



3R (Reduce, Reuse, Recycle) Education for Waste Management Awareness among Elementary School Students at SD Muhammadiyah Sambon, Boyolali

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Abstract

Waste management education at the elementary school level is important for developing environmentally responsible habits from an early age. This community service activity aimed to enhance waste management awareness among fifth-grade students of SD Muhammadiyah Sambon, Banyudono, Boyolali, through education on the principles of Reduce, Reuse, and Recycle (3R). The activity involved fifth-grade students as the primary participants, with teachers serving as facilitators and companions throughout the learning process. The implementation consisted of interactive educational sessions introducing the concept of waste, waste classification, environmental impacts of improper waste management, and practical applications of the 3R principles in students' daily lives. Learning activities were designed to encourage active participation and facilitate students' understanding through examples and activities relevant to their school environment. The results showed that the activity increased students' understanding of waste management and their awareness of the importance of reducing, reusing, and recycling waste. Students were able to identify different types of waste and recognize simple actions that can be implemented to reduce waste generation and promote environmentally responsible behavior. The involvement of teachers also supported the continuity of 3R practices within the school environment. The activity demonstrates that interactive 3R education can serve as a practical approach to introducing waste management concepts to elementary school students and fostering environmental awareness from an early age.

1. Introduction

Waste management is an increasingly important environmental issue, particularly in relation to the growing volume of waste generated by daily human activities. Inadequate

waste management can contribute to environmental pollution, unpleasant odors, reduced environmental quality, and various health risks (Muhammad et al., 2025). One of the main challenges in waste management is not only the availability of waste facilities but also the limited awareness and participation of communities in reducing and properly managing waste from its source (Hadibasyir et al., 2025). Therefore, environmental awareness needs to be developed through approaches that encourage individuals to understand the consequences of waste generation and to adopt responsible waste management practices in their daily lives (Anna & Sari, 2025).

Schools have an important role in developing environmental awareness from an early age. Elementary school students are at a formative stage in developing knowledge, attitudes, and everyday habits (Algur & Venugopal, 2021). Environmental education provided during this period can help students recognize environmental problems and encourage them to participate in simple actions to maintain environmental cleanliness (Priyana et al., 2025). Schools can therefore serve as an effective setting for introducing waste management practices because students can directly apply the knowledge they acquire in their classrooms and school environment (Ling & Silva, 2022). However, environmental education needs to be delivered through approaches that are appropriate for children's characteristics, interactive, and connected to their daily experiences (Kusuma et al., 2025).

One practical approach to waste management education is the application of the 3R principles: Reduce, Reuse, and Recycle. Reduce emphasizes minimizing waste generation by avoiding unnecessary consumption and the use of disposable materials. Reuse encourages the repeated use of items that are still functional, while Recycle involves processing used materials into new products that can be used again. Introducing these three principles to elementary school students can provide a simple and practical framework for understanding that waste management begins with individual behavior (Peraboni et al., 2026). Through appropriate learning activities, students can be encouraged not only to distinguish different types of waste but also to develop habits of reducing, reusing, and recycling materials in their everyday activities (Swami et al., 2011).

SD Muhammadiyah Sambon, Banyudono, Boyolali, provides an appropriate setting for implementing environmental education focused on the 3R principles (Muljaningsih, 2021).

Elementary school students require learning activities that are engaging and easy to understand so that environmental concepts can be translated into concrete actions. Conventional explanations alone may not be sufficient to encourage students to internalize waste management practices (Zorpas, 2024). Consequently, an interactive educational approach is needed to make the concept of 3R more accessible and encourage active student participation during the learning process.

Based on this situation, a community service program was conducted at SD Muhammadiyah Sambon, Banyudono, Boyolali, through educational activities focusing on the principles of Reduce, Reuse, and Recycle. The program was designed to introduce students to the importance of waste management while encouraging them to recognize and practice simple 3R behaviors in their school and daily environments. The activity aimed to enhance students' awareness and understanding of waste management through learning activities that were appropriate for elementary school students. In the longer term, the program is expected to contribute to the development of environmentally responsible habits among students and support the creation of a cleaner and more sustainable school environment.

2. Methods of Implementation

2.1 Location and Time of Activity

The activity was conducted at SD Muhammadiyah Sambon, Sambon Village, Banyudono District, Boyolali Regency from March 2026 to August 2026. The implementation of the activity was carried out through initial coordination with the school before the educational phase was conducted of the end of semester. The activity involved 40 fifth-grade students of SD Muhammadiyah Sambon as the primary participants.

2.2 Targets and Participants

The primary participants in this activity were fifth-grade students at SD Muhammadiyah Sambon. This grade was selected because the students are considered to have an appropriate level of cognitive development to understand basic waste management concepts, including waste classification and its potential environmental impacts. Teachers were also actively

involved in the activity as facilitators and companions, supporting students throughout the learning process and helping reinforce the application of the 3R principles in the school environment.

2.3 Preparation and Coordination Stage

The preparation stage begins with coordination with the school to schedule activities and identify the existing conditions of waste management. The service team prepared an educational module divided into four different presentation sessions, with visual media and interactive games tailored to the learning focus range of elementary school students.

2.4 Implementation Stage

The educational materials were developed to introduce elementary school students to basic waste management concepts and the practical application of the 3R principles (Reduce, Reuse, and Recycle). The materials were organized into four interactive sessions. The first session introduced the concept of waste, different types of waste, waste separation based on the designated colors of waste bins, and proper waste-sorting practices. The second session used interactive games, including a maze activity and waste-type guessing games, to help students identify different types of waste and understand their potential environmental impacts. The third session focused on the 3R principles, providing examples of reducing and reusing materials, recycling activities through simple crafts, and an introduction to the role of waste banks in waste management. The fourth session focused on strengthening students' environmental awareness by encouraging them to adopt simple waste management habits through an Environmental Heroes good-habits checklist.

The learning media consisted of visual presentation slides, interactive maze games, waste-identification activities, and checklist sheets. These media were designed to make the learning process more engaging and accessible for elementary school students while connecting the 3R principles with situations encountered in their daily lives.

2.5 Evaluation and Follow up Stage

The evaluation stage was conducted through direct observation and photo documentation during the educational activities. The evaluation focused on students' participation, responses to the learning materials, ability to identify different types of waste, and understanding of the 3R (Reduce, Reuse, and Recycle) principles as demonstrated through discussions and interactive games. Particular attention was given to students' engagement and their ability to relate the 3R principles to simple waste management practices in their daily lives. No quantitative measurements, such as pre-test and post-test scores, were used in this activity; therefore, the evaluation emphasized qualitative observations of students' responses and participation throughout the learning process.

The follow-up stage involved reinforcing the 3R principles through the involvement of teachers in the school environment. Teachers were encouraged to continue reminding and guiding students to practice waste reduction, reuse, and recycling in their daily activities. The good-habits checklist introduced during the activity was also intended to encourage students to maintain environmentally responsible habits beyond the educational sessions. Through continued guidance and monitoring by teachers, the activity is expected to support the gradual development of students' waste management awareness and sustainable behavior at school.

3. Results and Discussion

3.1 Increased awareness of waste types

Based on the observation results, it was found that SD Muhammadiyah Sambon is facing issues related to waste management in the school environment. Students' daily activities generate various types of waste, such as plastic bottles, snack wrappers, plastic cups, and paper waste. This situation is exacerbated by the lack of a structured waste sorting culture. Waste is generally mixed and disposed of directly without sorting according to its type. This existing condition shows that environmental literacy has not yet become a culture ingrained among the school community.



Figure 1. Students Practicing Waste Sorting Based on Waste Types

3.2 Improved understanding of the 3R concept

The implementation of 3R education demonstrated that students were able to recognize and understand the basic principles of Reduce, Reuse, and Recycle. Through interactive explanations, question-and-answer sessions, and educational games, students were introduced to practical examples of how the 3R principles can be applied in their daily activities. The students were able to identify simple actions related to reducing waste, such as limiting the use of single-use plastic items, reusing materials that were still functional, and recycling used materials into new products.

The interactive activities also helped students connect the 3R concept with waste management practices in their school environment. During the learning sessions, students actively responded to questions and participated in activities that required them to identify waste and determine appropriate ways to manage it. The use of simple examples and visual learning media made the concepts easier for students to understand and encouraged them to relate waste management practices to their everyday behavior.

The activity also introduced students to recycling through simple craft examples and provided an overview of how a waste bank can support waste management. These activities broadened students' understanding that waste can have value when it is properly sorted, reused, or processed. Overall, the students demonstrated an understanding of the 3R

principles through their responses, participation, and ability to provide examples of environmentally responsible waste management practices.

3.3 High student engagement through interactive media

The use of visual and interactive learning media contributed to active student engagement throughout the 3R education activities. The illustrated guidebook provided students with simple visual representations of waste types, waste-sorting practices, and examples of Reduce, Reuse, and Recycle activities. The use of pictures and concise explanations helped students relate the learning materials to waste management situations that they encounter in their daily lives (Maulana et al., 2023).

In addition to the illustrated guidebook, interactive videos were used to present waste management concepts in a more engaging format. Students showed enthusiasm while watching the videos and were encouraged to respond to questions and discuss the situations presented. The combination of visual materials and interactive videos created opportunities for students to observe, identify, and discuss appropriate waste management practices rather than only listening to explanations from the facilitators.

The students' active responses during the sessions indicated that the learning media were able to attract their attention and encourage participation. Students actively responded to questions, identified examples of waste, and shared their own experiences related to waste management. These observations suggest that combining illustrated learning materials with interactive videos can support the delivery of 3R education in an accessible and engaging manner for elementary school students.



Figure 2. Interactive Moduls for Elementary School

3.4 Commitment to environmentally responsible habits

The activity encouraged students to recognize the importance of developing environmentally responsible habits through the practical application of the 3R principles. The Environmental Heroes good-habits checklist was introduced as a simple tool to help students identify and reflect on daily actions related to waste management. Through the checklist, students were encouraged to practice habits such as disposing of waste in the appropriate bins, reducing the use of disposable materials, reusing items that are still functional, and keeping the school environment clean.

During the activity, students responded positively to the habit-building activities and were actively involved in identifying actions that they could apply in their daily routines. The checklist also helped translate the 3R concepts into simple and observable behaviors that could be practiced at school and at home. In addition, the involvement of teachers provided an important form of reinforcement, as teachers could continue to remind and guide students in applying these habits after the educational session.

Although the activity did not include a long-term behavioral assessment, the students' active participation and responses during the habit-building activities indicated an initial awareness of the importance of environmentally responsible waste management. The

combination of 3R education, practical examples, and the good-habits checklist therefore provided a foundation for encouraging students to incorporate waste management practices into their everyday behavior.



Figure 3. Students Practicing Checklist of 3R Principle

4. Conclusion

The 3R (Reduce, Reuse, and Recycle) education program at SD Muhammadiyah Sambon, Banyudono, Boyolali successfully engaged fifth-grade students in learning about waste management. The use of illustrated guidebooks, interactive videos, educational games, and habit-building activities helped students understand waste sorting and the practical application of the 3R principles in their daily lives. The students' active participation and positive responses indicated an initial development of waste management awareness. Continued guidance from teachers is expected to reinforce these practices and support the development of environmentally responsible habits within the school environment.

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