are still places that can are

used as a source of learning by students, especially on land, such as natural forests, former nickel mining forests, and the coast. Biodiversity provides life values for humans, including economic, biological, ecological, social, educational, and cultural values.

The environment in the school is the teacher's attention. Students are an important subject in research on the school environment because it has a role in maintaining the environment. Students who have exemplary achievements are usually associated with their perception of preserving the environment (Ichsan et al., 2019). With the environment's potential that supports this biological learning process, this research applies environmentally based learning.

Research that has been conducted related to environmental-based learning by Amini (2015); Firmansah & Gusti Putu Suryadarma (2019); Irmadora et al. (2020); and Irawati (2021) the results showed an influence on the learning process for students. But some of the research that has been done, namely related to the effect on learning outcomes (Murti & Maya, 2021), motivation (Irmadora et al., 2020), and environmental care (Firmansah & Gusti Putu Suryadarma, 2019). This is why this study found out how effective environmental-based learning is in understanding the concept of biological diversity.

According to Anderson & Krathwohl, (2010) understanding is a person's ability to understand what is being communicated and implement an idea without having to associate it with other ideas and without having to look at the concept deeply. According to Benjamin S. Bloom, "understanding is the ability to understand what is being communicated and implement ideas without having to associate them with other ideas, and also without having to look deeply at them" (Rosyada, 2004; Yanti et al., 2018). This lack of understanding of biodiversity is one of the causes of the common understanding of student concepts.

The concept of biodiversity describes the diversity of genes, types, and ecosystems through observational activities (Abdul & Purwantoyo, 2013). According Yunanda et al., (2019) the concept of biodiversity is still difficult to distinguish the diversity of gene levels and types and find solutions to the threat of biodiversity damage implemented in everyday life. Wirtha & Rapi, (2008) revealed that many students still learn only to memorize concepts, record what teachers perceive passively, and rarely use initial knowledge as a basis for learning planning. The research aims to apply environmental-based learning and improve students' understanding of biodiversity concepts through these observational activities.

Method

Scope of Research

This research was carried out to see the influence of environmentally-based biology learning in improving the understanding of the biodiversity of high school students in the North Konawe Regency. The sample used in the study was selected by purposive random sampling, and 105 students of class X MIA were selected from June to August 2019. The method used pseudo experimental (quasi-experiment) type Pre-test Post-test Control Group Design.

Research Procedures

The treatment stages in this study are the use of two classes, the experiment class, and the control class. The class used is class X MIA, and the sample used is selected by purposive sampling. In experiment class, there is the use of environmental-based Biology curriculum learning models and control classes using conventional learning. Both classes are given pre-test questions to find out students' initial abilities in the concept of biodiversity. The instruments shown in the form of instruments understand the concept of biodiversity by using seven indicators: interpreting, exemplifying, classifying, comparing, explaining, summarizing, and collecting.

Data Analysis

Data analysis carried out in this study has several stages. The first stage is the prerequisites, namely the promotion of normality with Kolmogorov-Smirnov and homogeneity testing with the Levene test and tested using SPSS 21 for windows. The test criterion is to receive H_0 if the D_{hit} value < D_{tabel} or the significance value is more significant than $\alpha = 0.05$.

Result

This study aims to analyze whether there is an influence on environmental-based biology learning in improving the understanding of the biodiversity of high school students in the North Konawe Regency. Understanding the concept of biodiversity of students before and after being taught with environmentally based learning has descriptive differences, both from the achievement of minimum, maximum, average scores, and standard deviation, as presented in Table 1.

Table 1. Descriptive Analysis Data

Components	Experiment Class			Control Class		
	Before	**After**	***Gain***	**Before**	**After**	***Gain***
Sample count	35	35	35	35	35	35
Minimum value	18,75	43,75	0,31	18,75	37,50	0,10
Maximum value	56,25	93,75	0,86	56,25	62,50	0,42
Average score	34,64	68,04	0,52	33,21	49,29	0,24
Standard deviation	9,86	11,32	0,14	9,44	7,70	0,07
Variance	97,30	128,15	0,02	89,09	59,22	0,01

Based on Table 1, there is a difference in value between before and after treatment. In the experimental class, before using the treatment environment-based learning application (34.64) and after treatment (68.04) with a gain of 0.52. From the table, it can be seen that the understanding of the concept of biodiversity after being taught with environmentally based learning is higher than before learning.

The study results show that the conventional learning presented in table 1 shows that the understanding of the concept of biodiversity after being taught with conventional learning has differences.

The results of this descriptive analysis are then carried out through prerequisite tests first, namely looking for normality and homogeneous data. Test the normality of data using the Kolmogorov-Smirnov test (Table 2).

Table 2. Normality Test with Kolmogorov-Smirnov (K-S)

Aspect	Significance			
	N	**Pre-test**	**Post-test**	**Alpha**
Experiment Class	35	0,420	0,576	0,05
Control Class	35	0,097	0,293	0,05

Based on Table 2, the experimental class (0.576) and control class (0.293) have a value of > 0.05 which means that the distribution data is normal. The data normality test then tests the homogeneity of the data. Data homogeneity testing is carried out using the Levene test (Table 3).

Table 3. Homogeneity Test with Levene

Measurement Aspects	F	df1	df2	Sig.
Understanding the concept of biodiversity	1,295	3	136	0,279

The probability value (Table 3) for the variable understanding of the concept of biodiversity is 0.279 greater than alpha 0.05. Then the data used in this study are homogeneous.

To determine whether there is a difference in increasing understanding of the concept of biodiversity before and after being given environmental-based learning compared to conventional learning is presented in the following table.

Table 4. Hypothesis Testing

Measurement Aspects	t_{count}	t_{table}	Prob.	Alpha	Conclusion
Understanding the concept of biodiversity	10,899	1,68	0,00	0,05	H_0 ditolak

Table 4 shows that that value (10,899) is more significant than t_{table} (1.68) at a = 0.05. It is said that there is a difference in the understanding of the concept of biodiversity with environmental-based compared to conventional learning.

Understanding the Concept of Biodiversity

Indicators of understanding the concept of biodiversity in this study are interpreting, exemplifying, classifying, comparing, explaining, summarizing, and concluding. The search results of each indicator of understanding the concept of biodiversity in the experimental class and control class presented below.

Table 5. Analysis of Indicators of Understanding Biodiversity Concepts

Indicators of understanding the concept of biodiversity	Environment-Based Learning		Learning of Conventional	
	Before	After	Before	After
Interpreting	38,10	68,57	36,19	50,48
Exemplifying	45,71	73,33	32,38	50,48
Classifying	30,00	67,14	34,29	45,71
Comparing	17,14	60,00	34,29	51,43
Explained	27,14	62,86	21,43	37,14
Summarizes	35,00	68,57	35,71	55,00
Conclude	31,43	68,57	37,14	48,57

Based on Table 5 there is an increase in understanding of the concept of biodiversity both in the experimental and control classes. However, it is still lower compared to the experiment class. In the experiment class with an example aspect, getting the highest score is 73.33. In the control class, the element summarizes has the highest value compared to other elements, 55.00.

A prominent aspect of understanding the concept of biodiversity after being taught with environmentally based learning is to exemplify, interpret, summarize and conclude. The element of summarizing and concluding has the same value of 68.57. Whereas in the control class taught with a conventional approach, the dominant element is summarizing and comparing.

Discussions

The concept of biodiversity is one of the materials in biology lessons. According to Wulandari et al. (2020), biological learning has a complex scope of the matter, interrelationships with various sciences, and process mechanisms that cannot be seen directly and are challenging to learn and teach. The research applies environment-based learning to increase understanding of the concept of biodiversity. According to Saleh (2017); Susani et al. (2019) the success of educational goals in schools depends mainly on the learning process experienced by students. Teachers are required to improve the quality of school subjects, especially regarding the mastery of student learning materials with the field of study taught (Susani et al., 2019).

The analysis of understanding the concept of biodiversity in the experimental class showed that all students who received environmental-based learning showed an increase in the value of gain. According to Mioković et al. (2012); Wulandari et al. (2020), one of

the most important components in understanding concepts is the beginning of knowledge that affects the processing of new information in the understanding of scientific concepts. Good knowledge of concepts is characterized by connecting new information with information they already use to solve problems (Saricayir et al., 2016).

The results of the hypothesis show differences in the improvement of understanding of the concept of biodiversity with environmental-based learning compared to conventional learning. The above findings hint that environmentally based learning outside the classroom provides students with valuable experiences to integrate with nature. Irmadora et al. (2020), learning outside of school will prioritize deep understanding. Teachers can engage students by utilizing the environment as a learning resource to provide deep knowledge of biodiversity.

The analysis of each indicator taught using environment-based learning showed an increase in the application of learning to understand the concept of biodiversity. Higher student ability is in the exemplified element of 73.33% after environmentally based learning. This suggests that students who are taught by a method closer to the student's environment will make it easier to remember objects that have been observed. Students are directly involved in observation activities in the field to get to know the variety of plants relevant to learning. Segara (2015) stated that environmental-based learning is developed to gain more experience related to the surrounding environment. In the learning process, students see directly the object of learning that is not known before or only through the medium of images. Learning like this makes it easier for students to internalize the object learned.

The surrounding environment is a learning facility that can be optimized to achieve the teaching and learning process and produce quality education (Rusman, 2012; Murti & Maya, 2021). Prabawani et al. (2017)environment as a means of learning can optimize its benefits in the teaching and learning process to enrich students' learning materials and activities on campus. Gautreau & Binns (2012) environmentally-based educational curriculum makes students more interested in learning and maintains student behavior from environmental destruction. Environmental biology learning is also to improve students' understanding of concepts.

Control classes that use conventional learning also show improvement. From the analysis results based on aspects, what is relatively low is to explain, classify, and conclude. At the same time, the element that stands out is summarizing and comparing. In conventional learning, students must understand the material through reading activities, listening to teacher explanations, and doing LKS. According to Santika et al. (2020) conventional learning for students only students memory in the short term therefore, students do not master the concept of the material being student, this kind of activity does not gain students' abilities, so students only summarize existing reading material and compare an example with other examples. Conventional learning only makes students not have long-term memory, and students do not have mastery of the material being taught, so conventional learning does not reduce students' abilities. Meanwhile, important aspects that determine students' understanding of the material taught, explained, classified, and concluded are poorly explored.

Conventional learning focuses less on understanding concepts and the benefits of the learning process. Students face many materials that are so much rote; this condition causes low student achievement. Wirtha & Rapi (2008), most students still memorize concepts, record what the teacher, passive give, and rarely use initial knowledge as the basis of learning planning. According to Jayawardana (2017), conventional learning makes students more passive. Suastra, (2007) also expressed the same thing, in fact, several obstacles result in teachers have not been able to make changes to conventional learning patterns consistently. Constraints experienced are the characteristics of the material that is too dense, and the benchmark for the success of education in schools is mostly focused on the product.

Regarding biology learning, Lynd-Balta, (2006) revealed that traditional teaching styles taught about the introduction to Biology allow contributing to the reduction of knowledge and the weakness of basic science concepts in students. This suggests that conventional learning emphasizes the teacher's function as an informant, where students are passive and only listen to the teacher's explanations.

The analysis results showed that the use of environmentally-based learning can improve students' understanding of concepts better than conventional learning and can improve understanding of concepts effectively, especially in biodiversity system materials. This is in line with Ariesandy (2021), outdoor learning in the form of exploring the environment associated with high student learning motivation can be expressed as the best learning strategy. Environmentally based biology learning will not be monotonous. It will be an interesting learning activity that will motivate and foster more significant curiosity in students towards biodiversity materials as a subject they should associate with their lives (Irmadora et al., 2020).

Conclusions

Research shows significant and effective positive results with environmentally-based Biology learning models. This can be seen in students who are taught with more improved environment-based learning than conventional learning. Implementing the environmental-based Biology learning model by applying the basic principles of learning, namely the guide of active learning, cooperative learning groups, the principle of direct engagement, and the principle of challenge. Environmentally based Biology Learning provides opportunities for learners to hone concept understanding skills through observation, investigation, discussion, and delivery of ideas. This can form integrity in building independence, creativity, and unyielding.

Declaration statement

The authors reported no potential conflict of interest.

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