School-Based Waste Management at SMP Negeri 2 Kupang

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ABSTRACT

This research aims at revealing the effect of knowledge, attitudes, behavior and motivation of students on school-based waste management at SMP Negeri 2 Kupang, finding out the school-based waste management model and the participation of school members in managing school waste at SMP Negeri 2 Kupang.

This research was conducted from January to July 2020 at SMP Negeri 2 Kupang. It was a descriptive qualitative and quantitative research. The data was collected through observation, interviews, socialization, questionnaires, and documentation. The qualitative data analysis was carried out through data collection, data reduction, data presentation and conclusions. Quantitative analysis used multiple linear regression test to analyze the factors that affected School Waste Management.

The results of the study indicated that knowledge, attitudes, behavior, and motivation of students had a significant effect on school-based waste management at SMP N 2 Kupang because partial T statistical test and paired T test were positive after socialization with a significance level of 0.000. The waste management model at SMP N 2 Kupang is 3R program by forming a school-based waste management team that involves school members through socializing waste management, recycling waste by making products that can be used as learning media.

Keywords: Waste Management, Knowledge, Attitude, Motivation, Behavior.

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I. INTRODUCTION

A. Background

East Nusa Tenggara Province is the most southern region of Indonesia that is located at 118-125 degrees east longitude and 8-12 degrees south latitude. This province is a strategic area because it is the southern gateway of Indonesia, especially to the continent and countries of Australia and the Indian Ocean. NTT consists of 19 regencies, 1 municipality, 270 sub-districts, 2533 villages and 303 urban villages. The total population of East Nusa Tenggara in 2019 was 5,456 million people. Kupang is a barometer of the province of East Nusa Tenggara but the production of waste in Kupang increases every year. In 2012, the production per day was 379.78 m³ (182674.0 kg) and it was kept increasing the years after until the production of waste per day was 439.25 m³ (211280.8 kg) in 2018. Sanitation Department of Kupang noted that each person in this capital town now produces approximately 300 to 400 tons of waste per day. This was calculated based on the population in 2019, around 433,970 million people multiplied by the amount of waste per person/day of 3.00 liters/day [1].

The main problem is the limited facilities and infrastructure, and low management system and human

resources which lead to an imbalance between services and the volume of waste. Garbage is a crucial problem for a city or town because it may decrease productivity and will hamper national economic development. According to Law Number 18 of 2008 concerning waste management, it is stated that waste management must be carried out to improve public health and environmental quality and waste can be used as a resource. Therefore, it needs to be managed quickly and correctly.

Schools as a large community are also a source of waste, both organic and inorganic waste. There are 153 elementary schools (SD), 63 junior high schools (SMP), 42 senior high schools (SMA) and 24 vocational high schools (SMK) in Kupang. Waste is also a problem because it can affect the aesthetics of the schools and can cause health problems for school members [2].

State Junior High School (SMP) 2 Kupang which is located in the center of Kupang has 1,298 students. This large number of students has the potential to produce masses of waste every day. The waste is seen scattered everywhere, both behind the school buildings and in front of the classrooms. This is due to the lack of proper waste management. The basic problems are students tend to be undisciplined and disobedient to throw garbage in the trash can be available in classes, lack of socialization in terms of

waste management through 3-R (Reduce, Reuse, Recycle) which has not been implemented. As a result, school members cannot distinguish organic waste from inorganic waste. In fact, they throw all kinds of garbage in one trash can. This attitude indicates low level of sensitivity of school citizens to the waste problem.

II. METHOD

This research was carried out for 6 months starting from January to July 2020. The research location was at SMP Negeri 2 Kupang that covers 4 (four) aspects including knowledge, attitude, behavior and motivation of students towards school waste management. The sample, 389 people respondents, were required to fill out the questionnaires. To determine the number of respondents, the volume and composition of waste is calculated using Slovin formula [3]:

$$n = \frac{N}{1 + ne^2}$$

n = number of required samples (respondents);

N = total population;

e = sample error (10%).

By using the formula above, it was known that the minimum number of samples (respondents) for measuring the volume and composition of the waste was 389 people (consisting of 3 classes of 7th grade, 3 classes of 8th grade, 3 classes of 9th grade So, the calculation was as follows: the number of students in 7th grade was 134 people, the number of students in 8th grade was 138 people and the number of students in 9th grade was 117 people. The method for determining the sample was Stratified Proportional Random Sampling.

The data analysis used in this research were: qualitative descriptive analysis through interviews, questionnaires, documentation, and observation. The descriptive research instrument used a Likert scale to measure aspects of students' knowledge, attitudes, behavior, and motivation towards school-based waste management. The data from the observation of the knowledge aspect in the waste management questionnaire will be scored using a Likert scale.

TABLE I: CLASSIFICATION OF STUDENTS' KNOWLEDGE LEVELS

No	Knowledge level	Category
1	81-100	Very Good
2	61-80	Good
3	41-60	Fair
4	21-40	Low
5	0-20	Poor

The data from the questionnaire on aspects of attitude, motivation and behavior regarding school waste management using the Likert scale assessment criteria, can be seen in the following table:

TABLE II: INTERPRETATION OF ALTERNATIVE ANSWERS

Alternative Answer	Scale
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

Alternative assessment criteria can be seen in the following table:

TABLE III: CATEGORY ASSESSMENT FOR ATTITUDE, BEHAVIOR AND MOTIVATION

Score	Category
0 – 20	Poor
21 – 40	Moderate
41 – 60	Fairly good
61 – 80	Good
81 – 100	Very good

Quantitative analysis was used to answer descriptive hypotheses related to aspects of knowledge, attitudes, behavior, and motivation. Aspects of knowledge, attitude, behavior, and motivation were analyzed using: 1) univariate test (descriptive data analysis) 2) Bivariate test (paired T test or simple linear regression), 3) multivariate test (multiple linear regression) to analyze the factors that affected School Waste Management for respondents in 7th grade, 8th grade and 9th grade using Statistical Package for the Social Sciences (SPSS) version 20 program, with the following equation:

$$PS = \alpha + \beta_1P + \beta_2S + \beta_3PR + \beta_4M + \epsilon_i$$

where:

PS: Waste management;

α : Intercept;

β_1, β_n : Regression Coefficient;

P: Respondent Knowledge;

S: Respondent Attitude;

PR: Respondent Behavior;

M: Respondent Motivation;

ϵ : Error;

I: Respondent number ($i=1,2,3,\dots,n$).

III. RESULTS AND DISCUSSION

A. Development of School Vision and Mission

Research, vision, and mission of the school are closely related. However, based on the research conducted at this school, there was no formulation of an integrated vision and mission of waste management. Vision and mission are focused more on the academic achievement of students. Schools as formal institutions have crucial role in preparing quality human resources and fostering concern for the environment. Therefore, it is very necessary for schools to have a vision and mission that can support school members to care for the environment, more specifically good, effective, and innovative waste management good school vision and mission will affect all school components [4]. The school only prioritizes improving student achievement academically and ignores the character building and attitudes of school members about the environment.

B. Developing Environmental-Based Science Education

Interesting learning a balance between fun activities and opportunities for students to develop curiosity as widely as possible in order to achieve certain competencies. One of the interesting learning is contextual learning. In this learning, students directly learn around the school environment [5].

Character building of students is not a learning process that memorizes a concept or theory but is a habit of being honest, well-behaved, not cheating, not lazy and keep environment clean.

At SMP N 2 of Kupang, science education has also developed environment-based contextual learning focusing on the characteristics of living things, classification of living things, ecosystems, and global warming, where students and teachers use the school environment as a natural laboratory for learning. However, in this study, it was revealed that there was no integration of those elements into other subjects.

C. Waste management policy

Waste management aims to create a healthy school environment and school members. Therefore, the participation of school members is very important. Garbage in the trash cans is immediately disposed without being recycled into useful materials for learning at the school. Based on previous research, there are six elements of waste management including: control of generation, storage, collection, transfer and transport, processing and transportation and disposal. It was further explained that waste management in an area is largely determined by the regulations [6].

Based on the results of research in this school, school members, both students and teachers were still littering. There were students who littered in the classroom and some even littered in the desk drawers. This means that the awareness of school members about waste management is still low and requires a deeper understanding of waste management.

The results of the study also show that school members have not done waste sorting properly. In fact, organic and inorganic waste were mixed in one trash can. Garbage sorting has not been maximized as shown in the following picture:

Fig. 1. Improper waste sorting.

D. The Importance of Pre-test and Post-test

The research indicated that students in 7th grade has low level of knowledge which affected their attitudes, behavior, and motivation in waste management. While students in 8th grade had rather good understanding about waste and the impacts of waste because they learned about environmental pollution and global warming when they were in 7th grade that affected their attitudes, behavior, and motivation in waste management. For 9th grade, they had good knowledge, attitudes, behavior, and motivation after the post-test. The teaching and learning process, which was preceded by a pre-test method and ended by a post-test, aims to see the cognitive development of students. The learning process

consists of 3 stages including assimilation, accommodation, and equilibration. The assimilation process is the process of integrating new information into new cognitive structures that already exist in the minds of students under new situations. The equilibration process is a continuous adjustment between assimilation and accommodation. The results of the pre-test will help assimilate the background knowledge of students with new information so that the teaching materials can be adjusted to the abilities of the students or cognitive accommodation of students will take place for the materials that have not been mastered by them [7]. Thus, the results of the pre-test and post-test can be used as a reference for the waste management process by students of 7th grade, 8th grade and 9th grade so that waste management at SMP Negeri 2 Kupang will be better.

E. Level of knowledge, attitudes, behavior, and motivation of students towards school waste management

Based on the data before and after the socialization, students of SMP Negeri 2 Kupang had good knowledge on waste management. The pre-test score of students at 7th grade for knowledge aspect is illustrated in the following diagram:

Fig. 2. Pre-test score of students in 7th grade before socialization for knowledge aspect.

This result shows that the range of pre-test score of 134 students were between 61 to 80 in which 89 students got between 61 and 80 and 45 students got between 41 and 60. This means that there were only 89 who had good knowledge so that the knowledge of students in 7th grade about waste management was still low. To get good knowledge on waste management, this must be upgraded to 32%.

The post-test scores for aspect of knowledge for students in 8th grade can be seen in following diagram:

Fig. 3. Pre-test score of students in 8th grade before socialization for knowledge aspect.

After waste socialization followed by the post-test were carried out, there was an increase in knowledge, meaning that socialization has significant influence. There were 120 students who got between 81 and 100 which means that they had very good knowledge on waste management and 36 students got between 61 and 80 which means that they had good knowledge on waste management.

The post-test scores for aspect of knowledge for students in 9th grade can be seen in following diagram:

Fig. 4. Pre-test score of students in 9th grade before socialization for knowledge aspect.

The scores indicated that among 117 students, 2 students (2%), got between 81 and 100, 91 students (78%) got between 61 and 80 and 24 students (20%) got between 41 and 60.

The results of questionnaires that were given before socialization for attitude aspects of students in 7th grade can be seen in the following figure:

Fig. 5. Frequency of scores for students in 7th grade before socialization for attitude aspect.

The results of the questionnaire before the socialization for the attitude aspect show that among 134 students, 10 of them (7%) got between 61 and 80 which means fairly good and 12 of them (93%) got between 41 and 60 which means poor.

After waste socialization followed by giving another questionnaire were taken place, the attitude improved. 131 students (98%) got between 81 and 100 which means very good, 2 students (2%) got between 61 and 80 which means fairly good, and 1 student (1%) got between 41 and 60 which means poor.

The results of questionnaires that were given before socialization for behavioural aspect of students in 7th grade can be seen in the following figure:

Fig. 6. Frequency of scores for students in 7th grade before socialization for behavioral aspect.

Before socialization, scores for behavioral aspect of students in 7th grade show that among 134 students, 1 of them (1%) got between 81 and 100 which means very good, 24 of them (18%) got between 61 and 80 which means good, 108 of them (80%) got between 41 and 60 which means fairly good, and 1 of them got between 21 and 40 which means poor.

The results of questionnaires given after socialization for students in 7th grade show that among 134 students, 6 of them (5%) got improved between 81 and 100 which means very good, 122 of them (91%) got between 61 and 80 which means good, 6 students (4%) got between 41 and 60 which means fairly good.

The scores for the questionnaire before socialization for the motivational aspect of students in 7th grade can be seen in the following picture:

Fig. 7. Frequency of behavioral score for students in 7th grade before socialization.

The results showed that scores obtained by students in 7th grade before the socialization for the motivational aspect were 131 students (98%) got between 61 and 80 and 3 students (2%) got between 41 and 60.

After the socialization on waste management followed by giving questionnaire, it was indicated that among 134 students, 2 of them (1%) got between 81 and 100, and 132 of them (99%) got between 61 and 80.

From the results of linear regression analysis (partial T-test and paired T-test), the independent variables (Knowledge, Attitude, Motivation and Behavior) simultaneously affected the dependent variable (Waste Management) significantly, in which $F_{count} > F_{table}$, significance value (0.000) at α level = 0.05 and R^2 value above 90% in each class before and after socialization.

Fig. 8. The percentage of motivational score for students in 7th grade after the socialization.

The independent variables simultaneously affected the dependent variable. However, if viewed partially and in pairs, it was found that several variables in each class and stage of this test had more influence on views about waste management. In fact, T count was positive which means that it had a significant effect, and vice versa, if T count was negative, it had less significant effect.

The survey of respondents shows that for students in 7th grade, variables that had a significant effect before socialization were attitudes and motivation variables. After socialization, the knowledge, attitudes, and motivation were the most significant variables. For students in 8th grade, the variables that had a significant effect before socialization were behavioral variable, while knowledge and motivation had significant effect after the socialization. For students in 9th grade, the variables that had a significant effect before the socialization were knowledge and attitudes. On the other hand, knowledge, attitudes, behavior, and motivation had significant effect after the socialization

IV. CONCLUSION

1. Aspects of knowledge, attitudes, motivation, and behaviour had a significant effect on waste management at SMP N 2 Kupang. Before socialization about waste, the scores of knowledges, attitude, behaviour, and motivation of students were still low. However, the scores of these four aspects increased after socializations for students in 7th grade, 8th grade and 9th grade.

2. The Waste Management Model at SMP N 2 Kupang is forming a school-based waste management team by involving the principal as advisor and also committee and teachers in their respective fields/sections.

3. The participation of school members in managing school waste at SMPN 2 Kupang was conducting socialization about waste management in each class, using 3R (Reuse, Reduce and Recycle) principle, which is to recycle waste by making products that can be used as learning media.

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