

Lekersmulia: Improving Indonesian Students' Environmental Responsibility Using Multimedia In Environmental Learning

Mieke Miarsyah, Diana Vivanti Sigit, Ilmi Zajuli Ichsan, Rahmat Fadrikal, Mahrawi Suprpto

Abstract: This study aimed to examine the effectiveness of Lekersmulia (Lembar Kerja Multimedia Siswa) or multimedia-based student worksheets on environmental pollution material to improve students' Environmental Responsibility (ER). The study was conducted from February 2018 to June 2018 with the experimental method. The study sample was 10th-grade students in 15 schools in the provinces of Jakarta, Banten and West Java with a sample of 1840 students. Lekersmulia was used as the media, which can be accessed at <http://Lekersmulia.blogspot.co.id> and <http://lekersmulia.com>. Based on the results of the prerequisite test, the data showed normal and homogeneous distribution. The hypothesis was done using the t-test by comparing the average gain score of the experimental with the control class. The results of the t-test between pre-test and post-test in experimental group showed the value of $\text{sig.000} < 0.05$, the average gain score comparison shows $\text{sig.000} \leq 0.05$. This showed that learning by the Lekersmulia effective to improve students' ER. In conclusion, Lekersmulia effective to improve students' ER and recommended for teacher to use in class.

Index Terms: environmental learning, environmental pollution, environmental responsibility, experiment student, Lekersmulia, multimedia

1. INTRODUCTION

Environmental problems are a very complex problem and must be overcome. These environmental problems are often found in the environment around us. Problems such as the amount of waste, illegal logging, air pollution, waste of energy are one of the many problems found. Solving these environmental problems also varies, from using various technologies to reduce waste, using energy-saving lamps and so on. All of these behaviors can be included in Environmental Responsibility (ER). Simple terms, ER can be interpreted as behavior that prioritizes the responsibility of maintaining the environment [1–3]. ER improvement can be done in various ways. In education, it can be done by giving innovation in terms of learning media, learning strategies, student worksheets, and teaching materials. All these things can be modified by a variety of material which in the end aims to improve the ER. One way is through Student Worksheets (Lembar Kerja Siswa/LKS). LKS is a learning tool that guides activities that can be carried out by students in the class either individually or in groups [4–6]. The use of student worksheets (LKS) in schools is still limited, the results of needs analysis conducted at Senior High School of 77 and 21 Jakarta. Learning tools used by teachers and students in schools are textbooks (27%), teachers (25%), internet (25%), and LKS (14%). Based on the results of observations, LKS used in schools is a more unstructured student worksheet. A good LKS is a worksheet that has a structured sequence by the basic competencies students want to achieve [7–9]. In this study, Lekersmulia (Lembar Kerja Multimedia Siswa) or multimedia-based student worksheets, used the topic on Biology learning, especially on the use of environmental

pollution materials which included observations, group experimentation activities, making products and recycling exercises. Each activity contains learning objectives, short material, materials and tools, ways of working that direct students to carry out their learning activities and achieve learning goals, as well as discussion questions. The short material is equipped with videos, comics, and pictures that support the material. The workings of each activity use videos, so students are more easily understood [10–12]. The results reported from each activity can be filled in by students on the page provided and automatically sent to the teacher's e-mail. Question exercises are conducted online and interactively. Students can immediately find out their learning outcomes when they are finished working on the problem so that students can measure their development. Previous research related to ER has been studied a lot about the characteristics of ER in society [13,14]. Meanwhile, for ER among students, it is still rarely studied. Especially in environmental learning in schools, it is still rarely studied. The development of worksheets is a novelty in this research because no previous research has developed to improve the ER. This study aimed to see the effectiveness of Lekersmulia in improving student ER.

2. METHOD

The research conducted was quantitative using the experimental method with the control group pretest-posttest design. In this study, Lekersmulia was used as independent variables and ER as a dependent variable. Lekersmulia is website can be accessed in <http://Lekersmulia.blogspot.co.id> and <http://lekersmulia.com>, both pages contain information about environmental pollution materials, and their worksheets see in Figure 1.

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Fig 1. Website Homepage of Lekersmulia

The population of this research was all of the students in Jakarta, Banten, and West Java province, Indonesia. The research place was chosen by cluster random sampling, 15 schools were selected. Finally, to determine the number of samples used simple random sampling and selected 1840 samples of students. The research was conducted from February 2018 to June 2018. Data collection in this study was done by Survey method in the form of a questionnaire on environmental responsibility. The score used for each item is on a scale of 1-7. Each item has been tested for validity and reliability. Indicators of instrument environmental responsibility in table 1.

Table 1. Indicators of Environmental Responsibility Instrument

| No | Indicator | Positive | Negative |
|----|---|-----------|----------|
| 1 | Proactive in maintaining the environment | 1, 2,3 | 9,14,20 |
| 2 | Rational action in preventing environmental damage | 4,5,6,7,8 | 13,16,17 |
| 3 | Innovative in finding solutions to environmental problems | 10 | 11,18 |
| 4 | Consistent in environmental conservation efforts | 12 | 15,19 |

Data analysis techniques used in this study include pre-requisite test data analysis to test the normality and homogeneity of data. The normality test used Kolmogorov Smirnov and homogeneity used Bartlett test. Hypothesis test in this research using the t-test in significance level 0.05. Further analysis was performed by comparing each pre-post score of the experimental class and calculating the gain score. The categories the gain score are as follows in table 2.

Table 2. Gain Score Category

| Gain Score | Category |
|--------------------|----------|
| $g \geq 0,7$ | High |
| $0,7 > g \geq 0,3$ | Moderate |
| $g < 0,3$ | Low |

3. RESULT AND DISCUSSION

The first step done was a normality test, using the Kolmogorov Smirnov test, where the data results were normally distributed. Homogeneity test using the Bartlett test resulted in homogeneous data. The following are the results of the test in table 3.

Table 3. Normality and Homogeneity Test

| Group | | Mean | Normality | Homogeneity |
|------------|------|--------|-----------|-------------|
| Control | Pre | 115.49 | 0.654 | 0.207 |
| | Post | 119.95 | 0.654 | 0.207 |
| Experiment | Pre | 116.78 | 0.052 | 0.062 |
| | Post | 120.00 | 0.052 | 0.062 |

The results of this study the value of normality in all groups was $sig > 0.05$ which showed that the data was normally distributed. From the table also can be seen the value of homogeneity test in all groups was $sig > 0.05$ which shows that the data was homogeneous. After that, a t-test was conducted to find out that the use of Lekersmulia effectiveness in learning before using lekersmulia (pre-test) and after using Lekersmulia (post-test) in experimental group. From the calculation results in table 4, the results of the t-test show the value of $sig < 0.05$. It means Lekersmulia effective to Improve students' environmental responsibility.

Table 4. Result of t-test between post-test and pre-test in experimental group/class

| | Mean | Std. deviation | t | sig |
|---------------|------|----------------|------|------|
| Pre-post test | 4.46 | 20.60 | 6.56 | .000 |

After calculating the t-test, the average gain score comparison showed $sig .000$, which means $sig \leq 0.05$. This shows that there was an influence of the Lekersmulia on the material of pollution towards students' environmental responsibility. The gain score between control and experiment research group can be seen in table 5 as follow. Other results are shown in the form of descriptive data on ER profiles of students after being given Lekersmulia can see in table 6. There was 3 item decrease after use Lekersmulia there in item 5, 8 and 14.

Table 5. Gain Score Experiment and Control Group

| | Data Group | N | Mean | Sig. |
|------------|------------|-----|-------|------|
| Gain Score | Experiment | 920 | 10.08 | .000 |
| | Control | 920 | 3.15 | |

Table 6. Pre test and Post test score of each item ER in experiment classes

| No | Item | Pre | Post | Gain Score | Category |
|----|---|------|------|------------|----------|
| 1 | Picking up trash when there is scattered garbage | 6.07 | 6.13 | 0.06 | Low |
| 2 | Planting trees for go green | 5.72 | 6.06 | 0.27 | Low |
| 3 | Participate if there is a go green activity | 5.72 | 5.81 | 0.07 | Low |
| 4 | Use public transportation to reduce air pollution | 5.43 | 5.84 | 0.26 | Low |
| 5 | Dispose of garbage in the place provided | 6.50 | 6.09 | -0.82 | - |
| 6 | Apply the 3R principle (Reuse, Reduce, Recycle) | 5.38 | 5.89 | 0.31 | Low |
| 7 | Reduce the use of plastic and styrofoam bags | 5.59 | 6.24 | 0.46 | Moderate |
| 8 | Use paper back and forth to save its use | 6.27 | 5.97 | -0.41 | - |
| 9 | Throw garbage in any place* | 5.82 | 6.02 | 0.17 | Low |
| 10 | Utilize organic waste | 5.19 | 5.50 | 0.17 | Low |

| | | | | | |
|----|---|------|------|-------|----------|
| 11 | as fertilizer Don't want to waste time thinking about solutions to environmental problems* | 5.45 | 6.12 | 0.43 | Moderate |
| 12 | Join together to clean the environment | 5.96 | 6.02 | 0.06 | Low |
| 13 | Keep the room lights on even though it is daytime* | 5.80 | 6.16 | 0.30 | Moderate |
| 14 | Throw garbage in the gutter* | 6.23 | 6.06 | -0.22 | - |
| 15 | Let friends throw litter* | 5.77 | 6.11 | 0.28 | Low |
| 16 | Lazy to reforest* | 5.52 | 5.82 | 0.20 | Low |
| 17 | Damaging or removing plants for no reason* | 5.92 | 6.01 | 0.08 | Low |
| 18 | Not interested in recycling used goods* | 5.41 | 5.95 | 0.34 | Moderate |
| 19 | Do not want to try to preserve the environment* | 5.98 | 6.38 | 0.39 | Moderate |
| 20 | Put garbage in the school desk drawer* | 5.76 | 5.78 | 0.02 | Low |

Note: *statement with negative item

Biology learning, especially in environmental material, is a hot issue presently, where environmental problems are a global problem. Since the issue is important, then learning about the environment must be taught as best as possible. Learning about the ER must start from the home environment itself, then taught at school to students for various levels. Learning given at school will have an impact on increasing student knowledge about environment and students ER [15]. This has become one of the good effects in Biology learning for environmental material that can be done by the teacher [16]. Based on the calculation of the hypothesis test, it was found that the use of the Lekersmulia for environmental pollution affects the ER. This was also seen from the difference in scores in the experimental class, which in learning using Lekersmulia within the control class. Lekersmulia was effective to improve ER based on pretest and post-test t-test in experimental class. Success in learning can be supported by many factors, but one of the most important things is the media and learning resources used. The right media and learning resources make learning more effective. One of the multimedia-based media and learning resources is one of them. Lekersmulia has an advantage in general, this causes the score in the experimental class to be higher than the control class. The advantage of Lekersmulia is that there is various content such as images, videos, graphics, and there is a complete guide to what tasks should be done. This makes students interested in learning. Also, learning to use multimedia like this will make students more understanding than before [17–21]. The active role of students will also be seen when students are given learning media that attract their attention [22,23]. However, based on table 6, there is an interesting item which is a decrease in points 5, 8 and 14. This is because these behaviors are inherent in their daily lives so that the treatment in the form of learning with Lekersmulia is not enough. In points 5 and 14 for example, where the habit of disposing of garbage is a habit that is difficult to change. It's not enough to only provide videos or material about garbage. So that the teacher needs to do further efforts, not only to give

Lekersmulia. In addition, item 8 also decreased because the habits of students in using paper are also difficult to change. Various additional treatments are needed, for example, the rules where the exam no longer uses paper or paperless, for example, by using various digital media as a test device [24,25]. The curriculum currently requires students to be able to study independently, especially in biology learning. So that the media and learning resources used must be able to facilitate students to be more active and independent in learning. Student worksheets are made to facilitate students in the process of learning the environment in order to form a scientific character of students that matches the abilities of students in the 21st century [26–29]. This can be seen in the learning process that lasts for three meetings; all students actively use their android to do the tasks that are in the Lekersmulia. Student Worksheet is a medium that can guide students in understanding a concept in a structured manner. The use of Student Worksheets can reduce student passivity so that students are more active because they must solve problems that require them to find facts from each problem [22,30–33]. The combination of Student Worksheets and Multimedia such as Lekersmulia (Multimedia Student Worksheet), can guide students more independently and will provide a different nuance of learning. Learning using multimedia will be far more effective because students can construct their knowledge independently [34–37]. In the Lekersmulia, there were assignments and discussions that must be done, even there was a laboratory activity, the students do practical work in groups, even though the laboratory report must be made individually. Here the teacher acted as a facilitator, gave direction and answered questions raised by students if there was something not understood. That students' worksheets demand student independence, while teachers have little chance of guiding. However, the teacher keeps an eye on the learning [4,38]. The material discussed in the Lekersmulia is material for environmental pollution because this is a warm global issue presently. Pollution and environmental damage currently occur due to a lack of responsibility from the community to protect the environment. The environmental responsibility (ER) is one's activities in carrying out interaction with the environment including utilizing, maintaining, and managing the environment that is based on an awareness of himself as part of the environment, oriented towards values moral development to achieve ecological, social and economic goals [1,39]. While ER is very important because the ER is a wise and conscious attitude in using natural resources and paying attention to the carrying capacity of the environment for sustainable life [40,41]. ER is also a very important thing to be formed, especially for students who are the successors of the future environmental management. The ER that exists in students will make students more sensitive to the environment which will make students prevent actions that damage the environment and have a great responsibility to protect the environment [42–45]. One of the activities at the Lekersmulia is to conduct experiments on the effects of water pollution. Students conduct experiments on the impact of household waste on the life of aquatic biota. Experiments were carried out on fish that had been given detergent waste in it. Through experiments conducted, students can observe the impact of detergent used on the life of biota in water, the fish. Students observe the condition of fish affected by detergent waste, which on a large scale, this water pollution, will not only kill fish

but also endanger human life. The existence of experiments conducted by these students will have an impact on the students' responsibility for the environment to be better. Learning with an experimental approach or by using an experiment will provide information on the knowledge that will shape the knowledge and behavior of students [16,46–50]. Experiments carried out by students to provide their own experience in observing the consequences of water pollution. This will result in students who understand environmental pollution material properly through the use of Lekersmulia to be more aware and improve ER.

4. CONCLUSION

It can be concluded that the use of Lekersmulia was effective for improving ER. This is because Lekersmulia displays a variety of interesting content. This will result in an increase in student ER. Recommendations that can be given to teachers at school based on the results of this study is that it is better to use multimedia-based worksheets because students' ER can increase.

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