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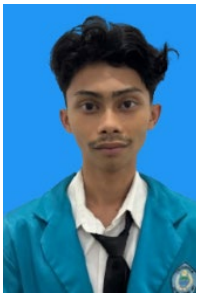

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OPTIMIZING PLASTIC WASTE MANAGEMENT THROUGH DECOMPOSITION EDUCATION AND ECOBRICK IMPLEMENTATION IN KEDUNGBOKOR VILLAGE

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Abstract
Background. Waste problems remain an environmental challenge in rural communities, including Kedungbokor Village, Larangan District, Brebes Regency. Low public awareness of waste sorting and limited educational media on waste decomposition times lead to suboptimal waste management.

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Aims. This community service activity aims to increase community knowledge and participation in inorganic waste management by providing educational media on waste decomposition and training in making ecobricks.
Methods. The implementation method uses a participatory approach, which includes the stages of problem identification, socialization, environmental education, application of simple technology, mentoring, and evaluation of activities.
Result. The results of the activity show the installation of educational media on the decomposition times of various types of waste as a permanent source of information in the village environment, and the community's implementation of ecobrick-making practices.
Conclusion. This program also increases public understanding of the importance of waste sorting and reducing plastic waste through the 3R (Reduce, Reuse, Recycle) principle.
Implementation. This activity made an initial contribution to raising community environmental awareness, although the program's sustainability required continuous support from the village government and active community participation.

Keywords: community empowerment, waste management, ecobricks, environmental education media, waste decomposition

INTRODUCTION

Waste management has become an increasingly complex environmental issue amid rapid population growth, expanding economic activities, and evolving consumption patterns. Inadequately managed household waste generates a wide range of adverse impacts, including soil, water, and air pollution, as well as significant risks to public health. In Indonesia, waste management remains a critical challenge, particularly in rural areas, where infrastructure limitations and the availability of effective waste management systems remain prevalent (Andriyanto et al., 2023). Low public awareness regarding waste segregation and proper disposal practices frequently leads to environmentally harmful behaviors, such as indiscriminate dumping and open burning, which further exacerbate environmental degradation (Kurniawan et al., 2024). If not properly addressed, the accumulation of waste can undermine environmental quality, threaten ecosystem sustainability, and pose long-term risks to human health. Among various types of waste, plastic waste is a particularly serious concern due to its prolonged decomposition, which contributes to persistent environmental pollution (Kurniati et al., 2025).

At the regional level, Brebes Regency in Central Java Province is among the areas facing significant challenges in managing waste. Rapid population growth and increased economic activities have led to a substantial rise in daily waste generation, which can exceed 1,200 tons. This condition necessitates implementing an integrated waste management system that involves both governmental institutions and active community participation. However, existing waste management practices in Brebes Regency are still constrained by limited waste-

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collection infrastructure, low levels of community engagement, and a continued reliance on conventional disposal methods. As a result, a considerable portion of waste remains inadequately managed and relies primarily on final disposal at the Kaliwlingi landfill, which is currently at capacity.

At the local level, Kedungbokor Village, in Larangan District, Brebes Regency, is a community facing similar waste management challenges. Geographically, the village is situated in a lowland area and borders the Pemali River, making its environmental conditions highly sensitive to community activities, particularly regarding waste disposal. The village consists of several hamlets, with the majority of residents engaged in agricultural activities, including the cultivation of shallots, chili, rice, and corn. Both domestic and agricultural economic activities generate various types of household waste that require proper management to prevent environmental contamination.

These conditions indicate that waste management challenges are not solely technical but also closely related to behavioral and educational aspects. Therefore, addressing waste issues requires not only improvements in infrastructure but also the implementation of educational and participatory approaches to increase community awareness and involvement. In this context, community-based waste management through the application of the 3R principles (Reduce, Reuse, Recycle) has been widely recognized as an effective strategy to reduce waste volume while promoting sustainable environmental practices (Nugrahini et al., 2023).

One potential approach to enhancing community awareness is the use of environmental education media combined with practical waste management activities. Educational tools that provide information about the time required for waste to decompose can help communities better understand the long-term environmental impacts of different types of waste, particularly plastic. Such awareness is expected to encourage behavioral changes toward proper waste segregation and reduction (Afifah et al., 2025). In addition, implementing ecobrick practices offers an alternative solution for managing plastic waste by converting it into reusable, economically valuable materials. Ecobrick refers to the process of compacting plastic waste into used plastic bottles to produce solid units that can be utilized as alternative building materials or creative products (Dinatha et al., 2023). Previous studies have demonstrated that ecobrick initiatives can improve environmental awareness, promote better waste segregation practices, and create economic opportunities at the community level.

Based on these considerations, this community service program aims to enhance the awareness and participation of the Kedungbokor Village community in waste management

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through an educational and participatory approach. By integrating environmental education media and practical ecobrick training, this program is expected to serve as an initial step toward establishing a sustainable, community-based waste management system driven by awareness, participation, and local empowerment.

Figure 1. Condition of the Temporary Waste Disposal Site in the Kedungbokor Area

At the village level, waste management is often still carried out using conventional methods, such as open burning or disposal in vacant land. These practices are generally influenced by low public awareness regarding the importance of waste segregation, as well as limited access to adequate information and education. Furthermore, the lack of accessible, communicative educational media constitutes an additional barrier to the development of sustainable waste management behavior (Mahyudin et al., 2024).

Based on preliminary observations conducted by the community service team, waste management in Kedungbokor Village still faces several key challenges. A significant portion of the community continues to mix organic and inorganic waste without prior segregation. In addition, the limited availability of educational media on the environmental impacts of waste contributes to low public awareness of sustainable waste management. The lack of information on the decomposition times of various types of waste, particularly plastic waste, means the community does not fully understand the long-term environmental consequences of improper waste disposal.

Kedungbokor Village is located in Larangan District, Brebes Regency, Central Java. The village has considerable potential in the agricultural, livestock, and culinary sectors due to its strategic location. Based on 2025 population data, the total population of Kedungbokor Village is 11,133 individuals, comprising 5,615 males and 5,518 females, and 4,686 households. In terms of age distribution, 1,721 individuals are aged 0–15 years, 6,535 are aged 15–56 years, and 1,513 are aged over 56 years.

The majority of the residents of Kedungbokor Village are engaged in agriculture, with shallots as the primary commodity, along with other crops such as chili, rice, corn, peanuts,

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and tubers. These agricultural activities constitute the community's main source of livelihood. However, the level of digital literacy among residents remains relatively low. Initial observations, conducted in collaboration with village officials, indicate that most residents have not yet effectively managed their waste.

These conditions indicate that waste management challenges are not solely technical in nature but also involve behavioral and educational dimensions. Therefore, addressing waste-related issues requires not only technical solutions, such as infrastructure development, but also educational approaches that can enhance community awareness and participation. In the context of community-based waste management, an empowerment approach is considered a key strategy to encourage behavioral change. The application of the 3R principles (Reduce, Reuse, Recycle) represents a viable alternative for reducing waste volume while simultaneously creating local economic opportunities through the reuse of plastic waste (Nugrahini et al., 2023). This approach is consistent with global frameworks that emphasize integrating social motivation, local institutions, and sustainable practices to reduce the environmental burden of household waste (Warintarawej & Nillaor, 2022).

One potential innovation to enhance community awareness of waste management is the use of environmental education media combined with practical waste-processing activities (Al Mansyur et al., 2021). Educational media that provide information about the decomposition times of different types of waste can help communities better understand the environmental impacts of these waste types in a more concrete manner. This is expected to increase public awareness of the long-term environmental impacts of waste and encourage behavioral changes in waste segregation and reduction (Afifah et al., 2025). In addition, processing plastic waste through the ecobrick method offers an alternative to reducing plastic waste volume while increasing the utility value of waste generated by the community. Ecobrick refers to the process of compacting plastic waste into used plastic bottles to produce dense units that can be utilized as alternative building materials or creative products (Dinatha et al., 2023). A number of studies have demonstrated that ecobrick initiatives can enhance environmental awareness, improve waste segregation practices, and generate employment and local economic opportunities within rural communities (Adessa et al., 2024; Dinatha et al., 2023; Matsuri et al., 2023; Ratnaningsih et al., 2023; Rozi, 2023; Trisniawati et al., 2019). This concept aligns with the 3R principles (Reduce, Reuse, Recycle), which emphasize reducing plastic use, reusing materials, and recycling to support sustainable waste management (Majida et al., 2023).

Previous studies conducted in various regions indicate that communicative environmental education media can significantly improve environmental literacy and

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awareness, thereby encouraging behavioral changes toward better waste segregation and reduction of household plastic waste (Irkham et al., 2019; Nugrahini et al., 2023; Syaharuddin et al., 2021). Various educational initiatives, including ecobrick socialization, ecobrick production training, and the development of educational materials such as waste decomposition time signage, have been implemented as part of community empowerment programs in rural areas of Indonesia. These approaches are characterized by active community participation, collaboration with village authorities, and continuous assistance to ensure the sustainable adoption of environmentally friendly practices (Adessa et al., 2024; Dalimunthe et al., 2024; Dinatha et al., 2023).

Based on these issues, this community service program aims to enhance the awareness and participation of the Kedungbokor Village community in waste management through an educational and participatory approach. Through collaborative efforts involving both the village government and the community, this program is expected to serve as an initial step toward establishing a community-based waste management system driven by awareness and self-reliance (Mawar Pira Sumantri et al., 2024). The program is implemented through a series of activities, including waste management socialization, the development of educational media in the form of waste-decomposition time signage, and practical training in ecobrick production as a means of plastic waste reuse. Through these activities, the community is expected to gain a better understanding of environmentally friendly waste management and implement sustainable waste management practices within the village.

METHOD

This community service program employed a community empowerment approach using a participatory method, specifically the Participatory Action Approach, which emphasizes active community involvement in all stages of the program (Nirmalasari et al., 2021). This approach was selected due to its effectiveness in enhancing community awareness, knowledge, and behavioral change in community-based waste management. It has also been widely implemented in various rural and community settings in Indonesia to improve environmental awareness, participation, and plastic waste reutilization through ecobrick practices (Nugrahini et al., 2023; Nurfadillah et al., 2022; Ummat et al., 2021).

The program was conducted in Kedungbokor Village, Larangan District, Brebes Regency, targeting local residents, particularly those living near the village's waste management sites. The activities were carried out during the Community Service Program

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(Kuliah Kerja Nyata/KKN), involving university students and academic supervisors as facilitators.

In general, the program's implementation consisted of several main stages: needs assessment, socialization and education, simple technology implementation, community assistance, and program evaluation.

Program Implementation Stages :

1. Problem Identification and Needs Assessment

The initial stage involved field observations, interviews with village officials, and discussions with community members to identify existing waste management conditions in Kedungbokor Village.

The findings revealed several key issues, including low public awareness of waste segregation, the lack of educational media on the environmental impacts of plastic waste, and limited implementation of waste management practices aligned with the 3R principles (Reduce, Reuse, Recycle).

These findings served as the basis for designing educational interventions and practical waste management activities through the development of waste decomposition time signage and ecobrick training.

2. Waste Management Socialization and Education

The next stage involved conducting socialization sessions to educate the community on the importance of environmentally friendly waste management. The materials delivered included types of waste (organic and inorganic), the environmental impacts of plastic waste, the 3R concept (Reduce, Reuse, Recycle), and the decomposition time of various types of waste.

The sessions were delivered through interactive counseling, group discussions, and visual educational media to ensure the information was easily understood by the community.

3. Development and Installation of Waste Decomposition Time Educational Media

As part of the educational intervention, the community service team developed informational signage that displayed the decomposition times of various types of waste, such as plastic, glass, metal, and paper. This stage included the design of educational content, the production of media, and the installation of signage in strategic locations within the village.

This media serves as a permanent visual educational tool to increase community awareness of the long-term environmental impacts of waste.

4. Ecobrick Training Implementation

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The program continued with practical training sessions on ecobrick production as an alternative solution for managing plastic waste. The training stages included an introduction to the ecobrick concept, collection and segregation of plastic waste, the process of compacting plastic waste into used plastic bottles, and the utilization of ecobricks as alternative, environmentally friendly products.

The method used involved direct demonstration and hands-on practice, enabling participants to gain a practical understanding of the ecobrick production process.

5. Community Assistance

Following the training, the community service team provided continuous assistance to ensure the sustainability of waste management practices. This assistance was conducted periodically throughout the program implementation period and included monitoring ecobrick production activities, discussing challenges faced by the community, and reinforcing environmental awareness.

6. Program Evaluation

Program evaluation was conducted to assess the effectiveness of the activities in improving community understanding and participation in waste management. The evaluation methods included observation of community participation, reflective discussions with residents, and assessment of changes in community understanding before and after the program.

The indicators of success included increased community understanding of waste management, the installation of educational signage in the village, and increased community participation in ecobrick production.

The evaluation data were analyzed using a descriptive qualitative approach to illustrate behavioral changes and the level of community participation following program implementation.

DISCUSSION

Identification of Waste Management Problems in Kedungbokor Village

The initial stage of the community service program involved field observations and discussions with village officials and local residents to identify the existing waste management conditions in Kedungbokor Village. The findings revealed several major challenges in community waste management practices, including low public awareness of the importance of waste segregation, limited availability of environmental education media, and suboptimal

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implementation of waste management practices based on the 3R principles (Reduce, Reuse, Recycle). Most residents still dispose of organic and inorganic waste together in a single container, thereby increasing the risk of environmental pollution.

Furthermore, discussions with community members indicated that many residents have not yet fully understood the long-term environmental impacts of plastic waste. The lack of information regarding the decomposition time of different types of waste has led to the perception that plastic waste does not pose a significant environmental threat. This condition highlights that waste management issues are not solely technical but are also closely related to the community's level of environmental knowledge and awareness. Therefore, educational interventions are essential in improving community understanding and promoting sustainable waste management practices.

Implementation of Waste Management Socialization and Education

The socialization phase is a crucial step in enhancing the community's understanding of proper waste management practices. This activity was conducted through interactive educational sessions involving local residents using a participatory approach. The materials delivered included the classification of waste types, the environmental impacts of plastic waste, and the concept of waste management based on the 3R principles.

The implementation of the socialization activities demonstrated a positive response from the community. This was reflected in participants' increased enthusiasm during discussions and their active engagement in raising questions about household waste management practices. The discussions also indicated that some community members had begun to recognize the importance of behavioral change in waste management, particularly in reducing single-use plastics.

Critically, the socialization activities served not only as a medium for disseminating information but also as a platform for dialogue between the community service team and local residents, fostering collective awareness of environmental issues. This approach aligns with the concept of community empowerment, which emphasizes active participation in understanding and addressing local environmental challenges. It is also consistent with participatory action research (PAR) approaches, which have been widely applied in ecobrick-based community programs across various rural contexts (Ahidin et al., 2023; Alfiqri et al., 2023; Leria et al., 2020).

Implementation of Waste Decomposition Time Educational Media

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One of the key innovations in this community service program was the development and installation of educational media in the form of informational signage that displayed the decomposition times of various types of waste. This media was designed as a visual educational tool that is easy to understand for the community. The information presented on the signage includes the decomposition times for several types of waste, such as plastic, glass, paper, and metal, which can take anywhere from decades to hundreds of years to decompose.

Figure 2. Development of Educational Media

The results of the program indicate that installing educational signage in strategic locations within the village has increased community awareness of the environmental hazards of waste. These visual media serve as constant reminders for residents about the importance of managing waste more responsibly. In addition, the presence of informational signage provides sustained educational value, as it can be continuously accessed and read by the community. From an environmental education perspective, the use of visual media, such as informational signage, has proven effective in enhancing community understanding, as the information is delivered in a simple, easily accessible manner. This type of media also offers the advantage of functioning as a long-term educational tool that remains beneficial even after the completion of the community service program. Previous studies have also demonstrated that visual

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educational media can significantly improve environmental literacy when combined with hands-on practices and continuous assistance (Ahidin et al., 2023; Nirmalasari et al., 2021).

Ecobrick Training and Practical Implementation

As a practical implementation of plastic waste management, this community service program also conducted training sessions on ecobrick production. Ecobrick is a method of processing plastic waste by compacting used plastic materials into plastic bottles, which can then be reused as alternative materials for various environmentally friendly products.

Figure 3. Ecobrick Production

The training was conducted through demonstrations and hands-on practice, actively involving community participation. Participants were encouraged to collect plastic waste from their surroundings and then compact it into plastic bottles to produce dense, durable ecobricks. This process not only provided practical experience for the community but also fostered awareness of the importance of reusing plastic waste in sustainable waste management practices.

Figure 4. Training Activities on Household Waste Management

The training results indicate that the community understood the ecobrick production process effectively and expressed interest in applying the practice independently. In addition

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to reducing plastic waste, ecobricks can be developed into creative products such as chairs, tables, and decorative elements, providing additional economic value for the community.

From a critical perspective, ecobrick practices represent a relatively simple yet impactful innovation in waste management, particularly in reducing the volume of plastic waste within the community. However, the success and sustainability of this practice depend heavily on consistent community participation in collecting and utilizing plastic waste. Several studies have also highlighted that the sustainability of ecobrick programs is influenced by factors such as market availability, institutional support at the village level, and the continuity of community participation (Ahidin et al., 2023; Alfiqri et al., 2023).

Program Assistance and Evaluation

The assistance phase was conducted to ensure that the implemented activities would generate sustainable impacts within the community. This phase involved informal discussions with residents and monitoring of waste management activities in the village. It also served as a platform to identify challenges the community encountered in applying the introduced waste management practices.

The evaluation results indicate that this community service program successfully improved community understanding of the importance of environmentally friendly waste management. Furthermore, the presence of educational signage and ecobrick practices provided direct experiential learning opportunities, enabling the community to manage plastic waste more effectively.

Nevertheless, several challenges remain in ensuring the program's sustainability. These include the need for consistent community participation and stronger support from the village government in developing a more integrated waste management system. Therefore, collaboration among the community, village authorities, and educational institutions is essential to support the long-term sustainability of environmental empowerment programs.

Overall, this community service initiative demonstrates that educational and participatory approaches can be effective strategies for enhancing community awareness of waste management. The program not only provided new knowledge but also encouraged behavioral changes toward greater environmental responsibility.

These findings are consistent with previous studies emphasizing the importance of synergy among communities, local institutions, and external stakeholders in sustaining 3R and ecobrick-based programs (Leria et al., 2020; Nirmalasari et al., 2021). In general, the results support the notion that educational and participatory approaches can improve community

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knowledge, attitudes, and behaviors toward sustainable waste management, provided that institutional support and access to economic opportunities through ecobrick initiatives are available (Rozi, 2023; Trisniawati et al., 2019).

CONCLUSION

The community service program conducted in Kedungbokor Village demonstrates that educational and participatory approaches can serve as effective strategies for enhancing community awareness and understanding of environmentally sustainable waste management. Initial findings indicated that the community's primary challenges were limited knowledge of waste segregation and a lack of accessible environmental education media to support behavioral change in household waste management.

The implementation of waste management socialization based on the 3R principles (Reduce, Reuse, Recycle) helped improve community understanding of the environmental impacts of waste. This effort was further strengthened by the use of educational media in the form of waste-decomposition-time signage, which served as a visual learning tool for the community. The presence of this media not only provided information on the long-term environmental impacts of waste but also served as a continuous reminder for residents to manage waste more responsibly in their daily lives.

Furthermore, the ecobrick training program, as a form of plastic waste reuse, provided the community with practical experience in managing plastic waste more productively. Through this activity, community members not only gained knowledge of alternative plastic waste management methods but were also encouraged to develop creativity in transforming waste into products with functional value. The assistance provided throughout the program further strengthened community participation in implementing more sustainable waste management practices within the village.

Overall, this community service initiative highlights that integrating educational activities, environmental information media, and hands-on waste management practices can effectively improve community knowledge and attitudes toward responsible waste management. However, the program's sustainability requires continued support from multiple stakeholders, particularly the village government and the local community, to ensure that community-based waste management initiatives can be further developed and generate broader environmental benefits.

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