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Education Sustainable Development-Integrated Organic Waste Management to Improve Students Sustainability Literacy

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Abstract: This article aims to explore a startegi in the form of the implementation of organic waste management to create sustainable skills and mindsets. The method used in this study is the weak method of experimentation. Instruments used in research in the form of instruments about 15 questions are tested before and after learning. The sample used in this study as many as 32 students in one of the junior high schools in Pandeglang. The results showed an increase between the pretest and postest student results with a significance level of 0.00 which showed that there was an influence between sustainable development education integrated organic waste management and improved sustainability literacy. While the acquisition of N-Gain score of 46.87% with low category, 46.87% medium category and 6.25% in the high category. N-Gain scores show less than optimal results, because some students get low N-Gain grades. Thus, this research can be concluded to be able to increase the sustainability literacy of students with low categories. Therefore, it needs to be re-studied for further research. The results of this study are also useful for anyone who wants to learn about sustainable lifestyles, especially in organic waste management.

Keywords: science learning, sustainable development education, sustainability literacy.

Abstrak: *Artikel ini bertujuan untuk mengeksplorasi sebuah startegi berupa implementasi pengelolaan limbah organik untuk menciptakan keterampilan dan pola pikir yang berkelanjutan. Metode yang dipakai dalam penelitian ini yakni metode weak eksperimen. Instrument yang digunakan dalam penelitian berupa instrument soal sebanyak 15 soal yang diujikan pada saat sebelum dan sesudah pembelajaran. Sampel yang digunakan dalam penelitian ini sebanyak 32 siswa disalah satu SMP dikabupaten Pandeglang. Hasil penelitian menunjukan terdapat peningkatan antara hasil pretest dan postest siswa dengan taraf signifikansi sebesar 0,00 yang menunjukan bahwa terdapat pengaruh antara pengelolaan limbah organic terintegrasi Pendidikan pembangunan berkelanjutan dengan peningkatan sustainability literacy. Sedangkan perolehan nilai NGain sebesar 46,87% dengan kategori rendah, 46,87% kategori sedang dan 6,25% masuk dalam kategori tinggi. Perolehan nilai N-Gain menunjukan hasil yang kurang optimal, karena sebagian siswa memperoleh nilai N-Gain yang rendah. Sehingga dengan demikian, penelitian ini dapat disimpulkan mampu meningkatkan sustainability literacy siswa dengan kategori rendah. Oleh karena itu, perlu dipelajari kembali untuk penelitian lebih lanjut. Hasil dari penelitian ini juga bermanfaat untuk siapapun yang berkenan mempelajari tentang gaya hidup berkelanjutan khususnya dalam pengelolaan limbah organik.*

Kata kunci: *pembelajaran IPA, pendidikan pembangunan berkelanjutan, literasi keberlanjutan.*

▪ INTRODUCTION

Organic waste is one of the materials that contributes a fairly high percentage in the process of environmental pollution, especially during the covid-19 pandemic. New habits to carry out all activities at home have an impact on increasing the contribution of household organic waste. The amount of waste is increasing, making landfill capacity

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unable to accommodate more. Low technology and weak infrastructure make the problem of waste becomes more complicated (Widiarti, 2012). Household organic waste is becoming one of the environmental threats. The remains of household organic waste that is disposed of irregularly or not separated and then mixed with non-organic waste in landfill will have a bad impact. It can pollute the environment. The increase in organic waste production presents concerns for some countries. Therefore, there are some countries that think about the importance of sustainable living. The benefits of sustainable living can have an influence in the present as well as in the future. Therefore, some countries agreed to create a common goal for sustainable living, the goal is a sustainable development goal or commonly called the SDGs (Sustainable Development Goals). The SDGs since 2016 have drawn up a framework and planning until 2030 (Allen, Metternicht, & Wiedmann, 2018).

The SDGs are a sustainable development agenda, which every decision-making will always consider on several aspects, namely the impact on society, the environment, and the economy, and its effect on life in the future (Strange & Bayley, 2011). The SDGs also aim to protect the environment and reduce inequality in the face of increasingly stringent and extraordinary challenges (Mawdsley, 2018). The SDGs are also assumed to be protection for future generations (Menton et al., 2020). Indonesia is one of the countries that participate in it, so it can be ascertained that Indonesia will fully support the sustainable development goals that have three pillars, namely economic, social and environmental and 17 sustainable development goals (Alisjahbana & Murniningtyas, 2018). The sustainability of sustainable development goals one of them can be realized through Sustainable Development Education (SDE).

SDE is a strong interaction between education, public awareness, and paradigms to realize a quality and sustainable future (Rieckmann, 2017). SDE is the right place for students to recognize and solve a problem. This is an effort to train students to deal with all possible problems that will occur both in the near future and in the future (Laurie, Nonoyama-Tarumi, Mckeown, & Hopkins, 2016). Meanwhile, according to (Arbuthnott, 2009) stated that SDE is an approach that is not centered on the attitude approach, but on the habit of acting. In addition, SDE aims to provide ability to students in dealing with unexpected problems or events (Dale & Newman, 2005).

To achieve the sustainable development goals applied through education, it is in dire need of references and guidelines as a benchmark for success in realizing these sustainable development goals. Meanwhile, the guidelines used can be called Sustainability Literacy or Sustainability Literacy. Sustainability literacy is an approach to developing learners' awareness related to sustainability as well as to build skills such as communication and problem solving (Murray, 2012). Sustainability literacy is also a very important and needed ability to reduce the environmental footprint, especially about fostering responsibility and morals (Lee & Manfredi, 2021). According to (Opoku & Egbu, 2018) Sustainability literacy is the knowledge and understanding to make decisions and actions that will be taken that are sustainable to realize sustainable development. Thus, Sustainability literacy is a form of knowledge, skills and mindset of a person that is integrated in the economic, environmental and social scope to realize a sustainable life both in the present and in the future. Therefore, a person can be said to have sustainability literacy when he is able to make an action or decision in accordance with the needs of sustainable development goals.

Learning integrated with SDE is still very rare to be found around the world (Valderrama-Hernández, Sánchez-Carracedo, Rubio, & Limón-Domínguez, 2020).

There are only a few sustainability literacy universities that have been integrated in the school curriculum, it aims to print graduates who have a sustainable mindset and skills to face life in the present and future. As has been done by (Kokkarinen & Cotgrave, 2012) who stated that integrating sustainability literacy in learning in schools / universities is considered to have a big impact that is to form a sustainable student attitude. Thus, sustainability literacy is the first step to forming someone to be able to build a sustainable future (Sekhar & Raina, 2021). Preparing a quality and literate young generation for the importance of preparing for the future should be trained both in terms of attitude, skills and mindset. Therefore, it is important to learn something that is continuous and continuous. In accordance with the characteristics of SDE itself, namely that SDE is a lifelong learning (Mochizuki & Fadeeva, 2010). One of the materials that is quite contextual to everyday phenomena and easily observed by students is environmental pollution material caused by increasing the production of organic waste resulting from human daily activities. Therefore, organic waste management integrated with SDE is an alternative to increase student literary sustainability by reprocessing organic waste into something that is more beneficial both to the environment, social and economic.

▪ METHOD

This research uses a pre-experimental method with research design used is one group pretest-posttest design. The population in the study was all 7th grade students in one of the junior high schools in Pandeglang SMPN 01 Pulosari district of Pandeglang Regency. The sample used in this study as many as 32 students with sampling techniques, namely purposive sampling. Purposive sampling is a sampling technique based on knowledge of population characteristics and the purpose of research (fraenkel et al, 2012). Data retrieval technique is by using instruments in the form of multiple choice questions as many as 15 questions adopted in SULITEST (Décamps et al, 2017) which aims to measure sustainability literacy. Student sustainability literacy analysis techniques based on improving sustainability literacy indicator scores on pretest and posttest use N-Gain scores and are interpreted with categories when $g \geq 0.7$ classified high, $0.3 \leq g < 0.7$ classified medium, and $g < 0.3$ classified low.

▪ RESULT AND DISCUSSION

The results of this study aim to find out the improvement of sustainability literacy through pretest and posttest results. The questions presented in the pretest posttest are multiple choices that include 7 indicators of sustainability literacy. Questions are asked before and after learning with about 60 minutes provided. Student test and posttest results can be seen in Figure 1.

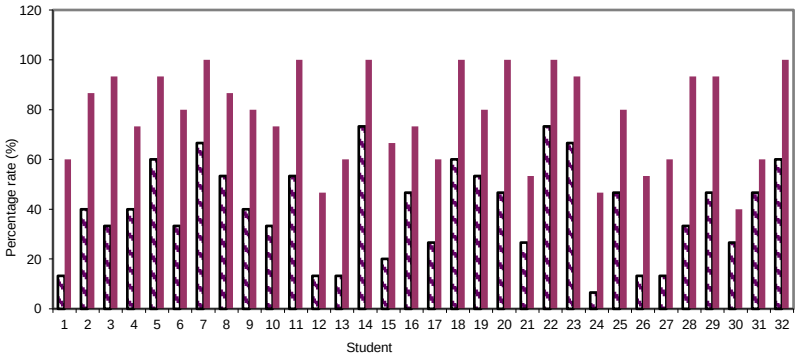

Figure 1. Graph of increasing number of students pretest and posttest grades

Figure 1 shows an increase in students' pretest and posttest Sustainability Literacy scores. The numbers 1-32 in Figure 1 show students taking pretests and posttests. While the numbers 1-100 in Figure 1 indicate the percentage of pretest and posttest scores achieved by students. The highest pretest value obtained is 73.3 and the smallest pretest value is 6.6. While the highest posttest value obtained is 100 and the smallest posttest value is 40. Before the N-gain calculation, sustainability literacy data results are analyzed using SPSS 16 for normality tests and hypothesis tests. The results of the analysis can be seen in Table 1.

Table 1. Results of student sustainability literacy value analysis

Statistical data		**Pre-test**	**Post-test**
		Sustainability Literacy Test	
N		32 Student	
Average		6.00	5.65
Standard Deviation		2.87	1.69
Normality Test (Saphiro-Wilk)	Sig.	0.216	0.136
	Inf.		
	con.	**Normal** data distribution	**Normal** data distribution
Hypothesis Test (Paired Sample T-test)	Sig.	0.000	
	Inf.		
	con.		

Based on the values obtained from the results of the normality test using Shapiro-Wilk stated that the pretest data is normal distribution and posttest data is normal distribution. If the data is both normally distributed then the next stage is the hypothesis test using the Paired Sample T-test. Hypothesis Test results show a significance figure of 0.000 which states that there is an average difference in pretest and posttest results. After that, N-gain calculations are carried out on the results of pretest and posttest values to see the effectiveness of SDE integrated organic waste management to improve Sustainability Literacy. In this study there are 7 indicators of sustainability literacy measured, namely indicators of thinking and acting systematically, the transition to sustainable life, humanity and sustainable ecosystems on planet Earth, individual skills, the role of self to shape and maintain individual and systemic change, in collaboration with others, and indicators of mindset (Décamps et al., 2017). In the 7 available indicators, each indicator gets a different percentage increase. The N-Gain value of each indicator can be seen in Figure 2.

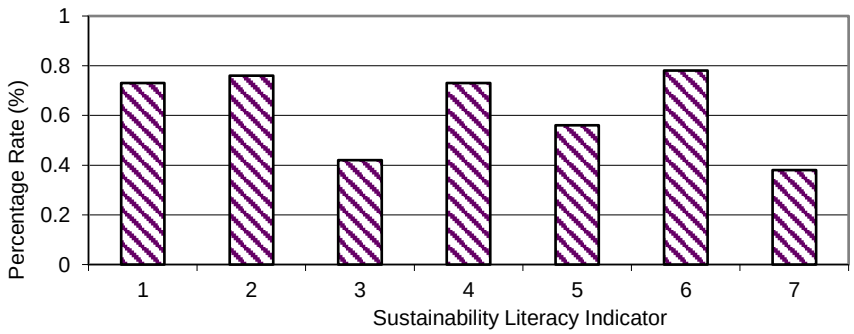

Figure 2. Graph of improvement of each indicator of sustainability literacy

Information:
Indicator 1: Humanity and sustainable ecosystems on planet Earth
Indicator 2: Transition to a sustainable life
Indicator 3: The role of self to shape and maintain individual and systemic change
Indicator 4: Individual skills
Indicator 5: Working with others
Indicator 6: Think and act systematically
Indicator 7: Mindset

Based on figure 2. Which presents N-Gain each indicator of sustainability literacy is seen that of the seven indicators that measured the highest increase obtained on the sixth indicator, namely the indicator of thinking and acting systematically with the value of NGain of 0.78 classified in the high category. Then the second highest NGain value is obtained on the second indicator, namely the transition to sustainable life indicator with the value of NGain 0.76 classified as high category. The first indicator is humanity and sustainable ecosystems on planet Earth and the fourth indicator is the skill of individuals obtaining the same NGain value of 0.73 which falls into the high category. While the acquisition of NGain on indicators of self-role to form and maintain individual and systemic changes, indicators in collaboration with others, as well as mindset indicators obtained NGain values of 0.42, 0.56, and 0.38 where the NGain gains of the three indicators are in the moderate category. So, in the research that has been done the highest NGain value obtained indicator six and the lowest NGain obtained mindset indicator. In line with (Décamps et al., 2017) which explains that the two main contributions in the application of difficultest are to map the extent of sustainability literacy skills in the world as well as to monitor its progress over time. The seven research indicators adopted from sulitest with the scope of SDGs are very helpful in the development of sustainability literacy especially when implemented in learning in schools. The percentage generated from each indicator is also influenced by the state of the environment, facilities and infrastructure that support the learning process in schools. In the research conducted there are media limitations such as the availability of mobile phones owned by children are inadequate, poor signals, as well as limited internet packages, all of which become one of the factors to realize the optimal learning process.

According to (Altameemy, 2017) which states that mobile phones have become an important tool for the majority of people in the world, with its substance as the most effective communication media, in fact in a small part in remote areas it cannot be fulfilled completely. This is one of them in the basis because the local community economy is in the category of less. Based on these factors, there are other things that can not be controlled at the time of online learning. The improvement of sustainability literacy based on the results of NGain sustainability literacy recapitulation can be seen in table 2.

Table 2. Recapitulation of N-Gain sustainability literacy students

	Category	**Number of Student**	**Percentage**
$g \geq 0.7$	Low	15	46.87%
$0.3 \leq g < 0.7$	Medium	15	46.87%
$g < 0.3$	High	2	6.25%

Table 2 states that 6.25% of students earn N-Gain in high categories. While the same percentage ratio of 46.87% get low and medium category N-Gain. Based on the value of N-Gain shows an increase in sustainability literacy in students. SDE integrated organic waste management can foster students' mindset or paradigm about the importance of sustainable living, starting from changing the lifestyle of minimal waste, or zero waste by optimizing the use of foodstuffs used as a form of awareness in maintaining a clean, maintained and sustainable environment. In line with research conducted by (Kristianto, 2020) which states that organic waste management with student assistance in the manufacture of environmentally friendly recycled products aims to develop a sustainable student mindset. Organic waste management can also improve students' skills in realizing something creative (Ceylan, 2020) it also fully supports to improve the economic stability of the community. So that the poverty rate becomes decreased, as explained by (Hannon et al., 2019) that if organic sapmah can not be managed properly can have a negative impact including polluted housing and increasing poverty rates. In addition to organic waste, waste management by recycling sanggar or studio waste to be reused is useful to realize a sustainable lifestyle, this fully supports the ability of sustainability literacy, which is a skill in reducing the environmental impact on us (Lee & Manfredi, 2021).

Sustainability literacy is a skill needed to be cultivated in an increasingly developed era. This aims so that all elements of society are able to be literate to the importance of caring for, maintaining and changing lifestyles in preparing for the life to come. As stated by (Kieu, Fernandez, & Shaw, 2016) that sustainability literacy is a skill that is being widely tested, especially in universities that aims to make college graduates are someone who is insightful, and literate of sustainability values. Efforts in cultivating these skills one of which is that can be applied in learning in school. From the results of the study presented, the research conducted has not obtained optimal results because the achievement of moderate categories with low categories has the same percentage number. Researchers suggest to conduct more research on learning strategies and models or stages of learning that can fully support attitudes, behaviors and mindsets and knowledge against the value of sustainability values whose impact is very significantly influential on human survival on earth.

▪ CONCLUSION

Based on research that has been done stated that learning integrated with SDE has a good impact on improving student sustainability literacy. With an implementation in the form of organic waste management in this study becomes the first step for students to learn and get used to a sustainable lifestyle. Starting from the nearest environment and daily activities becomes one of the steps in opening the paradigm or mindset of students to be more open and literate will live sustainably. Based on data analysis and discussion, it can be concluded on SDE integrated organic waste management research that can improve sustainability literacy capabilities with pretest and posttest results experiencing an increase seen from N-gain results of 6.25% of the number of students getting N-Gain with high categories. While the same percentage ratio of 46.87% get low and medium category N-Gain. Hopefully this research can be the basis of science for further research to create a more literate generation of sustainable living.

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