Research Artikel

LEARNING MATERIAL INTEGRATED ALTERNATIVE TECHNOLOGY IN WASTED ENVIRONMENT OF GOLD MINE TO ENHANCE COGNITION OF ENVIRONMENTAL

MATERI BELAJAR TEKNOLOGI ALTERNATIF TERINTEGRASI DI LINGKUNGAN LIMBAH TAMBANG EMAS UNTUK MENINGKATKAN KEMAMPUAN LINGKUNGAN

Novi Nurmayanti, Sri Atun

Universitas Negeri Yogyakarta, Indonesia

Novinurmayanti25@gmail.com

Abstract

West Kalimantan Province has damages over quater out of its area. It caused by exploration of mining, one of which is gold mining. The decay is needed for responsible of the people, include the students who live arround the area in order to make them qualified in understanding and caring to the environment. The objective of this study is to indicate the cognition improvement of environmental literacy using learning material integrated alternative technology in wasted environment of gold mine. The method used is quasi experiment. Data were collected by doing observation, documentation and test for the experiment class and control class with 31 students for each class. The result showed that there is any of cognition enhancement presented by N-Gain of 0.43 as moderate category in experiment class and 0.13 as low category in control class. The significant improvement of experiment class is attributed by the use of learning material integrated alternative technology in wasted environment of gold mine which is qualified to enhance students' cognition of environmental literacy.

Keywords: learning material; gold mine waste; cognition of environmental literacy

---

Abstrak

Provinsi Kalimantan Barat memiliki kerusakan karena quater keluar dari wilayahnya. Hal itu disebabkan oleh eksplorasi penambangan, salah satunya penambangan emas.Kerusakan ini harus dibertanggung jawabkan oleh masyarakat, termasuk siswa yang tinggal di sekitar daerah agar mereka memenuhi syarat dalam memahami dan peduli terhadap lingkungan. Tujuan dari penelitian ini adalah untuk menunjukkan peningkatan kognisi literasi lingkungan menggunakan bahan pembelajaran teknologi alternatif terintegrasi di lingkungan limbah tambang emas. Metode yang digunakan adalah eksperimen semu. Data dikumpulkan dengan melakukan observasi, dokumentasi dan tes untuk kelas eksperimen dan kelas kontrol dengan 31 siswa untuk setiap kelas. Hasil penelitian menunjukkan bahwa ada peningkatan kognisi yang disajikan oleh N-Gain dari 0,43 sebagai kategori sedang di kelas eksperimen dan 0,13 sebagai kategori rendah di kelas kontrol. Peningkatan yang signifikan dari kelas eksperimen disebabkan oleh penggunaan bahan pembelajaran teknologi alternatif yang terintegrasi dalam lingkungan limbah tambang emas yang memenuhi syarat untuk meningkatkan pengetahuan siswa tentang literasi lingkungan.

Kata Kunci: *materi pembelajaran; limbah tambang emas; kognisi literasi lingkungan*

INTRODUCTION

Gold mining activities in West Kalimantan promote negative impacts to the environment and human arround the area. The damage which is phycally observed is remaining holes or more known as gold holes over the area of West Kalimantan. According to investigative report, 5.4 millions Hectare out of its area was used as mining land. It caused critical condition on productive land because it was continuesly used by producing the remaining holes.

Environmental change in West Kalimantan influenced the equilibrium of ecosystem. The climate change, lack of clean water, reducing of fishes in river, dryness, and epidemic disease are the essential problems for the poeple in West Kalimantan. In additon, the damage on soil and water is improved by the day and it is really worrying.

Water and soil pollution caused the damage in West Kalimantan, it was needed for the attention from everyone in West Kalimantan include students who lived near that mining land. The balance between natural resources and physical condition is impotant to be saved, as such the solution for the problems should be concerned on learning process in the school. One way is by integrating alternative technology into learning material concerning to wasted environment of gold mine, thus the students being more understand the real condition of their environment and more enhanced for the cognition of environmental literacy.

Analysis for PISA 2016 by OECD (2006) showed that students' responsibilities to the environmental issues were in line with the cognition of environmental literacy. The more information gotten by students, the more skill they have in which concerning to environmental literacy in order to enhance their abilities in solving those environmental problems. This study is aimed to observe the influnce of the use of learning material integrated alternantive technology in wasted environment of gold mine to enhance the students' cognition of environmental literacy.

Learning Material Integrated Alternative Technology in Wasted Environment of Gold Mine

Learning material integrated alternative technology in wasted environment of gold mine is a tool to bring utilize the condition of local environment, comprehension and local understanding and problem surrounded which is eligible to be teaching material in order to develop students' compotency and to enhance their cognition especially about environment. It was directed as contextual learning related to local condition. The relation between learning material and students' living environment will creat

practical application in contextual learning (Kahar, 2014).

Tomazic (2011) explained that education based local problems has essential contribution in solving problems related environmental problems. The education has a function to provide information regarding to solve the environmental problems in order to create the human who take care of their healthy and able to conserve the environment. Then, the learning integrated with environmental condition provides the opportunities for students in presenting their curiosity, and taking a contribution and exploration in order to find the solution for the problems and making a conclussion (Aikenhead & Huntey, 2009).

One of the ways to realize the alternative technology in reducing waste of gold mine is by doing phytoremediation. It is an effort for environmental restoration through biology approach based plants (Zumani, D., *et al*., 2015). The heavy metal contamination can be reduced and neutralized by using cheap method which is rich known as phytoremediation (Truu, J., Talpsep, E., Vedler, E., 2003). This technology is an innovation, effctive in budgeting, and alternative to process dangerous waste and to be environmental friendly (EPA, 2001). The components from roots, stems, and leaves are going to change to be less dangerous chemicals as gaseous phase and it will be released to the air among respiration. One of water plants used for reducing heavy metal contamination is *Enceng gondok* (*Eichhornia crassipes*).

Accroding to several explanations described, it is directed to the conclusion stated that the learning material integrated alternative technology in wasted environment of gold mine is one of tools that can be used to ease students for having knowledge, comprehension, and a sense of belonging and to be one solution in order to share information to the students concerning how to handle the waste of gold mine.

The Cognition of Environmental Literacy

The cognition in environmental literacy is divided into 3 components namely, ecology, energy flows, and energy cycle. Minnesota Office of Environmental Assisstance (2002) mentioned environmental literacy as knowledge and individual

comprehension to the acpects in builing the environment, abilitiy in controlling environmental condition which are able to be apply in daily life. NAAEE (2011) explained that it is important for having knowledge of environmental literacy, as such the society will have strong contribution for the earth regarding to the iimprovement of people ammount will aslo impact to the increasing of their needs for the food, clean water, fuel, and also for the space. Therefore, the main objective in developing environmental literacy is to prepare the people in order to understand and have solution for their environmental problems.

Environmental literacy cognition is individual comprehension to the concept and principle related to the environment. The social comprehension implemented in daily life will have active role concerning to solve environmental problems (Coyle, 2004).

The cognition of environmental condition is individual comprehension to the concept and principle corralated to the environment. Regarding to this comprehension, it will be qualified to apply the knowledge in daily life (Coycle, K., 2004). In line with Kibert, N.C. (2000), environmental cognition is a basic for changing people's behavior to take care of their enviroment.

Based on the above description, it can be concluded that the cognition of environmental literacy is individual comprehension related to principle and environmental condition concerning to solve the environmental problems. Therefore, the students are expected to give their contribution in managing the environmental problems.

METHOD

Research Design

This study used apparent experiment research (quasi experimental research) with pretest-posttest only control design.

Tabel 1. Research Design

Classes	Pretest	Treatments	Posttest
Experiments	K-1	Using practicum guideline integrated alternantive technology in wasted environment of gold mine	K-2
Control		Using practicum guideline provided by teachers	

Information:
K-1 : Pretest
K-1 : Posttest

Population and Sampling Technique

The population in this study is students in junior high school in West Kalimantan. The sample in this study is 2 clasess with 31 students for each class who lived in location arround gold mining.

Instrumetation

This study developed multiple choice questions consist of 20 questions for pretest and 20 questions for posttest related to environmental comprehension, pollution and waste management.

Data Analysis

Data were collected and analyzed using persentage, calculation of one way frequency using ANOVA and t-test.

RESULT AND DISCUSSION

Result

The difference of learning achivement between students who learned using learning material integrated alternative technology in wasted environment of gold mine and students who used learning material served by teacher.

Pretest and Posttest of Experiment Class and Control Class

Before analyzing to the data of students' achivement in order to indicate learning outcome in experiment class and control class, the more important is to calculate the result before and after given a treatment. The 20 questions were presented in multiple choice with 4 alternative answer.
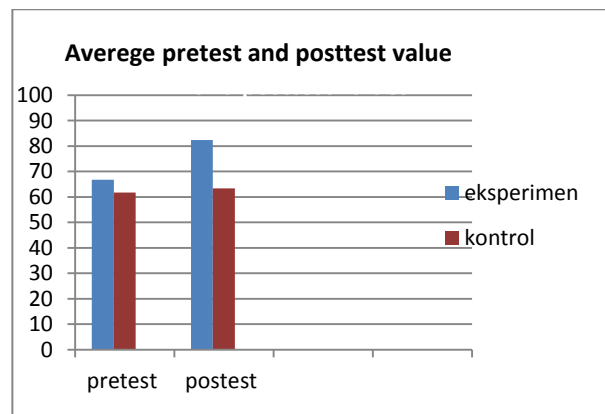
According to the above diagram, it showed that average score of pottest both in experiment class and control class was more greater than pretest, and this condition was attributed by environment based learning provided to the students. However, the posttest result of experiment class is higher than control class, it was caused by different treatment for each class regarding the uses of learning material integrated alternative technology for waste management of gold mine in experiment class, whereas the control class used learning material served by teacher.

N-Gain and Statistical Analysis Test

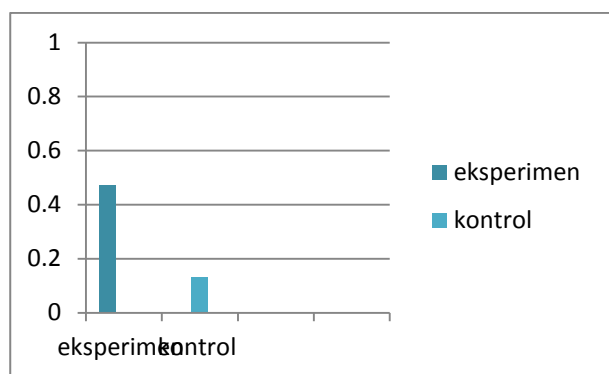The result of N-Gain will be shown in diagram below.

Figure Gain Bar Diagram between control class and class

According to the diagram above, it explained that there is a difference of N-Gain between experiment class and control class. The average N-gain of experiment class is 0.43 in medium category. Whereas the control class has N-Gain of 0.13 in low category. Regarding to the data, it can be realized that the enhancement of learning achievement in experiment class is greater than control class, where the N-gain of 0.43 in experiment class is higher than N-gain of 0.13 in control class (0.43>0.13). Then, it was tested through statistical approachs namely test of normality, homogenity and hypothesis.

Hypothesis Test

Regarding to result test of normality and homogenity on N-gain of experiment class and control class, the data are distributed normally and homogenously. In additon, test for hyphothesis can be conducted using parametric statistics. This test used independent tes of sample test (t) because it

was the analysis from two different treatments which have no corralation either in experiment class or control class. The hypothesis test is aimed to prove the proposed hypothesis which is "there is an improvement of student achivement learned using learning material integrated alternative technology for waste management of gold mine".

The significant value is presented by the analysis which is 0.09>0.05. According to the result, it can be concluded that there is an impovement of environmental comprehension using the learning material integrated alternative technology for waste management of gold mine.

Discussion

Before and after applying the learning with the use of learning material integrated alternative technology for wasted environment of gold mine, the data presented that there is an enhancement students' knowledge related to environmental literacy which can be seen both of pretest result and posttest result.

Pretest result in control class is in average of 61.774, whereas the average score of 66.74 in experiment class. Then, after doing some treatment by this study, the average score of posttest in control class is improved with score 68.38, however there is a significant improvement in experiment class with average score is 82.419. The amount of improvement is 6.6 for control class and 15.67 for experiment class. Consequently, the enhancement is strongly attributed by the use of learning material integrated alternative technology for wasted environment of gold mine where the module provided information and knowledge supported the students' cognition improvement of environmental literacy.

CONCLUSION

Regarding to the discussion above, it cna be concluded that the use of learning material integrated alternative technology for waste of gold mine can improve the students'cognition of environmental literacy. This fact is shown by the result of N-gain in experiment class with significant value of 0.43 as medium category, whereas the control class used learning material served by teacher only gained 0.13 of N-gain as low category.

REFERENCES

Aikenhead & Huntey (2009). Teacher' Views on Aboriginal Students Learning Western and Aboriginal Science [Online]. Tersedia http://www.rsc.org/Publishing/Journals/RP/index. asp [13 Maret 2018]

Coyle. K (2005) *Environmental Literacy In Amerika : What te years Of NEETF/ Roper Research and Related Studies say about Environmental Literacy in The US*. Washington, DC: The National Edducation and Training Foundation.

EPA (Environmental Protection Agency) (2012). *A Citizen's Guide to Phytoremediation*. United States

Kahar, A.P (2014) Pengembangan Bahan Ajar Ekosistem Mangrove Berbasis Potensi Lokal untuk Meningkatkan Hasil Belajar Siswa SMA. Poceeding Biology Education Conference

Kibert N.C (2000). *A Thesis Presented to the Graduate School of the University of Florida in Partial Fulfillmentof the Requirements for the Degree of Master of Science*, Universitas Of Florida, Florida.

Laporan Investigatif Eyes on the Forest Jaringan Kalimantan Barat (2016). *monitoring izin usaha pertambangan minerba di kalbar Laporan investigatif* . Pontianak : Eyes on the Forest

Minnesota Office of Environmental Assistance (2002). Report on all *Minnesota Office of Environmental Assistance Rules.*

NAAEE (North American Assocton For Environmental Education) (2011) *Developing a Framework For Assessing Environmental Literacy Washington DC*. The National Science Foundation

PISA (2006): *Technical Report* . USA: OECD-PISA

Tomazic (2011) Pre-Service Biology Teachers' and Primary School Students' Attitudes Toward and Knowledge about Snakes. *Eurasia Journal Of Mathematics Science and Technology Education*

Truu. J., Talpsep. E., Vedler. E (2003) *enhanced biodegradation of oil shale chemical industry solid wastes by phytoremediation and bioaugmentation institute of molecular and cell biology,* university of tartu

Zumani. D, Suryaman.M & Dewi S.M Pemanfaatan eceng gondok (*eichhornia crassipes (mart.) solms*) untuk fitoremediasi kadmium (cd) pada air tercemar *Jurnal siliwangi* vol. 1. no.1. nov. 2015 issn 2477-3891 seri sains dan teknologi