

Efforts to Handle Waste through Science, Environment, Technology and Society (SETS)

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Abstract. This research to identify the attempt to deal with the waste through a learning SETS to facilitate troubleshooting and environmentally conscious high school students. The research method is weak experiment, with the design of the study "The One-group pretest-Posttest Design". The population used in this study is an entire senior high school class in Ciamis Regency of Indonesia many as 10 classes totaling 360 students. The sample used in this study were 1 class. Data collected through pretest and posttest to increase problem-solving skills and environmental awareness of students. Instruments used in this research is to test the ability to solve the problem on the concept of Pollution and Environmental Protection, in the form of essays by 15 matter, the attitude scale questionnaire of 28 statements. The analysis N-gain average showed that the SETS problem-solving skills and environmental awareness of students in the medium category. In addition, students' creativity in finding out pretty good waste management by creating products that are aesthetically valuable and economic appropriately.

1. Introduction

The problem of environmental pollution effect on human life and human life at this time to come [1]. It is known that the number of industrial tahu (tofu) in Ciamis Regency of Indonesia as many as 103 companies with a production capacity ranging from 6 tons to 66 tons, and 1,500 tahu up to 90 million tahu [2]. Total industry tahu each year continues to increase along with demand for the tahu product. Of industrial waste treatment process tahu this is still using the wastewater treatment plant (IPAL) is simple. For waste tahu no impact on the environment, it needs special handling of the waste or waste water tahu into a more useful product. Education plays an important role in preventing environmental pollution, environmental destruction, and preserve the environment. Conserve natural resources, developing thinking about environmental issues, building a future clean and healthy obtained from study [3].

The activities carried out in the school environment is expected to become a habit and become a character that is strongly attached to the students [4]. The learning experience can be powered directly through the learning of science, environment, technology, society (SETS). Students are guided to have a sensitivity to the problems in the community and play an active role to contribute to finding solutions [5]. According to one study, learning SETS designed and developed to interpret science and technology as social complexity, and to develop critical faculties, scientific, decision-making, able to act and be responsible for those decisions [6].based learning SETS effective to increase creativity in



solving problems of environmental pollution [7]. Determine what the students do and can do is an important part of an effective classroom practice and is an important component of learning [8].

In this study, students were invited to direct observation of tofu factory near their homes so that students can immediately identify the problems that occur in their real environment that knows untreated waste into products that are more useful. After the observation, students design a wastewater treatment product out. Products made of students, namely, chips, nuggets and kecap from the waste out. This research includes elements of science, environment, technology, and society (SETS) more integrated and students to implement what they have learned in their real life. Learning so that SETS this research can facilitate problem-solving skills and environmental awareness of students. Based on the description above, it is important to examine more deeply and more about problem-solving skills and environmental awareness of students by using learning SETS who raised the issue in a real environment such as students or in community waste out.

2. Experimental Method

The research method used is the method of weak experiment/pre experiment. Subjects were all students of senior high school class in Ciamis many as 10 classes totaling 360 students. Samples are first class numbered 34 students, 18 girls and 16 boys. Measurement increase problem-solving skills and environmental awareness of students is carried out through the pretest and posttest, so the design of the study is "The One-group pretest-Posttest Design"[9]. Instruments used in this research is to test the ability to solve problems on the concept of Pollution and Environmental Protection, in the form of an essay of 15 questions, the questionnaire scale of attitude as much as 28 statements with positive statements and negative are required of students at one of the columns consisting of columns yes, hesitated and did not. The data in this study using a support program Microsoft Excel 2010 and SPSS version 24.

3. Result and Discussion

3.1. Students' ability to solve the problem

The statistics student's ability to solve problems before (pre-test), after (post-test), and N-gain during the learning process SETS can be seen in table 1.

Table 1. Data statistics student problem solving ability

Statistics	value		N-gain
	pretest	posttest	
Average	15.79	31.29	0.55
Variance	9.68	18.64	0.02
At least	10	21	0.19
Maximum	21	39	0.83
Standard deviation	3.11	4:32	0.15
Median	15	32	0.58

Table1 shows that there is a difference between pretest to posttest results and the value of N-gain indicates how much influence learning after learning SETS. The result of more increases than pretest posttest, so that the N-gain medium category. Learning SETS managed to make a difference and increase the number of frequencies on the posttest results. The learning process teachers try to make learning more active and fun. At first studied teachers to motivate students to make observations to the factory know, students were very enthusiastic about the learning activities outside of school and a real touch with their surroundings.

3.2. Students' environmental awareness

Based on the attitude likert scale questionnaire showed students experience a change in consciousness and environmental awareness as evidenced by the percentage difference in attitude scale questionnaire results before and after the learning SETS. Students are directly involved with the problem that is happening is the waste out. Innovation and creativity of students also increased by making a product refined from waste out, the students get a certain satisfaction when they succeeded in designing a product and can make the product. Because of the limited learning time, products made of students is not so perfect, but the cracker products, nuggets and ketchup from the waste out can be consumed and waste signify know can be processed into a very useful product.

3.3. Student activities during the learning SETS

Figure 1 shows the learning activities SETS that have been done student, that student successfully treat waste out into a food product that is suitable for consumption.



Figure 1. Figure product crackers and nuggets of waste out

Currently tofu factory observation activities, students carry out the observation of that waste will processed back into a useful product so that students can find solutions to overcome and control the environment caused by waste pollution know. Thus the ability to solve problems and increase the environmental awareness of students learning SETS. This research has managed to achieve the main goal of learning SETS namely the development of a scientific attitude of students, conceptual understanding, critical thinking, and problem solving skills through engagement with real-world problems [9].

4. Conclusion

Learning SETS can facilitate problem-solving skills and environmental awareness of high school students in an effort to deal with waste on the concept of Pollution and Environmental Conservation. Any student creativity in making a product can increase. Students can tackling the problem of environmental pollution. However, it takes additional time to actually be able to increase significantly the ability to solve problems and environmental awareness of students, the current regulatory research school schedule is not enough to do more research and more deeply.

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References

- [1] Cetin and Seda 2010 Enhancing Awareness Students' environmental *Elsevier* **2** pp 1830-1834
- [2] Dinas Perindustrian dan Perdagangan 2016 *Company Directory Food, Small Industries, and Medium* (Ciamis)
- [3] Kiraz A and Firat A 2016 Analyzing the Environmental Awareness of Students According to Their Educational Stage *Researchers World* **7** (2) pp 2231-4172
- [4] Ernst and Elizabeth 2015 Redigned High Schools for STEM Learning Transformed: Pilot Performance Assessment Outcome *Journal of STEM Education* **16** (4) pp 1-10.
- [5] Binadja and Ward 2006 *High School Chemistry Teaching Quality Improvement Through Application CBC Visionary SETS Approach*. Proposed Research Grants Program Grant A2 Chemistry Department Semarang.
- [6] Pedretti 2003 *Teaching Science, Technology, Society and Environment (STSE) Education*
- [7] Sugiarto and Djukri 2015 SETS based learning as Efforts to Improve Creativity in Problem Solving Environmental Pollution Innovation *Journal of Science Education* **1** (1) pp 1-11
- [8] Walker and Jeffrey 2014 Students Performance Driving Assessment: What Students Can Do Learning *National Council Of Teachers Of Mathematic* **19** (8) pp 468-476
- [9] Tal, Dori and Keiny 2010 Assessing Conceptual Change of Teachers Involved in Education and Curriculum STES Development the Stems Project Approach *IJSE* **23** (3) pp 247-262