

Effort To Facilitate Environmental Awareness Through Science, Environment, Technology, And Society (SETS)

Nur Ilmiyati, Adi Maladona, Rahmawati D, Nur Azizah Rahman

Abstract: This study to facilitate environmental awareness through SETS. The research method is a weak experiment, with the research design "The One-Group Pretest-Posttest Design". The research subjects were 34 high school class X students. The influence of SETS on students' environmental awareness was analyzed based on the test score Wilcoxon using the statistical calculation program SPSS 24.0 for Windows. The instrument used in this study was an attitude scale questionnaire of 20 questions. The analysis shows that SETS can increase students' environmental awareness and SETS has a significant effect on environmental awareness. Besides that, creativity in finding tofu waste treatment is good enough by making products that have aesthetic value.

Index Term: environmental awareness, SETS.

1 INTRODUCTION

Environmental pollution is one of the biggest problems of the 21st century along with developments in the field of science and technology, and along with the increasing human needs that require increased employment in various sectors, such as the livestock, agriculture, fisheries, industry, mining, and plantation sectors thus causing a decrease in natural resources[1]. The problem of environmental pollution affects human life today and human life to come[2]. One example of pollution caused by the tofu industry that produces solid tofu waste and liquid tofu waste. This tofu industry waste treatment process still uses a simple wastewater treatment plant (WWTP). Tofu solid waste is resold for animal feed, and tofu liquid waste is accommodated and some even overflows into the river. As a result, the river has become polluted, rice fields have failed to harvest, fisheries yields are not optimal and are threatened with bankruptcy, and residents have difficulty getting clean water[3]. Education plays an important role in preventing environmental pollution, environmental destruction, and preserving the environment. Conserve natural resources, develop thinking about environmental issues, build a clean and healthy future obtained from education[4]. In the UN (2009) listed 21 State agenda namely education is very important to improve the ability of the community to address environmental issues, increase environmental awareness, values, attitudes, skills, and consistent behavior to participate in sustainable development[5]. Students are expected to have environmental awareness by applying the concepts possessed from various related sciences, in accordance with the verses of the Al-Quran letter Qhasash: 77 which means "And do not do damage (on the face) of the earth. Surely Allah does not like those who do mischief ". Direct learning experiences that train students' environmental awareness can be supported through learning science, environment, technology, end society (SETS). Learning is SETS designed and developed to interpret science and technology as social complexity, as well as to develop critical, scientific, decision-making abilities, able to act and take responsibility for those decisions[6]. The problems that are in the community are brought into the classroom to be sought for solutions using learning SETS in an integrated way in the interrelationships between aspects of science,

environment, technology, and society. Students are trained to be able to think globally in solving local, national or international problems according to their ability to think and reason. Students are guided to be sensitive to the problems in society and play an active role to participate in finding solutions[7]. Based on the description above, it is important to study more deeply about the environmental awareness of students by using learning SETS that raises problems in the real environment of students or in the community such as tofu waste and the material in this study is environmental pollution and preservation, because in the context of implementation SETS of environmental problems inseparable from the context of science, environment, technology and society.

2 RESEARCH METHODS

The research method used is weak experiment or pre-experimental design, where SETS is applied to an experimental text[8]. This is because it is difficult to find comparable learning with SETS whose application requires a lot of time and energy so the researcher wants to focus his observations direct and detailed application of SETS in one class. Measurement of students' environmental awareness is carried out through pretest and posttest, so that the research design used is "The One-Group Pretest-Posttest Design"[9]. Learning SETS is learning to focus the problems of the real world that has a component of science, environment, technology and society from the perspective of students, in which there are concepts and processes. Furthermore learning SETS consists of the stages of invitations, explorations, solutions, applications, and stabilization of concepts. The learning stages are carried out during the four learning meetings. Each meeting takes 3x45 minutes. The stages of the meeting are:

- The first meeting giving pretest, then students and teachers visit the tofu factory. Students make observations and see problems that occur in the tofu factory environment.
- The second meeting students presented the results of observations at the first meeting and designed the manufacture of tofu waste processing products. The teacher determines the making of chips from tofu dregs so students get an idea of how to

process tofu dregs into a useful product.

- The third meeting of students carrying out the practice of tofu waste processing. Students make chips from tofu dregs in accordance with the design that students have made at the second meeting.
- The fourth meeting students presented the results of the processing of tofu waste at the third meeting and the teacher provided reinforcement of concepts, facts, procedures for pollution and environmental preservation material that students had obtained, then posttest.

The instrument used in this study questionnaire environmental awareness in the form of aspects of attitude (attitude) contained in the affective domain includes indicators of the desire to respond (willingness to respond), satisfaction in responding (satisfaction in response), acceptance of a value (acceptance of a value), tendency to value (preference for a value), commitment (commitment), and conceptualization of value (conceptualization of a value) [10]. The students' environmental awareness was captured using a questionnaire on the scale of attitude given before and after the implementation of the learning SETS

3 RESULT AND DISCUSSION

a. Result

Table 1 Statistics Indicators Environmental Awareness Students Before (PreTest, Next (PostTest) and N-Gain

Indicator Attitude	Average Value		N-Gain
	Before (pre test)	After (post test)	
willingness to respond	90	98	0,2
satisfaction in response	90	100	0,4
acceptance of a value	97	100	0,1
preference for a value	62	97	0,4
Commitment	97	100	0,1
conceptualization of a value	91	100	0,3

Source: Results of Data Processing

For more details Statistical data on environmental awareness indicators of students conducting the learning process SETS on the concept of pollution and environmental preservation can be seen in Figure 1.

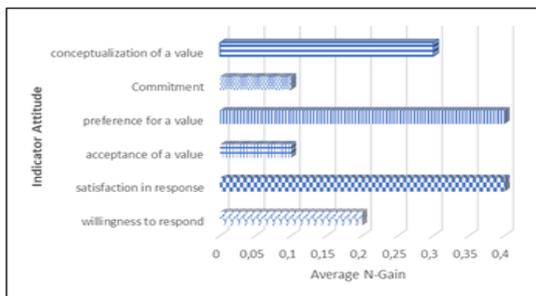


Fig 1: Comparison Diagram of N-Gain Values of Indicators Students' Environmental Awareness

Based on Figure 1, it can be seen that the acquisition of an average value of *N-gain* from each environmental awareness indicator has increased. The lowest increase is owned by the indicator of receiving a value and commitment by obtaining an average value of *N-gain* of 0.1 low category, an indicator of desire to respond to the acquisition of an average value of *N-gain* of 0.2 with the medium category, the indicator of satisfaction in responding and the tendency of values with the acquisition of an average value of *N-gain* of 0.4 with the medium category, then the indicator of conceptualization of values with the acquisition of the average value of the *N-gain* of 0.3 of the medium category.

b. Discussion

Learning SETS can be done quite well learning SETS emphasizes student activity maximally to search and find. This means learning SETS prioritizes students as learning subjects. Through the value of N-Gain can be known high or low improvement that occurs in each student in the student environmental awareness indicators. This improvement can occur because in the learning process SETS students are trained to see and observe students' real environments, so students are confronted with real conditions regarding environmental problems and require students to provide responses in the form of attitudes / concrete actions regarding the problems faced. Like the results of research that concluded that the relationship of students with the environment can increase a sense of caring, student awareness of the environment and their willingness to engage in activities that have a beneficial impact on the environment [11]. Through the learning stages SETS students are guided and directed how to take concrete actions/ behave systematically or through several stages, it is intended to familiarize the attitude of environmental awareness in their daily lives. Learning SETS facilitates environmental awareness of students starting from the indicator of willingness to respond (where *willingness to respond*) where at this stage students are expected to have the desire to take real action, the second stage of satisfaction in response (*satisfaction in response*) where at this stage students are able to take real action and satisfied after carrying out the concrete action, the third stage of acceptance of a value (acceptance of a value) at this stage students are interested in learning about pollution and environmental preservation, the fourth stage is the tendency to value (preference for a value) where at this stage students have a preference certain relating to pollution and environmental preservation for example students like in planning a solution to solve a pollution problem, the fifth stage of commitment (commitment) where at this stage students have a determination and commitment, and the last stage is the conceptualization of values (conceptualization of a value) where at this stage a certain value concept is found by students and is beneficial for the environment. The goal of science education is to enhance individuals who are environmentally conscious with better attitudes and behaviors with respect to environmental protection [12].

4 CONCLUSION

Students' environmental awareness has increased after learning SETS for all indicators, namely the desire to respond, satisfaction in responding, acceptance of a value,

tendency to values, commitment, and conceptualization of values. The average N-gain value of students' environmental awareness shows satisfactory results with a moderate N-gain category. In general, the stages of teacher implementation and student activities in each learning meeting *SETS* on the concept of pollution and environmental preservation can be implemented well. The results of students' creativity after participating in learning *SETS* from the aspect of making products as a way to process the pulp know quite well by producing products that have economic value and high taste as a form of environmental awareness.

5 REFERENCES

- [1] Erdogan, M., Bahar, M., and Usak, M. (2012). Environmental Education in High School 9th - 12th Biology Course Curricula Started to be Implemented in 2007. *Edam*, 12 (3), hlm. 2230-2235.
- [2] Cetin, G., and Seda, H. (2010). *Enhancing Students Environmental Awareness*. Elsevier, 2, hlm. 1830-1834.
- [3] *Pikiran Rakyat*, 15 Agustus 2016
- [4] Kiraz, A., and Altay, F. (2016). Analyzing The Environmental Awareness Of Students According To Their Educational Stage. *International Refereed Research Journal*, 7 (2), hlm. 2231-4172.
- [5] Umuhire, M., and Qinhuua, F. (2015). Method and Application Of Ocean Environmental Awareness Measurement: Lessons Learnt From University Students Of China. Elsevier, 7, article 6.
- [6] Pedretti, E. (2003). *Teaching Science, Technology, Society and Environment (STSE) Education*. Netherlands: Kluwer Academic.
- [7] Binadja, A & Fitriani, S. (2012). Penerapan Model Connected Bervisi Science Technology Society pada Pembelajaran IPA Terpadu. *Unnes Science Education Journal*, 2, hlm. 1-7.
- [8] Sugiyono. (2013). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta Bandung.
- [9] Fraenkel, J. R., dan Wallen, N. E. (2008). *How to Design and Evaluate research in Education*. New York: McGraw-Hill.
- [10] Krathwohl, D.R., et al. (1964). *Taxonomy of Educational Objectives Book 2 Affective Domain*. New York: Longman.
- [11] Gersteberger, Kelly, and Cross. (2004). The Influence of an Introductory Environmental Science Class on Environmental Perceptions. *Journal of Natural Resources and Life Science Education*, 33, hlm. 73-76.
- [12] Altin, A., Selcen, T., Lokman, T., et al. (2014). Environmental Awareness Level Of Secondary School Students: A Case Study In Balikesir (Türkiye). Elsevier, 141, hlm. 1208–1214.