



Use Of Waste In The School Environment Of Muhammadiyah Middle School Students Training Eco Enzym Production Day

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Info Artikel	Abstrak
Article History Juni Kata Kunci <i>Limbah, Enzim Eko, Produksi</i>	Abstrak Pemanfaatan sampah di lingkungan sekolah merupakan salah satu aspek penting dalam upaya menjaga kelestarian lingkungan. Artikel ini mengkaji praktik pemanfaatan sampah di Sekolah Menengah Pertama (SMP) Muhammadiyah Pelaihari dengan fokus pada produksi Eco Enzyme. Eco Enzym merupakan larutan yang dihasilkan dari fermentasi bahan-bahan organik, seperti sisa buah, sayuran dan bahan organik lainnya. Tujuan dari penelitian ini adalah untuk mengetahui sejauh mana pemanfaatan sampah dapat dilaksanakan oleh siswa di SMP Muhammadiyah Pelaihari melalui produksi Eco Enzym. Mereka terlibat aktif dalam pengumpulan sampah organik, melakukan proses fermentasi, dan merawat Eco Enzyme yang dihasilkan. Ditemukan bahwa siswa mengalami peningkatan kesadaran akan pentingnya pengelolaan sampah dan dampak positifnya terhadap lingkungan. Penerapan produksi Eco Enzym di sekolah ini juga memberikan dampak positif pada aspek pendidikan. Peserta didik terlibat dalam pembelajaran praktis yang memperkaya pengetahuan mereka tentang siklus daur ulang sampah dan kontribusi positifnya terhadap lingkungan. Pembelajaran ini tidak hanya terbatas pada aspek keilmuan saja, namun juga melibatkan aspek sosial dan keterampilan kolaborasi, karena siswa bekerja sama dalam tim untuk mencapai tujuan produksi Eco Enzym. Penelitian ini menunjukkan bahwa pemanfaatan sampah di lingkungan sekolah, khususnya melalui produksi Eco Enzyme, dapat menjadi model yang efektif untuk meningkatkan kesadaran lingkungan dan melibatkan siswa dalam praktik berkelanjutan. Implikasi dari temuan ini dapat menjadi panduan bagi sekolah lain untuk mengadopsi praktik serupa, menciptakan lingkungan pendidikan yang berkelanjutan dan bertanggung jawab secara ekologis. Selain itu, penelitian ini juga memberikan kontribusi literatur mengenai pendidikan lingkungan hidup dan pemanfaatan sampah dalam konteks pendidikan formal. Utilizing waste in the school environment is an important aspect in efforts to maintain environmental sustainability. This article examines waste utilization practices at Muhammadiyah Pelaihari Junior High School (SMP) with a focus on Eco Enzyme production. Eco Enzyme is a solution produced from the fermentation of organic materials, such as the remains of fruit, vegetables and other organic materials. The aim of this research is to explore the extent to which waste utilization can be implemented by students at Muhammadiyah Pelaihari Middle School through Eco Enzyme production. They are actively involved in collecting

organic waste, carrying out the fermentation process, and caring for the Eco Enzyme produced. It was found that students had increased awareness of the importance of waste management and its positive impact on the environment. The implementation of Eco Enzym production in this school also has a positive impact on educational aspects. Learners engage in practical learning that enriches their knowledge about the waste recycling cycle and its positive contribution to the environment. This learning is not only limited to scientific aspects, but also involves social aspects and collaboration skills, because students work together in teams to achieve Eco Enzym production goals. This research shows that the use of waste in the school environment, especially through the production of Eco Enzymes, can be an effective model for increasing environmental awareness and involving students in sustainable practices. The implications of these findings can serve as a guide for other schools to adopt similar practices, creating a sustainable and ecologically responsible educational environment. Apart from that, this research also contributes to the literature regarding environmental education and the use of waste in the context of formal education.

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INTRODUCTION

The school environment has a very strategic role in shaping students' attitudes and behavior towards the surrounding environment. Holistic and sustainable environmental education is an important key in equipping the younger generation with a deep understanding of the need to maintain the sustainability of nature. One of the main challenges in this context is waste management, which is a global issue that is not only related to environmental aspects, but also to public health and sustainable development. Muhammadiyah Pelaihari Junior High School (SMP) responded to this issue by designing and implementing an initiative to utilize waste through the production of Eco Enzymes. Eco Enzym, which is produced from the fermentation process of organic materials, is an innovative solution that can be applied in school environments to manage organic waste sustainably. This article aims to examine waste utilization practices at Muhammadiyah Pelaihari Middle School, particularly through Eco Enzym production, and explore its impact on students' environmental awareness.

Waste is a daily problem for human life in the world, this is because waste production occurs every day. In developed countries, waste problems can be overcome with various technologies, whereas in developing countries the handling of waste processing is not optimal

(Akhlis and Masyrukan, 2016; Azkha, 2007). In fact, simple technology can be used to process waste into various environmentally friendly products, one example is making waste as raw material for other natural resources. Plastic waste can be converted into motor vehicle fuel, while organic waste can be converted into organic fertilizer (Dewi et al., 2007; Chrystomo et al., 2018). Hidayati et al. (2016) added that the use of bioethanol as fuel has good prospects, increasing octane number, combustion efficiency so that it is more environmentally friendly. Eco-enzyme was first developed by Dr. Rasukan Poompanvong comes from Thailand. Eco-enzyme is a multifunctional liquid produced from the fermentation of waste or organic waste, brown sugar/granulated sugar, and water. Eco-enzym is a magic liquid, even though it only has three basic ingredients, its benefits are very environmentally friendly, such as the eco-enzym production process produces O₃ gas (the same as planting 10 trees), one liter of eco-enzyme solution can purify contaminated river water. , as an antiseptic and fertilizes the soil (Dewi et al., 2007; Megah et al., 2017; Bernadin et al., 2017).

Several research results, as mentioned by Astra et al, (2021), show that the use of eco enzyme has had a good influence on the growth of chilies, which is characterized by greater height, stem diameter, leaf width and greener color than plants without eco enzyme fertilizer. Likewise, it

was reported that eco enzyme was effective in increasing the growth and productivity of eggplant for 3 months (Diputra, 2020). The fermentation process in the first month will produce alcohol, then in the second month it will produce vinegar and in the third month it will produce enzymes. In the third month, eco enzyme can be used (Prasetio, 2021). However, excessive use of eco enzyme can cause plants to wilt and die because of the high acid levels. Therefore, education is very important to convey caution in applying eco enzyme as a fermented fertilizer. Apart from its benefits for agriculture, eco enzyme can be used as an air filter, natural pesticide and water filter

The importance of exploring the potential for using waste in the school environment is not only related to solving waste problems, but also by educating students to become agents of change who care about the environment. Organic waste, most of which can be recycled, provides a great opportunity to be turned into a valuable resource. Initiatives such as Eco Enzym production are strategic steps in changing the waste paradigm from a burden to an opportunity. The global context shows that climate change, biodiversity loss and waste problems pose serious threats to the sustainability of our planet.

Therefore, real and effective steps on a local scale, such as those taken at Muhammadiyah Pelaihari Middle School, are very meaningful. In line with sustainable development goals, the use of waste in schools is not only a necessity, but also an integral part of a curriculum oriented towards sustainable learning. In an effort to achieve success in implementing Eco Enzyme production, Muhammadiyah Pelaihari Middle School chose a participatory approach through direct practice in making eco enzymes. By actively involving students in the entire process, from planning to evaluation, it is hoped that learning can be created that is more comprehensive and sustainable. Students' activeness in managing waste at school is one indicator of success in creating an environmentally friendly school environment. This article not only covers the practical aspects of Eco Enzym production, but also involves dimensions of education, environmental awareness and social impact. By understanding the implications of using waste in the school environment, we can develop a richer view regarding the role of schools in forming a generation that is responsible for environmental sustainability.

RESEARCH METHOD

This article is the result of social studies learning activities carried out in August, the first week of the odd semester 2023, involving all school students, namely teachers and students. The students involved were 21 people from classes VII, VIII, XI and a teacher. The first step in learning begins by watching a video that shows in detail the process of making eco enzymes. This video aims to provide students with an initial understanding of the ingredients needed, the steps that must be followed, and the benefits of eco enzymes. After watching the video of the process of making eco enzymes, 21 students were divided into 3 groups, each student was complete with their respective tools. 1 group consists of 7 students. This group division aims to facilitate collaboration and teamwork in carrying out the next stages more effectively.

The first step taken after group division was to pick up fruit waste that had fallen around the school environment, collect and sort the waste. Students are asked to identify types of waste that can be used in making eco enzymes. Waste sorting is carried out to ensure that the raw materials used meet the needs in the eco enzyme manufacturing process. After the waste is collected and sorted, students begin the process of making eco enzymes according to the instructions given. Cut the fruit waste into the smallest pieces so that it can be put into the bottle. Then grind the brown sugar using a knife so that it dissolves easily in water.

After the creation process is complete, each group makes a presentation in turn. This presentation includes an explanation of the materials used, the steps taken, and the final results of the eco enzyme that has been produced. The final step is to fill out the Student Activity Sheet (LKPD) which contains the steps for making eco enzymes. Participants were asked to write down in detail every step they took during the process of making eco enzymes. This aims to ensure that participants can repeat and understand the process in writing, and can use it as a guide for them in the future.

By following these stages, participants are expected to experience holistic learning, from understanding concepts to practical skills in making eco enzymes. In order to improve the quality of the results obtained from eco enzyme processing activities, the author has supplemented the analysis with relevant literature. The number of literature used was 11 articles related to the eco enzyme processing process. This literature study includes theoretical understanding based on book and article

references, as explained by Sarman (2004). Apart from a theoretical approach, this article also adopts an empirical approach as a basis. On this basis, it is hoped that students' production results in the form of eco enzymes can provide a comprehensive contribution to the field organize the results of activities scientifically and rationally. This approach allows for more in-depth description, combining practical experience with grounding strong theory to better achieve research objectives.

RESULTS AND DISCUSSION

Making eco enzymes has a broad impact on the environment globally and also has positive implications from an economic perspective. From an environmental perspective, during the enzyme fermentation process, O_3 gas is produced, known as ozone (Rubin, 2001). Eco Enzyme contains Acetic Acid (H_3COOH) which has the ability to kill germs, viruses and bacteria. Apart from that, the enzyme content such as lipase, trypsin and amylase can kill or prevent the growth of pathogenic bacteria. This process also produces NO_3 (Nitrate) and CO_3 (Carbon trioxide) as nutrients needed by the soil. From an economic perspective, enzyme production can reduce expenses for purchasing floor cleaning fluids and pesticides (Eviati & Sulaeman, 2009). The fermentation process in making eco-enzymes lasts for 3 months. After that, the fermented liquid, which is dark brown in color and has a strong sweet and sour fermented aroma, can be used immediately.

Eco-enzyme provides various benefits, especially in the midst of the pandemic that has occurred, it can be used as a disinfectant and hand sanitizer in everyday life. In the health sector, eco-enzymes can act as medicine to heal wounds, relieve infections, and treat allergies in children. In the agricultural sector, eco-enzymes can be used as fertilizers and pesticides. From a household economics perspective, the use of eco-enzyme can save costs because it can be used as a cleaner and germ remover for various needs, such as cleaning floors, toilets, window panes, stoves, washing dishes, clothes, and even as a spa ingredient to smooth blood vessels. The Ecocommunity concept is an idea to create a society or community that cares about the environment, with the main focus on managing organic waste into eco-enzymes and using them commercially (Lutfiyyah, 2010). Muhammadiyah Pelaihari Middle School carries out eco enzyme processing activities due to the large volume of fruit waste around the school environment. The

Muhammadiyah Pelaihari Middle School environment is surrounded by various types of fruit plants, including rambutan trees, jackfruit trees, mango trees and kedondong trees. These fallen and almost rotting fruits are then mixed and fermented in brown sugar water for 3 months.



Figure 1. Sorting fruit waste to be put into brown sugar water

Source: Activity Documentation, August 2023

Eco Enzyme is made from the remaining skin of fresh fruit, not taken from those that have undergone processing and are rotten. The composition of this raw material consists of 80% fruit. It is important to note that oil-containing fruit skins and hard, dry parts cannot be used, as this can result in fermentation failure. The ratio of organic materials is 3:1:10 for glucose, water and fruit peel, with a water content of 60%, which can be filled in containers. (Marlinda et al., 2023). In the eco enzyme processing process at Muhammadiyah Pelaihari Middle School, large plastic bottles measuring 1.5 liters and 550 ml are used, filled completely with water that has been mixed with brown sugar. Students must be able to ensure that pieces of fruit can fit into the bottle and that the fruit that is cut into pieces is fruit that is not rotting. When grinding brown sugar, students do it in various ways, including some who chop it finely with a knife and some who grind it using a stone. This is done because the water and brown sugar must be sure to dissolve in the water. A total of 21 students were actively involved from the process of sorting rotten and non-rotten fruit to the eco enzyme processing process which was carried out at school.



Figure 2. Process of cutting fruit
Source: Activity documentation, August 2023

After one by one the groups mixed all the ingredients into plastic bottles, each group was required to make a presentation regarding the process of selecting fruit waste to the process of making eco enzyme, each group was also asked for their opinion about making eco enzyme related to school environmental problems. In the presentation process, each group is required to display the results of the eco enzyme by writing the group order along with the date of manufacture on each bottle containing eco enzyme liquid. This is so that students are able to count the days when eco enzyme can be used. After the presentation is finished, students return to fill out the LKPD relating to the eco enzyme processing process from start to finish. At the end of the activity, students brought bottles containing eco enzyme into the class to be arranged on the table at the front of the class



Figure 3. Group photo after finishing making eco enzyme

Source: Activity documentation, August 2023

After a period of 3 months, this new solution from Eco Enzyme can be used in everyday life and as a liquid organic fertilizer. Eco Enzyme solution can be produced for soap making needs by mixing it with Lerak. Eco Enzyme has various applications in the household, such as washing dishes, washing clothes, mopping, providing room aroma, detoxification, mouthwash, bathroom cleaning, shampoo, liquid organic fertilizer (POC), as well as cleaning waste water and air. The uses of eco enzyme solutions are very diverse, so it can be considered a multi-purpose solution that helps with household needs. The fermentation process which lasts for 3 months begins by producing alcohol in the first month, acidic vinegar in the second month, and ecoenzyme in the third month. After a period of 3 months, the ecoenzyme is filtered using gauze or a filter. The resulting residue can be reused for the production of new batches as a starter which helps speed up the process of making the next eco-enzyme by adding fresh waste. Residues can also be dried or buried in the ground as fertilizer, or used to help the decomposition process in septic tanks by crushing them and putting them in the toilet drain (Maharmi et al., 2022)

CONCLUSIONS

The use of fruit waste in the Muhammadiyah Middle School environment which can produce eco enzyme production has a great influence on students' awareness of protecting the environment around the school. The process of making eco enzyme emphasizes the active role of students. Students are directly involved in waste collection to the eco enzyme production process. Utilizing waste and producing eco enzymes in schools can be a concrete step towards environmental sustainability. This reflects the awareness of schools and students of the importance of protecting the environment. This article has an educational element, by conveying information to readers about how waste utilization and eco enzyme production can be part of environmental education in schools.

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