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Community Empowerment through Waste Management into Ecobricks

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Abstract

Plastic waste in eco-bricks is one of the innovative solutions to reduce the negative impact of plastic waste on the environment. Ecobricks are plastic bottles filled densely with non-organic plastic waste cut into small pieces, forming a sturdy building material that can be used for various construction purposes. The socialization program for the use of waste in eco-bricks is one of the important initiatives in overcoming the increasingly worrying problem of plastic waste. This program aims to increase public awareness about the importance of plastic waste management, reduce the amount of plastic waste that ends up in landfills, and provide alternatives to using plastic waste that is more useful. This service uses the PAR (Participatory Action Research) method by directly providing education to students, including the lecture and question and answer method. Through this socialization, the community is invited to actively participate in making eco-bricks, understand the techniques and benefits, and apply them in daily life. The result of this service is creating a cleaner environment, reducing plastic pollution, and forming collective awareness to preserve the environment through concrete actions. This service concludes that eco-bricks are an effective and sustainable solution to overcome the problem of plastic waste while providing added value to the community. Further development and socialization of the use of eco-bricks are expected to encourage wider participation from the community in managing plastic waste creatively and environmentally friendly.

Keywords Ecobricks, Socialization, Waste Utilization

INTRODUCTION

Waste is one of the problems in Indonesia that can hurt both the environment and public health. Waste is closely related to population growth and tends to increase yearly. The increase in volume and type of waste is also related to people's lifestyles.

Environmental cleanliness is a shared responsibility of children and adults (Hasanah, 2021).

According to (Hemalatha & Visantini, 2020), every human activity will produce waste or garbage where the amount or volume of waste is proportional to the level of consumption of goods/materials used daily. The same is true for the type of waste; it also depends on the material we consume. One person, on average, produces more than half a ton of waste per year, so if calculated, it is about one kilogram per day. If this is managed properly, it will help the environment and society. An example that can be raised is the existence of a breeding ground for Aedes Aegypti mosquitoes, which plays a role in the transmission of Dengue Hemorrhagic Fever disease and can reduce the beauty of the environment (Ranti, 2021). One example of a problem with waste is plastic waste. The public widely uses plastic in general for buying and selling activities. Plastic waste is used goods that are not used, and the material is produced from non-renewable chemicals (Nirmalasari et al., 2021). However, other types of inorganic waste cannot be decomposed, not only plastic waste. This can cause other problems that are detrimental to the community if not immediately handled properly.

Environmental cleanliness is everyone's responsibility. It is necessary to be given understanding and habituation from an early age to become individuals who can maintain environmental cleanliness, starting from building the habit of throwing garbage in its place to reusing waste that can still be used/reprocessed. Waste, especially garbage, deserves attention. Waste management is known as the "3R principle, namely Reduce, Reuse, and Recycle (Arisona, 2018). This service activity will focus on the principle of recycling through eco-bricks. Therefore, socialization activities were carried out at one of the elementary schools in Bondowoso, namely "SDN Badean 02," to provide education about waste management by making eco-bricks.

Ecobrick is Made from used plastic bottles filled with soil, foam, plastic food wrappers, plastic bags, and other plastic materials (Antico et al., 2017). Ecobrick is usually made from used plastic bottles filled with other smaller plastics. Ecobrick is a waste management technique made from used plastic bottles filled with garbage until they are full and then compacted until they become hard. After the bottles are full and hard, the bottles can be assembled with glue and assembled into tables, simple chairs, wall-building materials, towers, and small stages, and even have the potential to be assembled into fences and foundations of simple playgrounds and even houses.

Manisha & Singh (2017) mentioned the benefits of making eco-bricks among others: 1) Waste management; Making eco-bricks is one of the efficient ways to process plastic waste and can be done by everyone because of its easy manufacture; 2) Protect

the environment by reducing the amount of plastic waste; 3) Making eco-bricks used as building materials or furniture can reduce their production costs (Mohamed et al., 2017).

This program aims to increase public awareness about the importance of plastic waste management, reduce the amount of plastic waste that ends up in landfills, and provide alternatives to using plastic waste that is more useful. Further development and socialization of the use of eco-bricks are expected to encourage wider participation from the community in managing plastic waste creatively and environmentally friendly.

METHOD

This service uses the PAR (Participatory Action Research) method and the descriptive method through a qualitative approach. The PAR (Participatory Action Research) method is a service activity through research as a result of the service process, namely research that begins with the planning, implementation, and evaluation of an activity or action (Salviana et al., 2022). This activity is carried out by providing education directly to students, including using the lecture and question and answer method (Wilyanti et al., 2023). This aims to provide education to grade V students about waste management. This activity aims to provide information or education about the use of waste as eco-bricks for the environment to increase students' awareness and creativity in cleanliness and health in the surrounding environment. The target of this activity is students of SDN Badean 01 Panti as a form of knowledge sharing in waste management.

The processing of ecobricks is quite easy. But it must start right. Follow the simple instructions to create an ecobrick: 1) Collect, separate, and clean up the garbage to make ecobricks. 2) Choose the same brand and bottle size. The most bottles in your community. 3) Having eco-bricks in the same bottle will make it easier and embellish the results. 4) Use a wooden stick to compact. 5) Avoid iron and glass, which will damage the bottle. Avoid paper and food scraps that will decompose. 6) Put in waste, such as colored soft plastic, for the bottom of the bottle to make the eco brick building construction colorful. 7) It is very important to ensure the quality of eco-bricks. Ecobrick scales are recommended to have weights. Minimum weight = bottle volume x 0.33 g/ml and 1500 ml = 500 g, 600 ml = 200 g is a good minimum density of eco-bricks. 8) Label each ecobrick: name, date, weight, serial number.

FINDINGS AND DISCUSSION

Based on the implementation of socialization regarding the use of waste in eco-bricks, some of the school's grade V students already know what eco-bricks are. However, the problem is that students have yet to be able to sort waste between organic

waste and inorganic waste. At the school, different trash cans have been provided. The socialization of the use of waste into eco-bricks is carried out in 2 stages: The first stage is to provide education to grade V students in the classroom.

The first stage is to educate class V students in the classroom. The material presented was the meaning of eco-bricks, the purpose of eco-bricks, the benefits of making eco-bricks, and examples of works from eco-bricks. After an explanation of eco-bricks, students are given several questions about the previous explanation or education.

The second stage is providing education for class V students outside the classroom. Eco-bricks directly manufactured the material presented. The garbage was obtained from the school environment. At the school, there is not so much waste, so making eco-bricks is only to make one bottle per student, not to produce work. The emphasis here is not on students' success in making work from using waste through eco-bricks but on how students understand what waste can be made into eco-bricks. After the two stages were completed, we gave a small appreciation to the students who successfully answered the questions in socialization stage 1 and succeeded in making one eco brick bottle.

Figure 1. Training on Processing Waste into Ecobricks

Based on the socialization activities carried out, the following results were obtained: (1) Students have enough knowledge about the use of waste in eco-bricks. (2) Students can sort the garbage that is thrown away so that the garbage disposal is not mixed in 1 garbage can. (3) Students can sort waste used to make eco-bricks. (4) Students have high enthusiasm and curiosity about the use of waste in eco-bricks.

The research reveals a significant increase in community awareness and involvement in managing plastic waste through ecobrick production. The program, conducted with Participatory Action Research (PAR) methodology, directly engaged students at SDN Badean 02, Bondowoso, in workshops focused on plastic waste reuse

and eco-brick construction (Jamiah et al., 2019). This initiative has effectively enhanced participants' understanding of plastic waste impacts and practical waste management methods.

Positive Environmental Impact: One notable outcome is reducing plastic waste at the school and surrounding community. Through hands-on learning, students learned how to compact plastic waste into eco-bricks, which were then repurposed for various practical applications (Nabilah Mokhtar et al., 2023). The program created a cleaner environment by decreasing waste accumulation and diverting plastic from landfills (Anh Khoa et al., 2020).

Sustainable Waste Management Practices: This research further illustrates the educational impact of engaging young students in sustainable waste management. By embedding these practices early, participants developed habits around reducing, reusing, and recycling waste (Soliati, 2019). Students demonstrated enthusiasm in promoting eco-bricks as an environmentally friendly solution to local waste issues, encouraging family members and peers to contribute plastic waste for continued eco-brick production (Ap. Moreira & Wanda Rutkoskwi, 2021).

Community Benefits and Practical Application: Beyond environmental benefits, the program provided a cost-effective method for creating furniture and building materials from recycled plastic (Chams & García-Blandón, 2019). The community has begun to use eco-bricks as low-cost resources to construct benches, tables, and playground structures, emphasizing the long-term practical value of recycling (Ibn-Mohammed et al., 2021). This approach offers both an innovative waste solution and an economic benefit by reducing the need for new materials.

Future Development: With the community's positive response, future program expansions could increase the scale and diversity of ecobrick applications. There is potential to involve a wider network of schools and local organizations in Bondowoso, enabling the broader community to engage actively in waste management initiatives. Continued education and training can further embed these practices, fostering an environmentally conscious culture and sustainable waste management model across the region (Kasapa & Gyan, 2023).

This study's findings align with research on eco-brick implementation for plastic waste management and community engagement. For instance, (Haghdan & Smith, 2015) highlighted ecobricks' dual role in managing waste and reducing the environmental footprint through an accessible, scalable solution. The present study reinforces these findings by demonstrating how eco-bricks can be seamlessly integrated

into educational settings, engaging students directly in sustainable practices and effectively promoting waste reduction and recycling awareness.

Regarding theoretical perspectives, the 3R (Reduce, Reuse, Recycle) waste management framework underpins this research, particularly emphasizing the 'Recycle' aspect. Ecobrick construction embodies this principle, converting otherwise unusable plastic into practical resources, thus minimizing waste that traditionally ends up in landfills (Awasthi et al., 2021). Furthermore, this aligns with Bandura's Social Learning Theory, as students and community members model and reinforce positive environmental behaviors through repeated engagement and visible outcomes, like completed ecobrick projects (Ripno et al., 2021).

Comparatively, previous research has often focused on eco-bricks as merely a waste management solution. However, this study broadens the scope by emphasizing ecobricks' educational and social benefits, a perspective also supported by Hart's Ladder of Youth Participation theory (Abdallah et al., 2020). This theory suggests that involving young people in meaningful community projects, such as ecobrick-making, enhances their sense of responsibility and community pride (Zebua, 2021). Through the program, participants transitioned from passive consumers to active agents of environmental stewardship, actively participating in sustainable solutions rather than just observing them (Allen et al., 1996).

Additionally, the economic impact observed in this study aligns with earlier findings on the cost-saving potential of eco-bricks. As highlighted in studies on sustainable construction practices, using recycled materials can reduce the need for new resources (Rane, 2023). This study echoes these findings, showing how the community has started using eco-bricks as low-cost furniture and playground structure alternatives. This demonstrates a practical application of the 3R principles and provides an economic incentive for continued community participation, consistent with the Sustainable Development Goal (SDG) 12 on responsible consumption and production (Chaves-Avila & Gallego-Bono, 2020).

In summary, by coupling theoretical frameworks with hands-on engagement, this research supports eco-bricks as a sustainable, community-driven solution to plastic waste. It provides a model that can be adopted by other schools and communities, broadening the scope and sustainability of waste management practices in line with both environmental and educational goals.

CONCLUSION

Based on the results of the socialization carried out, the manufacture of eco-bricks is considered to reduce waste in the school environment. With the education carried out,

students can sort waste that can be used as eco-bricks and have high enthusiasm for curiosity about the use of waste in eco-bricks. Therefore, eco-bricks are an effective and sustainable solution to overcome the problem of plastic waste while providing added value to the community. Further development and socialization of the use of eco-bricks are expected to encourage wider participation from the community in managing plastic waste creatively and environmentally friendly.

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