

# **The Implementation of Teaching Materials Based on Local Agricultural Wisdom in Binjai to Improve Student Environmental Literacy**

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## **Abstract**

Learning materials based on local wisdom are needed to make it easier for students to understand the material because it is close to the student environment. The study aims to measure the effectiveness of teaching materials based on local wisdom of agriculture in Binjai in improving the students' environmental literacy. The type of research was a quasi-experimental which use a nonequivalent control group in the pretest-posttest design. The sample of study were students of Senior High School grade X consisted of 36 students in the experiment group which used teaching materials based on local wisdom of agriculture in Binjai and 36 students in the control group used student handbooks. Material experts and technology experts to ensure the quality of teaching materials test teaching materials. Data collection was conducted through a test. The results showed that the teaching materials based on local wisdom of agriculture in Binjai effective in improving environmental literacy in the experimental group students based on the results of N gain value were 0.72 which has high criteria. It means teaching materials based on agricultural local wisdom of agriculture in Binjai can be used as one of the teaching materials in learning activities.

**Keywords:** local wisdom, teaching materials, effectiveness, environmental literacy

## **1. INTRODUCTION**

Education is one of the agents of information and environmental values transfer, so education should be able to take a role in overcoming environmental problems. To realize this goal, UNESCO in 1997 released environmental education, which aims to develop the students' awareness and concern for environmental problems. This environmental awareness is in line with environmental literacy, which is used as a skill framework that must be possessed in the 21st century (Mutiani, 2017).

Environmental literacy consists of several aspects including ecological knowledge, cognitive skills, caring attitude towards the environment and responsible behavior towards the environment. These aspects need to be owned by students to overcome environmental problems. Related to environmental literacy, environmental problems require real solutions to solve these problems. A learning approach is needed that is used to stimulate high-level thinking of students in situations that are oriented to real problems.

To realize learning in increasing awareness of the environment, learning should be sourced from the environment around students or in other words utilizing local wisdom based on the existing culture of the people. Raising local wisdom in learning will enhance students understanding of the material (Djulia, 2005), and can also help students maintain the environment or reduce the impact of

environmental damage (Parwati, Purnaweni, & Anggoro, 2012).

But, based on the results of the preliminary study conducted by researchers in one of the high schools in Binjai through interviews with one of the Biology Teachers, stated that learning in school uses teaching materials that are not contextual and not innovative. Also, teaching material uses examples that are far from the student environment and do not include local culture, causing students difficulties in understanding material concepts, especially ecosystem material and environmental change. This is very worrying because the students have no responsibility for the environment that is not where they live. That is, students' environmental literacy is not maximally fulfilled because students only have knowledge about the environment but cannot realize it into the environment. Because one of the purposes of environmental literacy is to make individuals develop new behavioral patterns towards the environment. In other hand, the research conducted by Sahin and Uzun (2017), states that the students' environmental literacy level is medium. Also, Erdogan (2009) found that the environmental literacy level of the 5th graders is also medium. Guler (2013) also reported that the environmental literacy level of the 8th graders is medium. The last, Kibert (2000) worked with university students and found that their environmental literacy level was low. The results of the studies that have been carried out reveal that the achievement of students' environmental literacy has not yet reached its maximum.

To achieve success in learning on ecosystem material and environmental change, a teaching material is needed that can facilitate students in receiving lessons, namely by applying teaching materials based on local wisdom that are oriented towards improving environmental literacy (Pratiwi & Pujiastuti, 2014). Teaching materials must be innovative and include local wisdom and local cultures so that it can provide students with real experiences to create contextual learning (Parmin & Peniati, 2012).

One region that is still closely related to its local culture is Binjai. The people in Binjai are the society that adheres to a hereditary tradition in maintaining local culture. The local culture of Binjai that is still maintained is in the process of managing agriculture. The management of agriculture with local wisdom aims to preserve the environment.

Agriculture in Binjai, not only processed by organically, but also has a variety of local wisdom, including *Turun tanam*, *Menukal*, *Pengeboman*, *Mengemping padi*, and *Tutup panen*. *Turun tanam* is the soil management technique begins with prayers by farmers, and then the soil is hoped and stepped on. *Menukal* is an agricultural management by utilizing the remains of straw, which are used as the main ingredient of insect repellents in the fields. This activity plays a major role in maintaining the balance of the ecosystem because it can minimize the use of chemical-based pesticides. In addition to the use of straw, *Pengeboman* is also one way to eradicate rats using sulfur that is burned and fired directly into the nest of a rat under the ground with bamboo. This activity can preserve the environment because the rat will die in the hole without polluting the environment. Postharvest, farmers have a tradition of threshing rice using legs which are carried out in a row at one of the residents' houses, this activity is called *Tutup panen*. Farmers also carry out traditional ceremonies such as Upah-upah by praying to God for blessings on their agricultural products. Also, there is also a tradition that is carried out once a year as a hereditary tradition that is welcomed enthusiastically by the Binjai people, *Mengemping padi*, is the tradition of processing rice which is pounded and shaped like a chip.

Agricultural management with local wisdom in Binjai is integrated into teaching materials on ecosystem material and environmental change. Thus, in addition to improving student environmental literacy, teaching materials based on local wisdom can also be used as an effort to instill student responsibility and concern for the environment. This study aims to determine the effectiveness of the application of teaching materials based on local wisdom in agriculture in Binjai in improving student environment literacy.

**2. METHOD**

This study used a quasi experiment using a non equivalent control group design.

**2.1 Population and Sample**

In the implementation of teaching materials implemented in class X students in one of the High Schools in Binjai.

Schools are chosen using the purposive sampling method, where schools are chosen based on certain considerations. School selection is done based on the location of the school, which is close to the agricultural area in Binjai. Next, two classes were selected using the simple random sampling method, which was used as an implementation of teaching materials based on local agricultural wisdom in Binjai as an experimental group, and a control group whose learning used Biology textbooks for class X for SMA /MA. Table 1 is an overview of the structure of the non-equivalent group control design.

Table 1. The Structure of the Non equivalent Control Group Design

Group	Pretest	Treatment	Posttest
Experiment	O <sub>1</sub>	X <sub>1</sub>	O <sub>2</sub>
Control	O <sub>1</sub>	X <sub>2</sub>	O <sub>2</sub>

**2.2 Instrument**

Students' environmental literacy ability is measured using a written test in the form of multiple choice practice questions. The questions made include the environmental literacy component, namely the ecological knowledge component, cognitive skills, caring attitude about the environment, and responsible behaviour towards the environment. These questions about the ability of environmental literacy are used in the implementation of the pretest and posttest for the experimental and control groups.

**2.3 Data Analysis**

Expert lecturers tested the teaching materials based on local wisdom of agriculture in Binjai for material validity and technology. Data collection in this study through observation, documentation and environmental literacy tests. In the data analysis technique researchers used the SPSS version 22 programs to conduct normality tests through the Shapiro Wilk test. Hypothesis testing uses Mann Whitney U. The decision making of hypothesis in this study are if the significance value is smaller than  $\alpha$  (0.05) then  $H_0$  is accepted, meaning that there are differences in student learning outcomes between the experimental group and the control group. Increasing environmental literacy is calculated using the Normalized Gain (N-Gain) statistical test based on the results of the pre-test and post-test with the provisions of the N-Gain criteria according to Hake (1999) as follows:

Table 2. Criteria Level N-Gain

<i>N-Gain</i> <i>Obtained</i>	<i>Value</i>	<i>Criteria</i>
$G > 0.7$		High
$0.3 < G \leq 0.7$		Medium
$G \leq 0.3$		Low

### 3. RESULTS

Based on the results of the validity test on teaching materials by material expert lecturers, the results obtained are shown in Table 3.

Table 3. Validation Results by Material Expert Lecturers

Aspects	Validation Result	
	Score	Criteria
Content Assessment	79.69%	Feasible
Presentation Assessment	77.27%	Feasible
Contextual Assessment	77.77%	Feasible
Average	78.18%	Feasible

Based on the results of the validation, the average score of teaching material assessment by material experts obtained 78.18% in feasible criteria, so this teaching material can be tested for research.

In addition to the feasibility of teaching materials tested by material experts, the technology expert lecturers shown in Table 4 also tested the teaching materials for feasibility.

Table 4. Validation Results by Technology Expert Lecturers

Aspects	Validation Result	
	Score	Criteria
Integrity Assessment	90.78%	Very feasible
Language assessment	93.75%	Very feasible
Average	92.26%	Very feasible

The results of the validation by the technologist lecturer indicate that the average score of the teaching material assessment was 92.26% in very feasible criteria, so this teaching material can be tested in research.

Student learning outcomes were seen from the average scores of the pretest and posttest for the experimental group and the control group in the environmental literacy test. Data from students' environmental literacy tests were carried out statistical tests in the form of normality, homogeneity and differences in mean learning outcomes between the experimental and control groups. The results of statistical tests on pretest data in the experimental and control groups are shown in Table 5.

Table 5. The Results of Statistical Tests on Pretest Data of Environmental Literacy

Data	Group	
	Experiment	Control
Number of Students	36	36
Pretest Score	42.29	41.49
Normality	0.030	0.050
Mann Whitney-U	0.602	

Based on the results of the statistical test in Table 5 shows that there is no difference in the mean value of the students

environmental literacy skills pretest between the experimental group and the control group. Thus, to see the increase in students' environmental literacy skills in each group, then an analysis was carried out on the posttest value of environmental literacy skills.

Table 6. The Results of Statistical Tests on Posttest Data of Environmental Literacy

Data	Group	
	Experiment	Control
Number of Students	36	36
Posttest Score	85.26	64.57
Normality	0.060	0.060
Homogeneity	0.007	
Mann Whitney-U	0.000	

Table 6 shows that the posttest environmental literacy abilities of the experimental group students and the control group. Based on the test results of the mean difference in posttest values of students' environmental literacy abilities indicate that the significance value of 0,000 is smaller than the significance level  $\alpha$  (0.05). That is, there are differences in the mean posttest values of students' environmental literacy skills between the experimental groups that use teaching materials based on local wisdom of agriculture in Binjai and control groups used student handbook.

The discussion of each component of environmental literacy is as follows.

Table 7. The Statistical Tests Results of Knowledge Component

Data	Experiment		Control	
	Pretest	Posttest	Pretest	Posttest
Score	43.57	81.43	44.29	79.29
Normality	0.000	0.000	0.000	0.000
Mann Whitney U	0.782		0.622	
N-Gain	0.66		0.62	

Table 7 shows the post-test mean score in the experimental group was not significantly different from the post-test mean score in the control group. This is likely to occur because students in the experimental and control groups have general knowledge about the material of the ecosystem and changes in the environment that students get from the learning process. In addition, knowledge of ecosystem material and environmental change is an easy material to learn for students because it relates to the environment around students, so there is no difficulty for students to answer questions that refer to knowledge about ecosystems and environmental changes. Increasing the score on the knowledge component in both groups was included in the medium category.

Furthermore, the statistical test result of cognitive skills component in the experimental and control groups are shown in Table 8.

**Table 8. The Statistical Tests Results of Cognitive Skills**

Data	Experiment		Control	
	<i>Pretest</i>	<i>Posttest</i>	<i>Pretest</i>	<i>Posttest</i>
Score	36.52	86.32	36.04	55.49
Normality	0.000	0.000	0.000	0.000
Mann Whitney-U	0.788		0.000	
N-Gain	0.77		0.30	

Table 8 shows the difference scores of posttest in the experimental group is higher than the control group because students are used to answering questions that refer to indicators of cognitive skills including identifying problems, analyzing problems, and solving problems. The indicators contained in the ability of cognitive skills are widely presented in teaching materials based on local wisdom of agriculture in Binjai. The intensity of students often find questions with these indicators, so it can make it easier for students to answer questions related to cognitive skills. This is in line with the opinion of Aikenhead & Huntley (2009) explaining that the environmental learning process with insight into local wisdom can provide opportunities for students to express curiosity, engage in the process of analysis and exploration and be creative in finding answers. Then, Subhan (2017) also explained in his research that local wisdom of a community could improve the ability of knowledge, cognitive skills and behavior of students in learning Biology. That is why, increasing cognitive skills into components with the greatest results among other components with increasing scores in the experimental group obtained an N-gain value in high category and the control group obtained an N-gain value in low category.

Furthermore, the results of the statistical test data of caring attitude towards the environmental component in the experimental and control groups are shown in Table 9.

**Table 9. The Statistical Tests Results of Caring Attitude Towards the Environmental**

Data	Experiment		Control	
	<i>Pretest</i>	<i>Posttest</i>	<i>Pretest</i>	<i>Posttest</i>
Score	45.14	85.14	42.85	58.18
Normality	0.000	0.000	0.000	0.000
Mann Whitney-U	0.340		0.000	
N-Gain	0.71		0.25	

Table 9 shows the increase scores in the experimental group was greater than in the control group. It was because students in the experimental group in the learning process did not only focus on knowledge about ecosystems and environmental changes, but also connected material with agricultural management activities in Binjai contained in teaching materials. Thus, students in the experimental group had knowledge of the positive and negative effects on the environment obtained from the management of agriculture in Binjai, which was presented in teaching materials based on local wisdom of agriculture in Binjai. Students are guided to foster an attitude of their concern for the environment, how to

preserve the environment and maintain ecosystem balance from the process of agricultural management in Binjai, so that students have a high sense of empathy and concern to protect the environment from agricultural activities that have an influence on the environment. This agrees with Mumpuni (2013) who states that incorporating local elements in Biology learning must contain positive knowledge and attitudes towards local conditions so that it can foster student motivation to develop their skills and attitudes. The development of the student's affective domain will lead to a caring attitude towards the environment of students. That is why; increasing the score on the component of caring for the environment in the experimental group obtained the N-gain value in the high category while in the control group was in the low category.

Furthermore, the results of the statistical test data of responsible behaviour towards the environmental component in the experimental and control groups are shown in Table 10.

**Table 10. The Statistical Tests Results of Responsible Behaviour Towards the Environmental**

Data	Experiment		Control	
	<i>Pretest</i>	<i>Posttest</i>	<i>Pretest</i>	<i>Posttest</i>
Score	41.14	85.14	42.85	58.28
Normality	0.001	0.000	0.008	0.000
Mann Whitney-U	0.864		0.000	
N-Gain	0.73		0.41	

Table 10 shows the mean difference in the posttest value of the environmental literacy ability of the responsible behaviour towards the environmental component between the students of the experimental group and the control group students.

The use of teaching materials by utilizing the environment and local culture in the surrounding area as a learning tool, can bridge students to solve environmental problems because they are faced directly with the environment around the student's residence. Besides being able to improve the ability to solve environmental problems, the use of local wisdom-based teaching materials can also instill a loving attitude towards the environment. The students' love for the environment will foster the behavior of students' responsibility to preserve the environment and motivate students not to damage the environment. That is why the environmental literacy ability of the responsibility for the environment component is a component with the greatest increase after the component of cognitive skills. Both of these components bind to each other in improving students' environmental literacy skills. Increasing the score on the component of responsible behaviour toward the environment in the experimental group obtained an N-gain value in high category and the control group obtained an N-gain value in medium category.

Overall, the increase in scores for each component of environmental literacy in the experimental group and the control group is presented in table 11.

Table 11. N-Gain Value of Environmental Literacy Ability Test

Component	N-gain	
	Experiment	Control
Knowledge	0.66	0.39
Cognitive Skills	0.77	0.30
Caring Attitude Towards the Environmental Responsible Behavior Towards the Environmental	0.71	0.25
Average	0.72	0.39

Table 11 shows the effectiveness of teaching materials based on local wisdom of agriculture in experimental group obtained an N-gain value of 0.72 with a high category, while in the control group obtained an N-gain value of 0.39 with the medium category. This means that the increase in learning outcomes in the experimental group using teaching materials based on local wisdom of agriculture in Binjai is better than the control group that uses school teaching materials. These results are related to the Laksana and Wawe (2015) studies, which show that student learning activities, increase after learning with local wisdom.

In general, the data obtained by researchers show that the use of teaching materials based on local wisdom on agriculture in Binjai has a significant influence on student learning outcomes. This can be seen from the average score of each aspect of environmental literacy, which shows an increase. Improving student learning outcomes is in accordance with the opinion of Anggraeni and Devi (2018), which states that local wisdom has advantages that can be used as learning tools for each student. The use of teaching materials based on local wisdom of agricultural in Binjai utilizing examples in everyday life and the local agricultural environment in Binjai is intended as an effort to facilitate students in understanding the material and building a caring attitude and responsibility for students towards the environment. This is supported by the opinion of Sardjiyo and Pannen (2005) that the learning process based on local wisdom not only transfers culture but also uses it to make students able to create meaning and creativity in achieving a deep understanding of subjects. In addition, Lukluah (2016) also argues that integrating local wisdom in learning serves to design the formation of children's character

#### 4. CONCLUSION

Based on the test results on students' environmental literacy abilities, the highest component was in the responsible behavior towards the environmental with the N-gain value was 0.73 while the lowest component was shown in the knowledge component with the N-gain value was 0.66.

Overall, the N-gain value of the student's environmental literacy ability test was obtained at 0.72 with a high category, meaning that the teaching material based on local wisdom of agriculture in Binjai was effective in improving student learning outcomes for environmental literacy

#### 5. REFERENCES

- Aikenhead, G., & Huntley, B. (1999). Teachers' views on Aboriginal students learning western and Aboriginal science. *Canadian Journal of Native Education*, 23(2), 159-175.
- Anggraeni, K., & Devi, A. Y. (2018). Efektivitas bahan ajar berbasis kearifan lokal dalam model pembelajaran teknik jigsaw terhadap keterampilan menulis deskripsi. *Jurnal Visipena*. 9(2), 385-395.
- Djulia, E. (2005). *Peran budaya lokal dalam pembentukan sains (studi naturalistik sains siswa kelompok budaya sunda tentang fotosintesis dan respirasi tumbuhan dalam konteks sekolah dan lingkungan pertanian* (Doctoral Dissertation). Retrieved from <http://repository.upi.edu>
- Erdogan, M. (2009). *Fifth grade students' environmental literacy and the factors affecting students' environmentally responsible behaviors*. (Doctoral Dissertation). Retrieved from <http://etd.lib.metu.edu.t>
- Guler, E. (2013). *İlköğretim 8. sınıf öğrencilerinin çevre okuryazarlığı düzeylerinin belirlenmesi ve öğrencilerin okuryazarlığı düzeylerinin çeşitli değişkenler açısından incelenmesi*. Yüksek Lisans Tezi, Çukurova Üniversitesi, Sosyal Bilimler Enstitüsü, İlköğretim Ana Bilim Dalı, Adana.
- Hake, R. R. (1999). *Analyzing change/gain scores*. (Online). Retrieved from <http://www.physics.indiana.edu/~sdi/AnalyzingChange-Gain.pdf>
- Kibert, N. C. (2000). *An analysis of the correlations between the attitude, behavior, and knowledge components of environmental literacy in undergraduate university students*. (Master Thesis). Retrieved from <http://etd.fcla.edu>
- Laksana, D., & Wawe, F. (2015). Penggunaan media berbasis budaya lokal dalam pembelajaran IPA untuk meningkatkan aktivitas belajar dan pemahaman konsep IPA siswa sekolah dasar. *Jurnal Ilmiah Pendidikan Citra Bakti*, 2(1), 27-3.
- Lukluah, U. (2016). *Pengembangan bahan ajar tematik berbasis islam dan kearifan lokal kelas iv min bancong & mis Al-fatah dimong Kabupaten Madiun* (Master Thesis). Retrieved from <http://etheses.uin-malang.ac.id>
- Mumpuni, K.E. (2013). *Potensi pendidikan keunggulan lokal berbasis karakter dalam pembelajaran biologi di indonesia*. Symposium conducted at National Seminar

Biologi Education of Faculty of Teacher Training and Education, Sebelas Maret University.

- Mutiani. (2017). IPS dan pendidikan lingkungan: Urgensi pengembangan sikap kesadaran lingkungan peserta didik. *Social Science Education Journal*, 4(1), 45-53.
- Parmin & Peniati, E. (2012). Pengembangan modul matakuliah strategi belajar mengajar IPA berbasis hasil penelitian pembelajaran. *Jurnal Pendidikan IPA Indonesia*, 1(1). Retrieved from <http://journal.unnes.ac.id/index.php/jpii>.
- Parwati, A., Purnaweni, H., & Anggoro D. D. (2012). *Nilai pelestarian lingkungan dalam kearifan lokal Lubuk Larangan Ngalau Agung di Kampuang Surau Kabupaten dharmasraya provinsi Sumatera Barat*. Symposium conducted at Nasional Seminar of Natural Resources and Environmental Management of Diponegoro University.
- Pratiwi, D., & Pujiastuti, P. (2014). Pengembangan bahan ajar biologi berbasis pendekatan savi (somatic, auditory, visual, intellectual) pada pokok bahasan sistem pernapasan kelompok xi sma dalam meningkatkan motivasi dan hasil belajar siswa. *Jurnal Edukasi Unej*, 1(2), 5-9.
- Sahin, M., & Uzun, N. (2017). Investigation of secondary school students' environmental literacy levels. *Europian Journal of Education Studies*, 3(9), 356-368. doi: 10.5281/zenodo.885544
- Sardjiyo & Pannen. (2005). Pembelajaran berbasis budaya: model inovasi pembelajaran dan implementasi kurikulum berbasis kompetensi. *Jurnal Pendidikan*, 6(2), 83-98.
- Subhan, A. (2017). *Pengembangan bahan ajar berbasis nilai-nilai kearifan lokal pertanian padi di Cirebon untuk meningkatkan literasi lingkungan siswa SMP* (Master Thesis). Retrieved from <http://repository.upi.edu>