



THE EVALUATION OF STUDENT PARTICIPATION IN IMPLEMENTING 3RS CONCEPT IN SCHOOL WASTE MANAGEMENT PROGRAM

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ABSTRACT

This research was part of the waste management program to support Adiwiyatas' school in SMAN 12 and SMAN 13 Semarang. This research aimed to evaluate the student participation in implementing 3R concept (reduce, reuse, recycle) in school waste management strategies. The data taken using survey methods and determined the respondents purposively. Respondents were 50 students from each school participating in waste management program. Pre and post-questionnaire consisting basic knowledge and self-participation on 3Rs concept in waste management program were used as instruments to measure the student participation. Analysis was performed using paired t-test. The result showed that the students' basic knowledge on waste management strategies before and after the implementation of the program was significantly different ($P < 0.05$), while the student self-participation in the implementation on 3Rs concept was not significantly different. In conclusion, the level of students' basic knowledge increased from moderate to high after the implementation of waste management program in school, while the level of student participation was in active category. The students' participation in waste management was sufficient to support the sustainability Adiwiyatas school program.

Keywords: waste management, 3R concept, basic knowledge, student participation

INTRODUCTION

In order to develop environment and education, since 2006 the Ministry of Environment together with the Ministry of Education and Culture started a program called Sekolah Peduli dan Berbudaya Lingkungan or known as Adiwiyata School Program. Adiwiyata School Program was launched by Ministry of Environment together with the Ministry of Education and Culture and was strengthened by law (PERMEN-LH) No. 2/2009 and later was revised to PERMEN-LH No. 5/ 2013. It is stated in Article 1 that Adiwiyata is a program to create a school which cares to nature. Adiwiyata program is implemented based on educational, participatory and sustained principles. One component of Adiwiyata program aims to grow awareness of the natural environment among people in schools, including positive attitudes and behaviors towards natural environment. The manifestation of this component reflected in the efforts of school community to manage the school with regard to the environmental management principles. The school community consists of the head principal, teachers, all students, janitors, security officers as well as the School Committee.

SMAN 12 and SMAN 13 Semarang are two of many educational institutions in Semarang which committed to do Adiwiyata program. They have gradually equipped themselves with proper facilities and infrastructure. This is in line with the development of conservation programs UNNES who have declared themselves as the University of Conservation since March 12, 2010, and pushed a team in Biology Unnes to implement one of the pillars of the seven pillars of conservation Unnes, namely especially for organic waste management school. One solution in waste management, as stated in Law No. 18/2008 on Waste Management, is the application of 3Rs concept (reduce; reuse, and recycle). Wibowo (2010) asserted that the concept of reduce means reducing the volume and weight of waste, reuse is the reuse or reuse materials from the disposal of waste into materials that can be in use again, for example, building construction waste. Recycle is to separate inorganic objects (e.g. bottles, cans, cardboard and other) from a pile of garbage to be processed back into the raw materials or goods that are more useful. According to Syafrudin (2004), 3Rs concept is still the best waste management strategy to reduce the burden on

landfill (TPA). 3Rs concept is able to reduce waste to 68.3% (Trihadiningrum 2010).

The implementation of waste management programs with the 3Rs concept in partner schools (SMAN 12 and SMAN 13 Semarang) began with the transfer of knowledge of waste management with 3Rs concept, built compost building along with production tools (chopped and sifted compost machines), training of composting, and the implementation and utilization strategy. In this activity, students were involved in all activities. According to Yolarita (2011), the participation of students can be observed and evaluated by the level of knowledge and application of the 3Rs concept in their daily lives. Directly observable participation is categorized as direct participation (Manurung, 2008), including reducing the use of hard-to-degraded materials, sorting trash, removing garbage from waste sources to temporary shelters, re-utilizing waste, and working on school cleanliness. Candra (2012) and Yuliastuti *et al.*, (2013) revealed that community participation in waste management is not only seen from the participation of the community in the process of implementation of waste management, but also from indirect involvement as a member of an organization that deals with the problem of waste, and involvement in the payment of garbage service.

Riswan *et al.* (2011) suggested that the student's basic knowledge about waste management would determine the level of participation in waste management to maintain the cleanliness of the environment. Hermawan & Roesman (2008) concluded that knowledge had a positive correlation with the waste management behavior. Based on the description above, this study aimed to evaluate the students' basic knowledge and participation in waste management with the 3Rs concept, to support Adiwiyata program in SMAN 12 and SMAN 13 Semarang.

METHODS

The research was performed in SMAN 12 and SMAN 13 Semarang. Both schools have become partners in school waste management program through a grant named IbM by Higher Education Directorate in 2015, with a 7-month implementation period. A survey with a questionnaire was used to collect information on the knowledge and participation of students in the implementation of 3Rs concept before and after the implementation of Adiwiyata program. Respondents were 50 students of KIR (Karya Ilmiah Remaja) members in each school and were determined

purposively. The implementation of the waste management program of the school includes two activities, namely: (a) the transfer of basic knowledge of environmental management, especially waste management based on 3Rs concept as guided by the Law No. 18 of 2008 on waste management, as well as the stages of waste management according to Miller (2008); (B) training and implementation of school composting organic waste and utilization strategies. To determine the extent of the increase in knowledge and the level of student participation in the implementation of the 3R concept, the participants were asked to fill out a questionnaire before and after the implementation of the program.

The questionnaire consisted of two parts: (a) Questions to determine the student's basic knowledge about waste management before and after the implementation of the program, consisting of 21 questions referring to research by Abdullah (2011). The correct answer was given a score of 1 (one), wrong answers were given a score of 0 (zero). Thus the highest score was 21 and the lowest value was zero. (b) statements to capture the level of student participation in implementing the 3Rs concept, consisting of 15 items with five alternative answers statements referring Likert scale: frequent (S); quite often (CS); rare (J); ever (P); never (TP). Each scale was scored 4-3-2-1-0 subsequently, so that the student obtained the maximum score is 60 and the minimum score of 0.

To calculate the percentage of the level of participation and the level of knowledge of students before and after the implementation of the program, we used formula as follows:

$$\text{Level of participation/knowledge} = \frac{\text{gained score}}{\text{maximum score}} \times 100\%$$

The results is then converted back into criteria as shown in Table 1, and the data were analyzed paired t-test

Table 1. Criteria Level of Knowledge and Participation of Students in the Application of Waste Management Based on the 3Rs Concept

Score (%)	Knowledge criteria	Participation criteria
75 < Score ≤ 100	High	Active
50 < Score ≤ 75	Moderate	Fair
25 < Score ≤ 50	Low	Less Active
Score ≤ 25	Very low	Inactive

RESULT AND DISCUSSION

The level of student participation in waste management with the 3Rs concept in this study were measured in two indicators, namely: (a) the participation of the students in understanding the basic knowledge of environmental management, especially waste; and (b) the student participation in implementing the concept of reduce, reuse and recycle.

Questions with multiple choice answers were used to capture information about how deep the students basic knowledge is about environmental management before and after the implementation of the program. The instrument consists of 21 items that have been validated based on research by Abdullah (2011). Tabulation of the results of in both schools is shown in Table 2.

Student's Basic Knowledge to Waste Management

Table2. Scores of Students' Basic Knowledge of Waste Management before and after the Implementation of the Waste Management Program in both Schools.

	Pre-test		Post-test	
	SMAN 12	SMAN 13	SMAN 12	SMAN 13
1. Participants (N)	50	50	50	50
2. Average score	11.58	12.12	18.06	18.02
3. Score (%)	55.14	57.71	86.00	85.81 ^{ns}
4. Average score in both schools (%)	56.42		85.90*	
5. Criteria of knowledge	moderate		High	

*) Significant based on p-value ($P < 0.01$) between pre and post-test

^{ns})Not significant between both partner schools.

Scores of students' knowledge before and after the implementation of the program (Table 2) suggests that the level of knowledge of students at both schools before the implementation of the program is still in the moderate category, but after the implementation of the program in the form of basic knowledge transfer and implementation of waste management programs, there was an increase in the high category with an average increase of 29.48%. This suggests that the ability of students to absorb knowledge given is very good. Student's low basic knowledge before program implementation was probably because the environmental management knowledge were not included in the lesson being taught in schools, so that their basic knowledge of waste management in general were obtained from various sources such as internet media, books or public environment. The results showed that in addition to the theory, students' knowledge of environmental management can be maximized through training and implementation of waste management activities.

A way of learning that engages students directly in practice is proven to be more effective and last in the memory of the student than just learning theory. Hermawan and Roesman (2008) revealed that knowledge has a positive relation with a person's behavior in managing waste. While Azizah (2015) in her study

proved that knowledge and behavioral manifestations of students had increased after being given problem-based

learning strategy and supported by the waste management practice.

Student Participation in Implementing 3Rs Concept

Fifteen-item questionnaires were used to collect information about the level of student participation in implementing the concept of reduce, reuse and recycle. Recapitulation of the results in both schools before and after the implementation of the program is shown in Table 3.

The level of student participation to the implementation of the principle of reduce in both partner schools showed lower scores than the scores reuse and recycle. Reduce the principle in this case is any activity that is able to reduce and prevent waste creation. In the school environment, reduction of waste directly from the source (the students) could be used as information about the student's behavior in saving and avoiding the use of containers/packaging, especially plastic. Items in "reduce" part was gained from the students' effort in reducing plastic waste disposal, including: how often students carrying container/bag themselves when shopping,

reducing the use of plastic bags by choosing alternative containers which were made from environmental-friendly materials, saving paper by using the paper on both sides, sorting organic and inorganic waste in temporary shelters, as well as avoiding the use of containers /disposable plastic bags.

The survey results before and after the implementation of the program showed that most students could not answer on aspects “reduce”. The reason that emerged from the respondents said that most of the light snacks available at the school are in the plastic packaging products and there is no other choice. This led to numerous plastics waste which is difficult to

control. Initiatives to bring their own bags when shopping, also got a low score, this is because shopping is often unplanned. Another reason, because the seller always provides a plastic bag to ease buyer in carrying stuffs, and there is no need to object it. Thus, internal rules of not providing plastic bags from food vendors, especially in schools, should be considered, as an effort to encourage the application of the principles of reduce. Students should be encouraged to always bring / provide their own bags when they want to shop.

Table 3. Student Participation Score in Implementing 3Rs Concept before and after Implementing School Waste Management Program.

	Pre-test		Post-test	
	SMAN 12	SMAN 13	SMAN 12	SMAN 13
1.Participants (N)	50	50	50	50
2.Student participation in implementing 3Rs concept:				
a. <i>reduce</i>	12.18	12.50	12.96	12.98
b. <i>reuse</i>	16.56	16.68	16.40	17.44
c. <i>recycle</i>	14.74	15.00	14.94	15.12
3. Average score	43.48	44.18	44.32	45.54
4. Average score (%)	72.47	73.63 ^{ns}	73.87	75.90 ^{ns}
5. Average score in both schools (%)	73.05		74.88 ^{ns}	
6. Participation criteria	Fair		Fair	

^{ns})Not significant based on t-test between pre- and post-test of both partner schools

Prevention of waste generation by doing the principles of reduce is one of the waste management strategy that has both economic advantages in the form of cost savings and additional profits due to using materials that can still be used, thereby reducing the cost of transporting waste to be disposed of to landfill (Shochib, 2008). Integrated waste management can be defined as the selection and application of techniques, technology, and management programs, as appropriate to achieve the specific goals and objectives of waste management, including waste management school. According to Yasa (2012), willingness to manage environmental-friendly waste must be preceded by a shift in perspective in seeing garbage. Garbage should be seen as a valuable economic resource and can be reused, such as in compost manufacture. Changing the perspective can be started with building waste sorting habits, although urging people sorting garbage is very difficult because it involves customs, culture, understanding and level of concern some people which is very low. Moreover, one of the efforts to raise awareness in the community is by setting up Garbage Bank, which have the value of the

rupiah where people can be motivated. Garbage Bank is one way to motivate people to sort waste from the source.

Scores on the implementation of the principle of reuse and recycle is higher than the principles of reduce in both schools. The principle of reuse is the reuse of waste with same function or other functions. In this study, information on how often students apply the principles of reuse were derived from student participation in storing bags/plastic container obtained to be used again, reusing bottles/cans/boxes of plastic for the same function or other function, using cloth as mat, and others. To get information on to what extent the students apply the principles of recycle, we see from how often the students participating in training on recycled plastic materials/fabrics, involving in the recycling process of plastic/fabric, doing composting, and using recycled products (plastics, cloth, cans, etc.).

The survey showed that the majority of students responded well to the statements related to reuse, especially for clean objects worth re-using for the same function or other functions. Similarly, the response to the

experience of recycling organic waste were quite well because schools often teach these activities through wall-magazine, properties, and home composting. Most students often use recycled products because not only it is interesting to learn and try, but also the products are widely available in the market at relatively low prices. Most of the students admitted several times to conduct the recycling of the paper and plastic into crafts (handicraft) student work. This situation is in line with research Sayekti (2012) that the instruction-based learning in school recycling activities may increase students' understanding of creativity, foster creativity works made from raw garbage, increased activity and inculcate the habit of students to live clean and handle waste properly. Similarly, according to research by Fikri (2012), the learning model of science-technology-society-based waste recycling could encourage students' creativity in designing products.

Efforts to reduce landfill waste by implementing the 3Rs concept is not easy for the community, including students. Generally, it is hard for people to change habit. It takes a long and lengthy process because it is associated with values, perceptions, knowledge and attitudes that have been embedded in people's lives. However Henry & Goddess (2010) states that activities and community action against littering is done collectively and occur continuously, and eventually form a pattern of behavior that is relatively stable. Based on the average score of the three principles of 3R, scores before and after the implementation of the program showed no significant increase, ie 73.05% (pre-test) to 74.88% (post-test). However, balanced level of participation of students in both partner schools still above average or included in the category of moderately active (positive).

Previous studies mentioned that the level of knowledge is very influential on public participation in waste management. The higher the knowledge possessed by the community regarding waste management, the higher the level of public participation is, because the public is increasingly aware of the importance of environmental hygiene in the places they live (Mulyadi *et al.*, 2010). Research by Riswan *et al.* (2011) also revealed that the public's knowledge on waste management will determine the level of community participation in waste management to maintain the cleanliness of the environment. Aryenti (2011) in her research concluded that there is a relationship between knowledge and action; the high level of knowledge will influence on the actions of the person in waste management. Similarly, if the student's knowledge on

waste management is adequate, then the behavior of students in treating waste also become better.

CONCLUSION

Waste management program is implemented in SMAN 12 and SMAN 13 Semarang can improve students' basic knowledge of the management of the environment, but has not affected the level of participation of the students to the application of the 3Rs principle in everyday life. Basic knowledge level of students to the management of the environment especially waste management increased in the high category after the implementation of the program, while the level of participation of the students remained on fair category.

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