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THE EFFECT OF THE INTEGRATED ETHNOSCIENCE *INQUIRY* LEARNING MODEL ON ENVIRONMENTAL LITERACY IN THE MATERIAL OF BIODIVERSITY.

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ABSTRACT

Environmental literacy is the ability of students to understand the environment and make appropriate decisions in maintaining environmental sustainability. This study aims to determine the effect of the ethnoscience integrated inquiry learning model on students' environmental literacy on biodiversity material at SMAN 7 Pekanbaru. The subjects of this study were grade X students of SMAN 7 Pekanbaru. Sampling was carried out using a purposive sampling technique, involving class X.3 as the control class and class X.5 as the experimental class, each consisting of 30 students. The instrument used in this study was a test instrument in the form of pretest and posttest questions to measure students' environmental literacy. Data were analyzed using prerequisite tests, namely normality and homogeneity tests, then hypothesis testing was carried out using t-tests and analysis of learning outcome improvements using N-Gain. Based on the results of the t-test of N-Gain data in the control and experimental classes, the results showed a Sig. (2-tailed) value of 0.000 <0.05 so that it can be concluded that there is a significant difference between the control and experimental classes. Based on the results of the study, it can be concluded that the ethnoscience integrated inquiry learning model has a significant effect on students' environmental literacy in the biodiversity material at SMAN 7 Pekanbaru.

Keywords: Inquary; Ethnoscience; Environmental Literacy; Biodiversity

1. INTRODUCTION

Education has the task of preparing human resources to build broader knowledge. The better a country's education system, the higher the quality of its human resources. In line with the crucial role of education in developing students' diverse potential, efforts are needed to achieve quality education so that the learning process can run effectively and national education goals can be optimally achieved. Achieving advanced and developing education requires a focused and systematic learning process. This learning model is used at every level of education, from elementary school to junior high school and high school. Using learning models in the learning process can assist teachers and students in carrying out the learning process.

The learning model and process used must be able to create effective interactions between teachers and students in teaching and learning activities. Learning is a two-way interaction between teachers and students in studying a field of science. Learning is an activity carried out by teachers as educators and students as learners (Isjoni, 2007). Susanto (2013) also explains that learning, or in English also pronounced as learning, is a word derived from *to learn* or study. This

word is a combination of two learning activities, this word is a combination of two learning activities, this word is a combination of two learning activities.

Learning between teachers and students must have clear goals and directions. According to Setiawan (2017), directed goals include effective, measurable, and process-based learning, resulting in ideal learning outcomes. One type of learning undertaken by teachers and students in schools is biology. Science education, particularly biology, is expected to improve metacognitive skills, scientific work and attitudes, and communication skills, all of which are important aspects of competence. The primary expectation in science learning, particularly biology, is for students to be more active in constructing their own knowledge and to be able to use their reasoning to understand and solve problems (Ministry of Education and Culture, 2013). The application of a good learning model can help and influence students' understanding of the lesson well (Slameto, 2010). One learning model that can help students understand the lesson well is the *inquiry learning model. The inquiry* learning model is a learning model that focuses on students discovering the problems presented by the teacher themselves. The *inquiry* learning model It is considered to remain applicable in Indonesian education because the *inquiry* learning model aligns with the development of Indonesian curricula, namely the School- Level Curriculum (KTSP), the 2013 Curriculum, and the Merdeka Curriculum. This aligns with educational goals, which emphasize not only knowledge acquisition but also the development of critical thinking skills and awareness of real-world issues, one of which is through strengthening environmental literacy.

Environmental literacy is an individual's ability to understand environmental systems and problems, be critical of ecological issues, and have the awareness and responsibility to act sustainably in life.

everyday life. Environmental literacy refers to knowledge of environmental issues and the ability to take environmentally responsible action (Chen *et al.,* 2018). Environmental literacy is an individual's ability to recognize and understand the situation of their surroundings. With this understanding, they are expected to be able to take appropriate action regarding environmental problems. Environmental literacy is important because it is one element of society that can address environmental problems Herlina,*et al.* 2021). Environmental literacy is important because it can provide individuals with the knowledge, skills, and awareness to understand and address environmental issues and foster a sense of responsibility for their surroundings. In line with modern life, humans are faced with complex environmental challenges such as climate change, pollution, the biodiversity crisis, and increasing waste and plastic waste. Environmental literacy is essential for understanding the cause-and-effect relationships of these issues and their impact on life.

Furthermore, environmental literacy encourages environmentally friendly behaviors, such as conserving energy, reducing plastic use, recycling waste, and supporting the consumption of sustainable products. Environmental literacy is also a crucial foundation for education for sustainable development , fostering critical, ethical, and informed decision-making about the environment. Furthermore, environmentally literate communities are more

aware of government policies and are able to actively participate in community environmental initiatives.

Environmental literacy not only equips individuals to act wisely towards the current environment, but also helps preserve the earth for future generations. In general, many schools implement environmental literacy to students so that students have awareness and responsibility to maintain the school environment. The application of environmental literacy is also reflected in the implementation of activities at SMAN 7 Pekanbaru which has become an Adiwiyata school that shows the awareness and responsibility of students at SMAN 7 Pekanbaru towards the environment around the school by disposing of trash in the proper place, maintaining classroom cleanliness and maintaining the cleanliness of the school environment. Awareness and responsibility for the cleanliness of the school environment begins with environmental literacy, with encouragement from supporting subjects about the environment. Efforts to support the achievement of environmental literacy, a learning model

is needed that can activate the role of students directly in the learning process.

One learning model that aligns with these characteristics is the *inquiry learning model.* The *inquiry* learning

model is a *"student-centered"* learning model , meaning the learning process is centered on the students.

This *inquiry-based* learning model involves students in their own discovery and assimilation of concepts and principles of the material. The teacher's *inquiry-based learning* model provides students with the opportunity to

become *scientists* , enabling them to master the discovery process and gain new, beneficial knowledge. can be

used as an alternative to improve learning outcomes and students' learning abilities. *Inquiry* learning is a

learning activity

where students are encouraged to learn through their active involvement with learning concepts and principles, and teachers encourage students to have experiences and conduct experiments that allow students to discover principles for themselves. This is in accordance with Sanjaya's (2006) opinion that the *inquiry* learning model

which focuses on the process of critical and analytical thinking to find one's own answer to a questioned problem. This is in line with research conducted by Agus Pujianto and Darsono (2014) which states that the goal of *inquiry* learning is to develop the ability to think systematically, logically, and critically, or to develop intellectual abilities as part of the mental process.

Inquiry -based learning is learning that involves students in formulating questions aimed at conducting investigations in an effort to build new knowledge and meaning (Sani,

2014). The *inquiry* learning model

focuses on the inquiry process based on efforts to answer questions. *Inquiry*

is an investigation of an idea, question, or problem. The investigation can take the form

of laboratory activities or other activities used to gather information. The process involves gathering information, building knowledge, and developing a deep understanding of the subject being investigated. This demonstrates the application of the *inquiry* learning model.

has strong relevance to efforts to develop local scientific knowledge.

With the development of education in Indonesia, there is a relationship that we can examine more deeply between the *inquiry* learning model and local scientific knowledge, one of which is ethnoscience. The combination of ethnoscience in the *inquiry* learning process can be applied to determine and study the influence of *the inquiry* learning

model with ethnoscience integration. Although they have different contexts and definitions, both share fundamental similarities. Through the concept of ethnoscience, knowledge cannot be separated from local culture and traditions (Garcia *et* al., 2020).

Humans are bound by culture and nature from birth, even before they experience formal education. Ethnoscience rooted in their lives is a form of contextual experience (Parmin & Fibriana,

2019). Ethnoscience balances the knowledge gained in formal classroom learning with learning in their socio-cultural lives (Arfianawati *et* al., 2016). The implementation of the ethnoscience-integrated *inquiry* learning model aims to improve the critical thinking skills of prospective teacher students. The application of the *inquiry* learning model is related to local community culture and science, although not many schools have implemented

the ethnoscience-integrated *inquiry* learning model in the learning process simultaneously.

2. METHODOLOGY

This research is a type of quantitative research with an experimental approach of the *Quasi Experimental Design* type with a *Nonequivalent Control Group design* (Sugiyono, 2015). According to Sugiyono (2009), Population is a generalization area consisting of objects with certain characteristics and qualities that researchers study and draw conclusions from. The population in this study were grade X high school students with a total of 9 classes and each class consisting of 39 students. According to Sugiyono (2019) *Purposive sampling* is a sampling determination technique with certain considerations. This means that the sample was chosen by the researcher because there were considerations from biology teachers towards students and the class was chosen because it was in accordance with the characteristics of students who were considered The data analysis techniques in this study are:

1) Test

Tests are questions that must be completed by students (Sugiyono, 2009).

The aim was to determine the students' aptitude levels. This study used a written test with descriptive questions as a pretest and posttest.

2) Questionnaire

A questionnaire is a data collection technique carried out by giving respondents a set of written questions or statements to answer (Sugiyono, 2013).

a). Validity Test

Validity tests are conducted to determine the level of validity of an instrument.

The validity measured in this study is an instrument in the form of a test/question using *the product moment*

correlation formula as follows:

$$rxy = \frac{N \sum XY - ((\sum X)(\sum Y))}{\sqrt{(N\sum X^2 - (\sum X^2)(N\sum Y^2 - (\sum Y^2))}}$$

Information :

(ÿY2)

xy : correlation coefficient between X and Y

n : number of students

ÿX : total score of test items ÿY : total score

ÿXY : sum of multiplication of X by Y

b). Reliability Test

Reliability testing is conducted to measure whether the instrument used is suitable for use (Payadnya

& Jayantika, 2018). An instrument is considered reliable if it can produce the same data when used multiple times to measure the same object.

$$r_{11} = \frac{(n)}{(n-1)} + \frac{(St^2 - \sum P_i q_1)}{(St^2)}$$

Information :

r11 : coefficient

n : number of questions

St2 : v arian total score

Pi : proportion of subjects who answered correctly

i

q : proportion of subjects who answered incorrectly

c). Normality Test

A normality test is needed to determine the distribution of data. One method used to test data normality is the *Shapiro-Wilk method.*

d). Homogeneity Test

A homogeneity test was conducted to determine whether the data from the samples taken were similar or not (Arikunto, 2010). This study used the Levene test with the help of SPSS.

e). Hypothesis Testing

The hypothesis is formulated after the data is known to be normal, requiring a normality test. This study used the Independent Sample T-Test technique with the help of SPSS.

f). *N-Gain* Test

The N-gain test is obtained from pretest and posttest scores to compare changes in students before and after receiving learning intervention, which can be measured using *N-gain.*

$$\text{N-gain} = \frac{\text{skor } posttest - \text{skor } pretest}{}$$

skor maksimal−skor *pretest*

g). Analysis of Environmental Literacy Questionnaire

In this study, the criteria for recording research results are analogous to Muhidin's opinion *in* Firda

(2019). The results of this data are interpreted into four levels, namely:

a. Very high criteria obtained 3.25-4.00 b. The high criterion is 2.50-3.24

c. Medium criteria obtain 1.75-2.49 d. Low criteria obtain 1.00-1.74

3. RESULTS AND DISCUSSION

Questionnaire Data Analysis

Data on the environmental literacy of students in the experimental class can be seen in the following table.

Table 1. Questionnaire on attitudes of control and experimental classes, environmental sensitivity sub-indicators

Kelas	N	Skor	%
Kontrol	30	3.48	87.00
Eksperimen	30	3.52	87.19

The results of the attitude questionnaire on the environmental sensitivity sub-indicator in the control class were 3.48 with a score

of 87.00% and the experimental class 3.52 with a score of 87.19%, falling into the very high category with a total of 30 students.

Table 2. Attitude questionnaire for control and experimental classes, verbal commitment sub-indicator

Kelas	N	Skor	%
Kontrol	30	3.30	82.08
Eksperimen	30	3.29	82.24

The results of the attitude questionnaire on the verbal commitment sub-indicator in the control class were 3.30 with a score of

82.08% and the experimental class 3.29 with a score of 82.24%, which is in the very high category with a total of 30 students.

Pretest dan *Posttest*

Based on the research data that was conducted in November 2022 in class X.7 as the experimental class and X.8 as the control class, a recapitulation of *pretest* and *posttest* data was obtained in the following table 3:

Table 3. Descriptive Statistics of *Pretest* and *Posttest* Scores

Nilai Kelas		N	Hasil Belajar			Rerata
			Nilai ideal	Nilai Minimum	Nilai Maksimum	
Pretest	Kontrol	30	100	13.33	90.00	30.87
	Eksperimen	30	100	10.00	93.35	47.88
Posttest	Kontrol	30	100	56.66	83.34	71.67
	Eksperimen	30	100	60.00	100	80.33

Based on Table 3, it can be seen that the number of samples in the control class was 30.

The control class and the experimental class each had 30 students. The minimum *pretest* score in the control class was 13.33 in the experimental class 10.00. The minimum *posttest* score in the control class was 56.66 while in the experimental class it was 60.00. The maximum *pretest* score for the control class was 90.00, the experimental class was 93.35. The maximum *posttest* score for the control class was 83.34 and

experimental class is 100. *The pretest* average in the control class is

30.87, while the experimental class's score was 47.88. The control class's *posttest* average was 71.67, while the experimental class's score was 80.33. The ideal *pretest* and *posttest* scale or value is 100.

The *pretest* and *posttest* data obtained in the control class and the experimental class were then analyzed using *the Shapiro Wilk* normality test and *Levene* homogeneity test as a prerequisite for determining whether the comparative hypothesis test *is parametric* or non-*parametric.* If the data is normally distributed, the t-test is continued . If the data is not normally distributed, the test is carried out using the *U-Mann Whitney test.* The results of *the pretest* and *posttest* data normality test in the control class and the experimental class

can be seen in Table 4 below:

Table 4. Results of *Pretest* and *Posttest* Normality Tests

Jenis Data	Kelas		Hasil Uji Normalitas		
	Asymp. Sig (2-tailed)		*α*	Keputusan	Keterangan
Pretest	Kontrol	0.87	0.05	Terima H_0	Normal
	Eksperimen	0.14	0.05	Terima H_0	Normal

Posttest	Kontrol	0.94	0.05	Terima H_0	Normal
	Eksperimen	0.151	0.05	Terima H_0	Normal

Table 4 shows the results of the normality test of *the pretest* and *posttest* data in the control class and the experimental class. *The Asymp. Sig. (2-tailed)* value in *the pretest* data *output* of the control class is 0.87 > 0.05, so H0 is accepted , this means the data comes from a normally distributed population. *The Asymp. Sig. (2-tailed)* value in *the pretest* data *output* of the experimental class is 0.14 > 0.05, so H0 is accepted , this means the data comes from a normally distributed population.

The Asymp Sig. (2-tailed) value for *the post-test* data *output* of the control class is 0.94 > 0.05, so H0 is accepted. This means the data comes from a normally distributed population. *The Asymp Sig. (2-tailed)* value *tailed)* on *the post-test* data *output* of the experimental class is 0.151 > 0.05, then accept H0, this means that the data comes from a population with a normal distribution he results of the data analysis for the homogeneity of the *Pretest* and *Posttest* data can be seen in Table 5 below.

This:

Tabel 5. Hasil Uji Homogenitas *Pretest* dan *Posttest*

Jenis data	*Sig.(2-tailed)*	*α*	Keputusan	Keterangan
Pretest	0.43	0.05	Terima H_0	Homogen
Posttest	0.72	0.05	Terima H_0	Homogen

Based on Table 5, the results of the homogeneity test can be seen, the value *based on the trimmed mean* in *the pretest* is 0.43 > 0.05 with a significance level ( ) of 0.05, the decision obtained is to accept H0.

This means that the *pretest* data comes from a homogeneous variant. Meanwhile, *the posttest* is 0.72 > 0.05 with a

significance level ( ) of 0.05, the decision obtained is to accept H0. This means that *the posttest* data comes from a homogeneous variant.

Based on the results of *the pretest* and *posttest* data analysis, it was found that the data were normally distributed and homogeneous, so the decision was made to conduct a t-test. The results of the t-test on *the pretest* and *posttest* data

can be seen in Table 6 below:

Table 6. T-Test Results of *Pretest and Posttest* Data

Jenis Data	*Sig.(2-tailed)*	*α*	Keputusan	Keterangan
Pretest	0.60	0.05	Terima H_0	Tidak berbeda signifikan
Posttest	0.000	0.05	Tolak H_0	Berbeda signifikan

Based on Table 6 above, the results of the pretest t-test obtained a value of 0.60 > 0.05, so H0 is accepted, which means there is no significant difference in the pretest value between the control class and the experimental class. Meanwhile, the results of the posttest data t-test obtained a value of 0.000 < 0.05, so H0 is rejected, which means there is a significant difference in the posttest data between the control and experimental classes.

N-Gain Data Analysis

Based on research conducted in November 2022 in class X.8 as the control class and X.7 as the experimental class, a recapitulation of N-Gain data was obtained in the following table 7:

Table 7. Descriptive Statistics of *N-Gain* Data in the Control and Experimental Classes

No	Kelas	N	N-*Gain*			Rerata	Kategori
			Nilai Ideal	Skor Minimum	Skor Maximum		
1	Kontrol	36	1.00	0.33	0.76	0.56	Sedang
2	Eksperiman	36	1.00	0.49	0.95	0.77	Tinggi

In Table 7, the average *N-Gain* value for the control class is 0.56 in the medium category, while the average *N-Gain* value for the experimental class is 0.77 in the high category.

Tabel 8. Hasil uji–t pada data *N-Gain*

Jenis data	*Sig.(2-tailed)*	*α*	Keputusan	Keterangan
N-Gain	0.000	0.05	Tolak H_0	Terdapat perbedaan signifikan

based on the t-test table 8, the *Sig. Value (2-tailed) Equal variances not assumed* on *the output of the Independent sample test* value is 0.000 < 0.05, so H0 is rejected , which means there is a difference between *the N-gain* of the control class and the experimental class.

Teacher and Student Activities

The following are the results of observations of the activities of students in the control class at meetings I and II. meeting II as shown in Table 9 below:

Tabel 9. Rekapitulasi Aktivitas Guru Kelas Eksperimen dan Kelas Kontrol

Kelas	Pertemuan I (%)	Pertemuan II (%)	Rerata Persentase%
Kontrol	100	100	100
Eksperimen	100	100	100

Based on Table 9, it is known that the activity of the experimental class teacher at meeting I had an average percentage of 100% and at meeting II increased by 100% with an average percentage of

100%. Student activities in the control and experimental classes can be seen in Table 10 below:

Tabel 10. Rekapitulasi Aktivitas Siswa Kelas Kontrol

Pertemuan	Aktivitas %				Rerata Persentase (%)
	1	2	3	4	
I	100	100	100	13.33	78.33
II	100	100	100	16.66	79.16

Based on Table 10, it can be seen that the average percentage of student activity in the control class at meeting

I was 78.33%. Meanwhile, at meeting II, the average percentage was 79.16%. This is different from the activities of students in the experimental class which can be seen in Table 11.

following:

Tabel 11. Rekapitulasi Aktivitas Siswa Kelas Eksperimen

Pertemuan	Aktivitas %				Rerata Persentase (%)
	1	2	3	4	
I	100	100	100	26.66	81.66
II	100	100	100	100	100

Based on the results of observations in Table 11, it can be seen that the average percentage of meetings I

The experimental class's score was 81.66%. Meanwhile, in the second meeting, it increased to 100%.

4. CONCLUSION

Based on the results of research and data analysis conducted at SMA Negeri 7 Pekanbaru, it can be concluded that the ethnoscience-integrated *inquiry* learning model is effective in the learning process, because it has an influence that can improve student learning outcomes. This can be seen from the results of the statistical tests obtained. Based on the statistical test on the *N-Gain* value , it is known that the ethnoscience-integrated *inquiry* learning model has an influence that can improve student learning outcomes.

Based on questionnaire data, the ethnoscience-integrated inquiry learning model significantly influenced environmental literacy in the knowledge and attitude categories of students. Furthermore, a t-test showed that classes implementing the *inquiry* learning model Integrated ethnoscience classes obtained higher average learning outcomes than classes that implemented conventional learning models with lecture methods.

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