
Implementation of Indigenous Knowledge Teaching Materials in Biology Learning Quasi-Experimental Study on Environmental Change Material

Melati Arum Hapsari, Hariyatmi*

Biology Education Department, Faculty of Teacher Training and Education, Universitas Muhammadiyah Surakarta.
Jl. A. Yani Tromol Pos I, Pabelan, Kartasura, Surakarta 57162, Jawa Tengah, Indonesia

*Corresponding Author. E-mail address: hariyatmi@ums.ac.id

ABSTRACT

KEYWORDS:

Biology
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Indigenous Knowledge
Teaching Materials

The purpose of this study was to determine the biology learning outcomes of SMA Negeri 1 Teras class X students using teaching materials containing indigenous knowledge in the 2023/2024 school year on environmental change material. This type of quantitative research with a Quasi Experiment design, this form of Quasi Experiment uses Nonequivalent Control Group Design. This research was conducted in two classes, namely the control class and the experimental class. In this study, an initial test (pretest) was conducted before treatment and a final test (posttest) was conducted after treatment. A total of 72 students were sampled in this study. The research instrument was a test of cognitive, affective, and psychomotor learning outcomes. Analysis of learning outcomes data using normality test, homogeneity test and independent sample t-test test. The results of the calculation using the independent sample t-test test obtained a significance value (2-tailed) of $0.033 < 0.050$, so the null hypothesis (H_0) is rejected. It can be concluded that the use of teaching materials containing Indigenous Knowledge is better and proven to have an effect on the learning outcomes of Biology class X students of SMA Negeri 1 Teras in the 2023/2024 school year on environmental change material.

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1. INTRODUCTION

Studying biology means studying the natural environment, biology is related to the discovery and understanding of nature systematically, and biology is not only a process of searching and collecting knowledge in the form of facts and concepts, but also a process of discovery (Harefa, Lase & Zega, 2022). Biological science is based on actual experience (empirical), and is characterized as a science that includes problem-solving techniques of interest to biology, the object of research in biology is a concrete object, can be captured by the five senses, based on real experience, and has systematic steps (Ikhtiar, et al, 2022). The culmination in the learning process is the acquisition of learning outcomes.

Learning outcomes in the world of education are the results of student measurements after going through a learning process (Khairani, 2019). There are three areas of learning outcomes, namely cognitive, affective and psychomotor. The cognitive domain includes changes that occur in cognition as a result of learning activities, starting from stimulation, receiving material, to storing material in the brain. The affective domain is the value associated with student behavior. After students master the basic learning level, the psychomotor domain learning outcomes are ranked from lowest to highest (Nabillah & Abadi, 2019). Therefore, educators should pay attention to biology learning activities by including them in teaching materials.

Teaching materials are arranged to build a learning environment for students, teachers and students should organize and use materials systematically in learning, teachers should use materials to support the learning process, materials should be designed in accordance with classroom regulations (Nuryasana & Desiningrum, 2020). Teaching materials are systematically

organized and designed in accordance with the curriculum for the purpose of student self-study, the role of the teacher in designing or assembling materials greatly determines the success of learning with materials and the learning process (Magdalena et al., 2020). The material consists of three core components, namely the main component, supplementary component, and learning outcomes assessment component. The main part contains the main information or topic that students want to convey or need to master. This complementary component can be in the form of information/topics to add insight to students, and an evaluation component to evaluate the results of the material that has been created (Manurung, Haloho & Napitu, 2023). Teachers and students must be active in carrying out learning, and teachers must be able to lead the class well and apply learning strategies that are aligned with learning objectives, on the other hand students are given the task of processing results and seeking information to communicate results, in the form of ideas, after making observations, problems in teacher performance in carrying out learning are identified, students are given the opportunity by the teacher to identify problems by asking questions (Hariyatmi., Septiety, D. D., Wijayanti, R., 2020). Teachers must provide alternative learning methods that are suitable for overcoming these difficulties, one of which is by applying a problem-solving learning model.

The problem solving model is a teaching method in which students are presented with a problem and asked to solve it, this model requires the ability to identify cause and effect, observe problems, look for relationships between various data collected, and draw conclusions from the results of problem solving, problem-based learning methods are chosen and used as a solution to improve students' skills and activities in learning biology related to environmental change material. (Musyafa, 2022). The problem-solving model is not just a teaching method, but also a way of thinking. Because other methods can also be used when solving problems, from finding data to drawing conclusions (Handayani, 2019). The solution that researchers found was to apply the problem-solving learning model to biology topics.

Environmental change materials included in the education module include environmental damage and pollution. The learning activities include: 1) Identification of factors causing environmental damage and analysis of the impact of environmental changes, 2) Identify various types of pollution that occur in the environment and analyze solutions that can be given to deal with environmental changes. Environmental change was chosen as the material for module development, because various human activities cause an imbalance in the ecosystem. Environmental problems are also an obstacle in learning the culture of protecting the environment, but the number of environmental change modules is still very small (Muttaqin, Fatirul, & Hartono, 2019). One curriculum approach that is gaining traction is incorporating indigenous knowledge into learning.

Indigenous Knowledge is knowledge based on the recognition of community beliefs, understandings, and customs that guide actions related to ecological and systemic environments (Muchsin, Sriyati, & Sabayar, 2023). Indigenous knowledge raises questions about the suitability and relevance of curriculum materials in a global and contemporary context (Jessen et al., 2022), one of the teaching materials by adding local wisdom to learning, students will be able to research and scientifically investigate existing local wisdom, so that it will increase their awareness of environmental protection and conservation along with the science learning materials they receive (Maharia, Yorida, & Malpaun, 2018). Indigenous scientific knowledge in the form of local wisdom needs to be studied and socialized, one way to apply local wisdom is in school learning, local wisdom can be used as a learning resource for teachers and students, and local traditions can be used as a local wisdom-based learning resource (Rikizaputra et al., 2022).

Integration of Indigenous Knowledge in biology learning allows students to explore and train their thinking skills and get used to doing problem solving activities based on local wisdom, learning biology with local wisdom-based problem solving activities activates student knowledge, analyzing problems that occur in the surrounding area, including local wisdom, as a learning experience. Thus, critical and creative thinking skills can be introduced through biology learning

with local wisdom-based problem solving activities (Alimah, 2019). Selection of teaching materials based on Indigenous Knowledge, students can respond to a variety of local wisdom, this makes students more critical and easy to apply what they have learned to their environment, teaching materials that involve learning are adapted to the environmental conditions of students, making learning more meaningful and supporting students (Masihu, 2021).

2. MATERIALS AND METHODS

2.1. Type of research

This type of research is quantitative with a pseudo-experimental research design (Quasi Experiment Design), the form of Quasi Experiment Design this research uses Nonequivalent Control Group Design. This research was conducted in two classes, namely class X J (control) and class X D (experimental). In this study, an initial test (pretest) was conducted before treatment and a final test (posttest) was conducted after treatment. In this study, there are two research variables, namely the independent variable and the dependent variable, the independent variable in the study is learning to implement teaching materials that contain indigeous knowledge. The dependent variable is student learning outcomes after learning to use teaching materials containing indigeous knowledge.

Table 1. Nonequivalent control group design

Class	Pretest	Treatment	Posttest
Experiment (X D)	P1	X	P2
Control (X J)	P3	-	P4

Note :

P1 : Pretest in the experimental group that has not been given treatment

X : Learning by using environmental change teaching materials that contain indigenous knowledge

P2 : Posttest in the experimental group that has not been given treatment

P3 : Posttest in the control group that has been given treatment

P4 : Posttest in the control group that has been given treatment.

2.2. Population, Sample and Sampling

All students of class X SMA Negeri 1 Teras even semester of the 2023/2024 school year consisting of 10 classes became the population in this study, each class consisting of 36 students. The sample consists of experimental class students (X D) and control class (X J). The sampling used was purposive sampling technique.

Table 2. Data

Data	Data Sources	Data Retrieval Technique	Instrument
Cognitive learning outcomes	Class student X	Pretest and posttest	Multiple choice question sheet
Affective learning outcomes	Class student X	Attitude observation	Attitude assessment sheet
Psychomotor learning outcomes	Class student X	Presentation Discussion result	Presentation assessment sheet discussion result

2.3. Research Procedure

The research began with determining the research site, namely SMA Negeri 1 Teras, then determining the class using the population purposive sampling technique, namely the sample of class X.D as an experimental class using teaching materials containing indigenous knowledge, and class X.J as a control class.

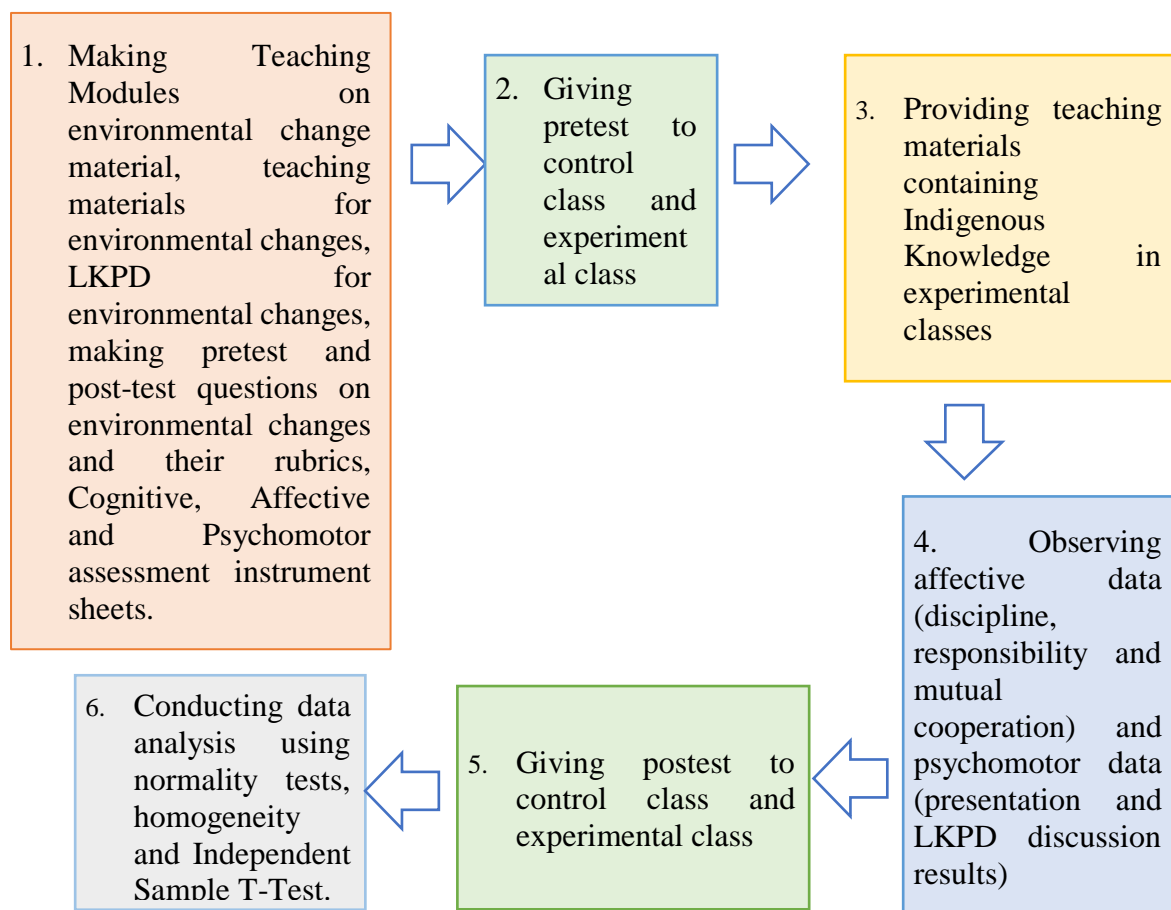


Figure 1. Research Procedure

Make an agreement with the teacher regarding the material that will be delivered in class X.D and X.J, namely environmental change material. After that, make learning tools that will be used, including Teaching Modules on environmental change materials, teaching materials for environmental changes, LKPD for environmental changes, making pretest and post-test questions on environmental changes and their rubrics, cognitive assessment instrument sheets (pretest-postest), Affective (attitude), Psychomotor (skills). The implementation of learning begins with conducting learning activities at school in accordance with the Teaching Module and its devices that have been made, providing teaching materials containing Indigenous Knowledge in the experimental class, then taking cognitive data with a pretest in the form of a test Affective data (discipline, responsibility and mutual cooperation) is taken by observing students during learning, psychomotor data (presentation and LKPD discussion results) is taken when presenting the results of the discussion. Cognitive, affective, and psychomotor data were tabulated for further analysis using the independent sample t test. Furthermore, completing learning activities and collecting data obtained. Data obtained from SMA Negeri 1 Teras were analyzed using SPSS 25. Before analyzing the data, prerequisite tests were conducted. The test carried out as a prerequisite is the normality and homogeneity test, if the data obtained is normal and homogeneous, then the next step is the independent samples t-test.

3. RESULTS AND DISCUSSION

3.1. Result

The purpose of this study was to determine the biology learning outcomes of SMA Negeri 1 Teras class X students using teaching materials containing indigenous knowledge in the 2023/2024 school year on environmental change material. This study involved an experimental class using teaching materials containing indigenous knowledge and a control class without using teaching materials containing indigenous knowledge at SMA Negeri 1 Teras.

Table 2. Data on the Implementation of Indigenous Knowledge Teaching Materials in Biology Learning Quasi-Experimental Study on Environmental Change Material

Data	EKSPERIMENT		CONTROL	
	PRETEST	POSTEST	PRETEST	POSTEST
COGNITIVE				
Maximum	90	90	90	90
Minimum	40	40	40	40
Mean±sd	63,89±13,58	71,11±12,82	64,72±14,24	65±14,04
AFFECTIVE				
Discipline		91		86
Responsibility		93		84
Mutual cooperation		88		82
Mean		90,6		84
PSYCHOMOTOR				
Presentation		81		72
Discussion results (LKPD)		99		90
Mean		90		81

Based on Table 2, the experimental class knowledge value is 71.11, while the control class is 65, meaning that the experimental class value is higher than the control class. The value of student activeness during the learning process in the experimental class was 100, while the control class was 90, meaning that the value of the experimental class was higher than the control class, the value of student learning process skills in the experimental class was 90, in the control class was 81, this shows that the learning outcomes of the experimental class were higher than the control class.

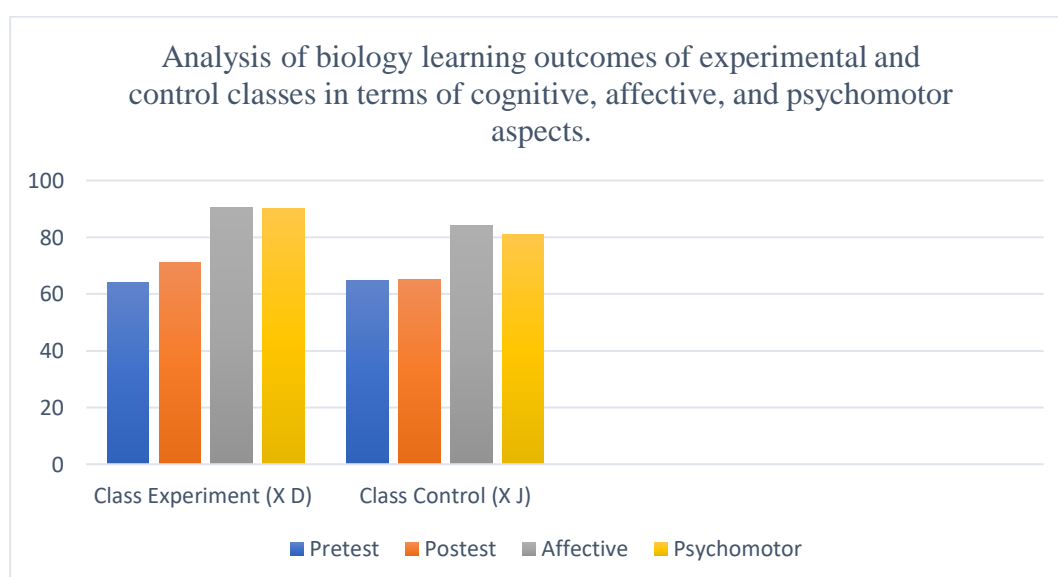


Figure 2. Analysis of biology learning outcomes

3.1.1. Normality Test

In this study, normality was tested using the Kolmogorov-Smirnov test. This test determines whether the data obtained is normally distributed or not. The calculation results are:

Table 3. Normality Test of the Implementation of Indigenous Knowledge Teaching Materials in Biology Learning Quasi-Experimental Study on Environmental Change Material

Treatment	Significance	Description
Pretest Exsperiment	0,051	Normal data
Postest Experiment	0,052	Normal data
Pretest Control	0,055	Normal data
Postest Control	0,076	Normal data

Based on table 3. on the Kolmogorof-Smirnov test, the Experiment class pretest data shows a significance value of $0.051 > 0.050$, meaning that the data is normal, for data on the Experiment Postest shows a significance value of $0.052 > 0.050$, meaning that the data is normal, while in the control class pretest with a significance value of $0.055 > 0.050$, meaning that the data is normal, and for the control class postest shows a significance value of $0.076 > 0.05$, meaning that the data is normal. It can be concluded that both classes have normally distributed data and the data is greater than the significance determination (0.050).

3.1.2. Homogeneity Test

This test is used to determine whether two populations have the same variation, the calculation results are as follows :

Table 4. Homogeneity Test of Implementation of Indigenous Knowledge Teaching Materials in Biology Learning Quasi-Experimental Study on Environmental Change Material

Homogeneity Test	Levene Statistic	df1	df2	Sign	Description
Biology Learning Outcomes	0,179	1	70	0,674	Homogeneous data

Based on table 4. the homogeneity test of the experimental and control classes shows a significance value of $0.674 > 0.050$, meaning that the population varies equally or homogeneously. It can be concluded that the population has the same or homogeneous variants that are normally distributed and the data is greater than the significance setting (0.050).

3.1.3. Independent Sample T Test

This test is used to test hypotheses about two or more populations. In this case, each sample group is independent. That is, the two populations are not related to each other. the following calculation results:

Table 5. Independent Sample T Test Implementation of Indigenous Knowledge Teaching Materials in Biology Learning Quasi-Experimental Study on Environmental Change Material

Class	Number of students	Mean	Sig. (2 tailed)	t- count	Description
Control	36	63.47	0,033	-2,173	H0 rejected
Eksperiment	36	68,19	0,033	- 2,173	H0 rejected

Based on Table 5, the t-test of biology learning data in the control and experimental classes amounted to 36 students each. The average value of control class students is 63.47, while the experimental class is 68.19, it can be concluded that there is a difference in the average learning outcomes of biology students in the control class and experimental class. The 2 tailed significance value in the T Test table is $0.033 < 0.50$, it is concluded that H_0 is rejected, meaning that there is a significant difference between the learning outcomes of experimental class students who are given teaching materials containing indigenous knowledge and control classes without teaching materials containing indigenous knowledge. To find out whether the two populations have the same variation, here are the calculation results :

3.2. Discussion

Teaching materials are learning resources that are systematically arranged and prepared in accordance with the curriculum so that students can learn independently, it can be understood that the role of the teacher in designing teaching materials greatly determines the success of the teaching and learning process by using these teaching materials (Magdalena et al., 2020), and this is supported by research (Kusuma, Faizah, Nur, Elmustian & Hermandra, 2023), educational materials are included in an important part of the learning process, one of which is the part of educational material that contains learning messages both specific and general that can be used for learning purposes. According to research (Yurinda, Ulia & Yustiana, 2021), teaching materials for teachers play an important role in conveying knowledge, and teachers can help students think more actively and expand their knowledge. Teaching materials in the form of companion books should provide a very diverse learning resource for teachers and students.

According to Pesurnay (2018), local wisdom is a form of knowledge based on community beliefs and perceptions about customs that are used as guidelines for behavior related to ecological and systemic environments. This is in accordance with Listia's (2020) field study, that wisdom can be in the form of beliefs in a community about something that can be learned by the younger generation, customs that can be used as a guide for behavior related to the ecological and systemic environment celebrated, and moral values, if related to moral values, lessons can be learned from legends and myths in the community.

Teaching materials that contain indigenous knowledge, namely cultural values that live and develop in society, students can easily solve the problems presented, this is in line with Riza's research (2022) which says that indigenous knowledge-based learning materials contain topics based on the curriculum that incorporate values developed in society, indigenous knowledge-based teaching materials contain information and content that students can learn, and contain noble values that allow students to internalize good values, the availability of indigenous knowledge-based learning materials causes learning and learning outcomes to be more effective, This is in accordance with the research of Tanjung, Daulay, and Ghafari (2018), stated that students who study descriptive text about Labuhan Batu which is the local wisdom of the West Bira region of North Sumatra have higher learning outcomes, students can achieve higher learning outcomes than students who use ordinary textbooks, students also understand the true meaning of learning because it is familiar to them in everyday life.

The environmental change material included in the Class X SMA education module includes environmental damage and pollution material, the learning activities carried out include: 1) Identify the factors that cause environmental damage and analyze the impact of environmental changes, 2) Identifying various types of pollution that occur in the environment and analyzing solutions that can be provided to deal with environmental changes, by integrating teaching materials that contain local wisdom into Javanese traditions, namely the Ruwat Bumi tradition in Guci Village, the Ruwat Jolotundro tradition in Mojokerto, and the Merti tradition in Kemetul Village, Semarang, these traditions are developed through respect for nature's role in protecting. This tradition contributes to maintaining the balance of ecosystems and natural beauty which is an

inseparable part of identity, through environmental preservation and recognition of human relationships with the environment (Aminuddin, 2023).

Learning in experimental classes based on indigenous knowledge developed in this study improves student learning outcomes based on the results of the t test, that there is a significant difference between the learning outcomes of experimental classes given teaching materials containing indigenous knowledge and control classes without teaching materials containing indigenous knowledge, and these learning outcomes are proven to be very effective in improving student learning outcomes, this is in line with Azizah's research (2022) that indigenous knowledge-based teaching materials to improve student learning outcomes are very suitable to be used as a basis for education because they are able to foster caring and responsible personalities. This also helps in student character education and is very effective in improving student learning outcomes.

4. CONCLUSIONS

The results showed that there were differences in student learning outcomes in Biology subjects with the use of teaching materials containing indigenous knowledge and control learning without using teaching materials containing indigenous knowledge, meaning that the use of indigenous knowledge-based teaching materials proved to be better and effective on biology learning outcomes in the material of environmental changes in class X SMA Negeri 1 Teras in the 2023/2024 school year, the use of indigenous knowledge-based teaching materials is superior.

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