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Waste Management Awareness Education for Senior High School Students

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***Abstract*—The increasing volume of waste in Indonesia is a feature of the low level of public awareness to waste management. The problem of waste management is still considered to be the responsibility of the government. School is one of the institutions that has a role to build awareness education for children and teenagers in waste management. In fact, there are still many teenagers in Indonesia who do not understand the importance of waste management. This paper aims to examine the ability of senior high school students in waste management by exploring three areas: knowledge about waste management, organic waste processing, and an organic waste processing. This research was conducted in senior high school by involving students and teachers. Participants were given knowledge about the types of waste, knowledge and practice of managing organic waste, and practicing an organic waste processing into useful items. The results showed that the student waste management's knowledge was still low, because they had never been taught in the school curriculum. They don't even know how to process organic waste. Our visit has changed their knowledge about waste and how to process it. So, it is necessary to teenagers to directly practice how to manage waste into something more valuable.**

Keywords—waste management awareness; senior high school students; Indonesia

I. INTRODUCTION

The objectives of the Sustainable Development Goals are good health and well-being, clean water and sanitation, sustainable cities and communities. The realization of these goals in sustainable cities is characterized by the condition of people who have good health, get clean water and sustainable sanitation services to create community welfare. This condition can be enjoyed by the community if the environmental conditions are good without garbage which can cause pollution.

Many studies on waste management have been carried out. Nabegu's research results on the amount of solid waste produced in several cities in Metropolitan City of Kano, so it is recommended that there is a need for public awareness to manage waste [1]. Esmaeilian analyzes the potential of smart cities associated with the community in handling solid waste management [2]. The results of the Virk study on community care in waste management in two cities in the state of Punjab state that there are still many households that do not care about waste disposal systems in their homes [3]. However, over 75% of families in both cities have understood composting, although no one understands incineration.

In general, the community considers the problem of waste management as government responsibility. Even though community participation in waste management is very important. Many studies have stated the importance of the role of the community in waste management. Anschutz state that the aspect of solid waste management is a crucial aspect of solid waste management [4]. Community participation in solid waste management is always required because it is a solid waste management system, for example, to bring it to an agreed point, to separate it from dry and wet waste etc. The key element in the waste cycle: we are responsible for the extraction and processing of mineral resources for everything from food products, paper, plastic, and chemicals to automobiles, ammunition, electronic goods, etc., that modern society is so much dependent upon. This process of converting raw materials into useful products generates a large volume of waste that ends up somewhere on the earth [5]. Hasan said that public awareness is the key to successful waste management [6].

Based on studies on environmental management, there are still a few that discuss the importance of awareness education about waste management for teenage in senior high school. The purpose of this study is to test the ability of high school students about waste management. Studies include: knowledge of waste, processing of organic waste, and processing of an organic waste.

II. METHODOLOGY

This research was conducted in high schools in West Java, a province in Indonesia. For the purpose of this study, the focus of the study was 50 high school students. The selection of students involved in the study was conducted randomly. This research method is explorative by providing training in the form of knowledge about waste, processing organic waste, and processing non-organic waste. This method is in line with Kandil7 research when conducting education and awareness training for technical middle students in Egypt with material packages in the form of: a) Environmental concepts, b) Environmental problems, c) Solid waste management, and d)

Case studies management success stories solid waste in various parts of Egypt.

In this study, all students were given knowledge about the types of waste, the concept of 3R waste management (Reduce, Reuse, and Recycle), and waste management techniques. The assessment of increasing knowledge about waste is measured by providing pre-tests and post-tests during training. The processing of organic waste is done through the practice of composting using the Takakura method. Selection of the Takakura method for several reasons, namely: practical, easy, and odorless. This process is carried out for 2 months to assess the compost produced. To test the ability to process waste, students are given group assignments to make goods from non-organic waste. This activity involves the teacher as the supervisor of each group.

III. Result and Discussions

The word 'waste management' has a broad understanding from the process of collecting waste to processing it. It includes generation, collection, processing, transport, minimization of production, the receptualizing of waste as an economic resource, mobilizing communities in the process, and protection of human health and environment.

A. *Introduction Types of Waste*

Our first visit to high school introduced ourselves and discussed the understanding of waste management education in schools with teachers and principals. These activities are usually carried out through non-formal training activities.

The first meeting with students in class, we asked about their knowledge about waste. All students are able to explain the definition of garbage. However, when we asked about the types of waste, only few students know. Most students stated that they had never attended a waste management training. The purpose of this study, waste management training for senior high school students begins with providing knowledge and understanding of waste.

In the next meeting, we taught about types of waste, the concept of 3R (Reduce, Reuse, and Recycle), and ways to process waste. Material delivered with presentations in class and participants were asked their opinions about good and bad behavior in disposing of garbage, and practicing waste sorting based on its type.

At the beginning and end of the material, students are given a test to fill out the questionnaire to find out the increase in knowledge and understanding of the types of waste and the 3R concept. Based on the test results, 100% of participants knew about the types of waste. In fact, all participants are able to sort waste by type correctly.

Knowledge about the 3R concept has increased. Before the training only 8% of participants knew the 3R concept. After being given training it increased to 93%. Questions are detailed in applying the three concepts and the results are as follows:

- Students who answered correctly about the reduce concept during the pre-test were 48% and increased to 80% at the post-test.
- Students who answered correctly the concept of reuse during the pre-test was 37% and became 78% at the time of the post-test.
- Participants' understanding of the recycle concept increased from 36% to 69%.

B. *Processing of Organic Waste*

The processing of organic waste is done by practicing composting. Before this, students were given the task to bring rubbish from their homes. Then they sort the garbage which can be processed for composting. In this activity students are divided into several groups. Students are taught to process garbage into compost with Takakura baskets. Each group has different treatments of Composting process. The compost is made purely from leaf waste, leaf waste plus molasses, and leaf waste plus manure.

After 3 months of fermentation in Takakura baskets, the compost produced by each group was evaluated. Evaluation of these results is observed through only 3 indicators including: color, smell, acidity, and temperature. All groups managed to make compost well. This is evident among others: i) the odor produced is not foul-smelling as at the beginning of the manufacturing process, ii) has a pH of 8 (alkaline), and iii) the color produced is dark.

The compost produced is used as fertilizer or planting media. Next the participants are assigned to treat the plants by watering them to grow properly.

Fig. 1. Evaluation activity of waste management training.

C. *Processing Anorganic Waste*

The activities carried out are not only through providing knowledge about waste management. Students are given group assignments to utilize non-organic waste such as paper, plastic, rubber, and so on to become useful items. Each group gave a presentation of their work. The resulting work varied, from making stationery stations, ATM coins, storing pens as well as decorations, field stoves, decorative lights, and mini LCD projectors.

Assessment of students' knowledge regarding waste management is carried out through pre-test and post-test. As a result, students' knowledge about processing organic and non-organic waste increased respectively to 98% and 87%. The following is a graph of increasing students' knowledge about processing organic and non-organic waste:

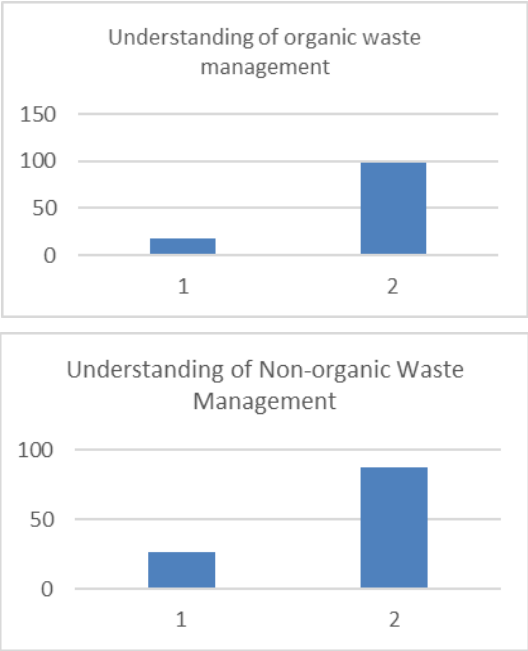

Fig. 2. Assesement of knowledge in organic and non organic waste management.

IV. Conclusions

The conclusion of the research conducted is the importance of education regarding waste management not only for senior high school students but starting from early childhood education. This limited research emphasizes that 'education' in waste management in the form of training is able to improve students' knowledge, abilities and innovations in processing waste. This is proven through the success of students in processing organic waste and making goods from non-organic waste. A standard knowledge material package is needed to be delivered to school students in improving education of environmental management awareness [7].

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