

## **Recycling-Based Montessori Method: A Sustainable Educational Model in Tambakasri Village**

*Tomy Rizky Izzalqurny, Apriana Rahmawati <sup>a)</sup>, Triadi Agung Sudarto, Alif Faruqi  
Febri Yanto*

Universitas Negeri Malang, Faculty of Economics and Business, Accounting Department

<sup>a)</sup>Corresponding author: [aprianarhmwt.feb@um.ac.id](mailto:aprianarhmwt.feb@um.ac.id)

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### **ABSTRACT**

This community service program aimed to apply the Montessori method based on recycling in Tambakasri Village, Malang, East Java, to address children's speech delay through sustainable education. Conducted on July 30, 2025, at the Tambakasri Village Hall, the program involved 30 participants, including children, parents, educators, and health cadres. The initiative emphasized self-directed learning using recycled household materials such as eggshells, cardboard, and paper to stimulate language, motor, and cognitive development. Evaluation was conducted through observation and participant feedback. The results showed that recycled Montessori-based learning significantly improved children's communication skills, creativity, and environmental awareness. This initiative demonstrates how low-cost, eco-friendly Montessori practices can enhance early childhood development while promoting sustainability in rural communities.

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## INTRODUCTION

Tambakasri Village is located in the Tajinan District, Malang Regency, East Java, covering an area of 248.60 hectares with a population of approximately 6,383 people (Central Statistics Agency of Malang Regency, 2020). The village community is characterized by strong social interaction and an active network of Posyandu (Integrated Health Posts), which function as centers for public health and early education. Many women in this community participate as health cadres and educators, especially in early childhood education institutions such as kindergartens (Taman Kanak-Kanak). However, one of the significant developmental challenges observed among children in Tambakasri Village is speech delay. Speech delay affects not only the ability of children to communicate but also their emotional regulation, social adaptation, and cognitive development (Ruth & Smith, 2020). Limited access to early intervention services, insufficient educational resources, and the lack of individualized learning approaches exacerbate these conditions. In many cases, parents have minimal understanding of how to provide language stimulation at home, which further delays linguistic and social progress. Consequently, there is an urgent need for community-based educational interventions that are contextual, inclusive, and sustainable.

The Montessori method provides a potential solution to this problem due to its philosophical and practical orientation toward child-centered learning. Developed by Dr. Maria Montessori, this approach emphasizes that every child has an innate drive to learn through exploration and sensory engagement (Lillard, 2021). Montessori education encourages children to engage in self-directed activities using concrete materials that stimulate sensory perception, motor control, and cognitive reasoning. Through repetitive manipulation and interaction with learning tools, children gain mastery and self-confidence—two essential foundations for language development. The principle of “learning by doing” underpins the Montessori framework, ensuring that children actively construct their knowledge through experience rather than passive instruction. Research has demonstrated that Montessori classrooms foster higher motivation, social collaboration, and intrinsic interest in learning compared to traditional education systems (Rathunde & Csikszentmihalyi, 2021). This is particularly relevant for children with speech delay, who often benefit from an environment that minimizes verbal pressure while encouraging expressive engagement through play, movement, and sensory experiences.

In addition, the Montessori method aligns well with the principles of sustainable education, especially when combined with recycling practices. The use of recycled materials such as eggshells, cardboard, and paper in learning activities not only supports environmental management but also enhances creativity and problem-solving skills. Everyday waste can be transformed into tactile learning tools that invite children to manipulate, explore, and create (Miller, 2020). For example, eggshell fragments can be used for fine-motor tasks that strengthen hand coordination, while cardboard can be converted into puzzle pieces that encourage collaboration and verbal expression. These activities provide sensory feedback and stimulate both cognitive and language functions, consistent with Montessori’s sensory-based pedagogy (Miller & Almon, 2021). Moreover, incorporating recycled materials introduces children to eco-friendly behavior, encouraging awareness of sustainability from an early age. Through these practices, learning becomes not only an educational activity but also an environmental act, teaching the value of reuse and resource efficiency within the local community (Sari et al., 2022; Utami & Kurniawan, 2022).

Another vital aspect of this initiative is community empowerment. The implementation of a recycling-based Montessori model fosters collaboration among educators, health cadres, and parents. In rural

communities such as Tambakasri, social capital plays a crucial role in sustaining educational initiatives. Active participation from parents and local leaders ensures that learning continues beyond the classroom and becomes part of daily life. By involving multiple stakeholders, this program bridges the gap between education, environmental management, and community development. It also provides opportunities for parents to learn about sustainable practices and the importance of early childhood stimulation, thus reinforcing the bond between home and school. In this context, education becomes a holistic community effort rather than an institutional task.

Given these considerations, the objective of this community service program is to implement the Montessori method using recycled household materials to address speech delay among children in Tambakasri Village. The program aims to enhance children's language proficiency, creativity, and fine motor skills while promoting environmental awareness and responsible waste management. The initiative also seeks to strengthen local capacity by training educators and health cadres to integrate Montessori-based activities into daily teaching and caregiving routines. In the long term, this community engagement project is expected to build a replicable model of sustainable education that combines developmental psychology, environmental stewardship, and local participation. Such an integrated approach not only supports child development but also advances the broader goal of sustainability by cultivating eco-conscious and socially responsible future generations (Yanto et al., 2024; Lillard, 2021; Maharani et al., 2022; Yuliana & Kurniawan, 2022).

## METHOD

### Activity Venue

The community service program was carried out at Tambakasri Village Hall, located in the Tajinan District of Malang Regency, East Java. The activity took place on July 30, 2025, with full-day sessions that combined theoretical explanations, practical workshops, and evaluation. The venue was chosen for its accessibility to parents, educators, and local health cadres, ensuring broad community participation and engagement.

### Materials and Resources

The program utilized both digital and recycled learning resources to support interactive, Montessori-based learning.

- Digital tools: LCD projector, microphone, and presentation slides for introducing the Montessori concepts.
- Recycled materials: eggshells, cardboard, colored paper, and used packaging, which were repurposed as Montessori learning aids such as tactile puzzles, color-sorting trays, and sound identification tools.
- Art supplies: watercolor paints, markers, glue, and scissors to encourage creativity and sensory stimulation.

These materials adhered to Montessori principles emphasizing hands-on, sensory learning, freedom of choice, and independence. The use of recycled household items reflected the program's dual objective promoting sustainable environmental practices while enhancing child development.

## Method of Activity Implementation

### Community Service Program

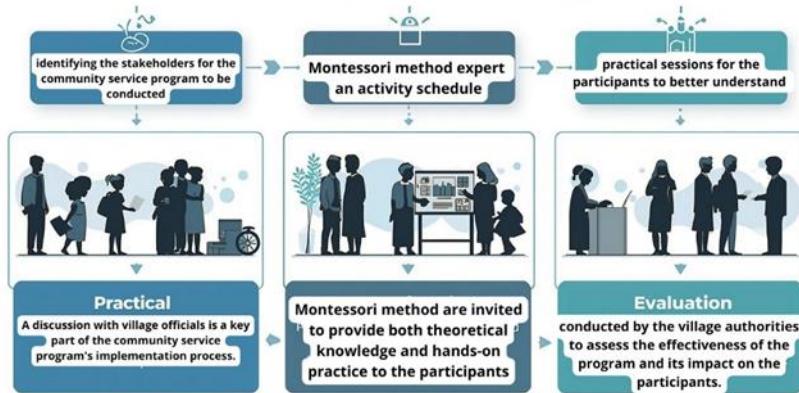


FIGURE 1. Steps of the Community Service Program

The steps involved in this activity begin with identifying the stakeholders for the community service program to be conducted. After that, a schedule for the activities is created, and experts in the Montessori method are invited to provide both theoretical knowledge and hands-on practice to the participants. The program also includes practical sessions for the participants to better understand and apply Montessori principles. Once the activity is completed, an evaluation is conducted by the village authorities to assess the effectiveness of the program and its impact on the participants.



FIGURE 2. Opening Session



FIGURE 3. Explanation of the Expert

## RESULTS AND DISCUSSION

The community service activity carried out at the Tambakasri Village Hall, Malang, aims to provide education using the Montessori approach to address the issues faced by children, particularly those with speech delay. In addition to speech delay, the development of motor skills in children is also crucial in helping them manage their emotions. Well-developed motor skills provide children with greater control over their bodies, which positively impacts their ability to regulate emotions and interact with their environment more positively (Ruth & Smith, 2021).

As one of the villages in the Tajinan District, Malang Regency, Tambakasri Village has a supportive community for such activities, with qualified educators, health cadres, and an understanding of the importance of child development-based education. This activity involves various parties, including Posyandu cadres, educators, and local community members.

The first step in the implementation of this activity is identifying the stakeholders involved in the community service program. Stakeholder selection is based on their vital role in supporting the development of children, particularly those facing speech delay issues. Following this, a coordination meeting is held to determine the schedule and invite experts in the Montessori method to provide an in-depth understanding to the participants regarding the principles and implementation of Montessori in addressing speech delay.

The materials provided by the experts include the basic theory of Montessori and practical ways to implement the method in everyday activities, especially for children with speech delay (Hidayat, & Fajriani, 2025). One focus area is the use of household waste materials as educational tools. The use of such materials not only supports Montessori's principles of using simple, natural materials but also helps raise community awareness about the importance of recycling and waste management in their environment (Miller & Almon, 2021).

The materials used in this activity include an LCD and a microphone to support effective delivery of the material to participants. In addition, various recycled materials, such as eggshells, cardboard, puzzles, markers, and watercolor paints, were used to create eco-friendly and creative learning aids. One of the activities conducted was creating a sound identification game using eggshells. This activity aims to stimulate children's language development in a fun and engaging way (Katz, 2021).

Apart from the sound identification game, another activity was assembling puzzles made from cardboard. These puzzles not only improve children's fine motor skills but also allow them to interact with their peers (Saputra, 2025). Through this activity, children are encouraged to speak and discuss, which indirectly helps them address their speech delay. Such activities are highly effective as they involve social interaction and communication, which are essential for language development (Rathunde & Csikszentmihalyi, 2021).

In addition to language skills, these materials are also used to improve children's cognitive and fine motor skills. Using markers and watercolor paints, children were encouraged to draw and color, which helps enhance creativity as well as hand-eye coordination (Rahmah et al, 2023). This type of activity allows children to express themselves freely, in accordance with Montessori's principle of freedom in learning. In this way, children not only learn language but also develop other skills such as attention to detail and creativity (Lillard, 2021).

The implementation of the Montessori method significantly supports the development of children's social and emotional skills. In every activity, children are encouraged to cooperate, help each other, and speak to one another. This helps them overcome anxiety or fear of speaking, which is often experienced

by children with speech delays. By providing opportunities for them to learn in a fun and pressure-free environment, children can naturally develop their language skills (Kristian et al, 2024).

Throughout the activity, there was high enthusiasm from the participants, both the children and the parents who participated in the program. The parents strongly supported the use of the Montessori method, as they realized the importance of playing an active role in supporting their children's development, particularly for those experiencing speech delays. This activity provided an opportunity for parents to learn alongside their children, thus strengthening the relationship and communication between them.

The evaluation of this activity was conducted by the village authorities, involving health cadres and educators who participated in the implementation. The evaluation results indicate that this community service program had a positive impact on addressing speech delay in children. Children who previously struggled with speaking began to show significant improvement in their language abilities, especially in pronouncing simple words and forming sentences. Although there were challenges in addressing speech delays, this program offered hope for the children to develop further (Maharani et al., 2022).

The evaluation also noted that the use of recycled materials in this activity provided dual benefits. Not only did it assist the children in learning, but it also raised community awareness about the importance of waste management. This activity demonstrated that learning based on simple and natural materials is not only effective for children's development but also supports environmental preservation. The people of Tambakasri Village began to see the potential in using household waste as a resource that can be utilized for education and environmental management (Sari et al., 2022).

Overall, the implementation of this community service program was very successful in achieving its goal, which was to help children with speech delays develop their language abilities through the creative Montessori approach based on direct exploration. Additionally, the program successfully introduced the importance of waste management and the use of recycled materials to the people of Tambakasri Village. With continued support from various stakeholders, this program is expected to continue and provide even greater benefits for the development of children and the environment in Tambakasri Village (Utami et al., 2022).

The significance of this Montessori-based approach is that it provides space for children to learn in a way that matches their individual pace and needs. Learning that is not rushed and is based on direct experience allows children to absorb the information and skills they need for their development more easily. Therefore, the introduction of the Montessori method in Tambakasri Village not only provides a solution for children with speech delays but also offers a more holistic approach to children's education in general (Yuliana & Kurniawan, 2022).

With the success of this activity, it is hoped that it will encourage more community-based service programs focused on community empowerment and local capacity building, particularly in terms of child education. The use of the Montessori method tailored to the local context, such as the use of recycled materials, can serve as an inspiring model for other villages facing similar challenges. This program provides evidence that with the right approach, resource limitations can be overcome through creativity and effective collaboration among stakeholders (Sari et al., 2022).

In the long term, this activity is expected to have a lasting impact on the development of children in Tambakasri Village, as well as strengthen the community's awareness of the importance of child-friendly education based on sustainability principles. If this program can be applied more widely, not only will children with speech delays benefit, but the entire village community will experience positive changes in the quality of education and environmental management (Maharani et al., 2022).



**FIGURE 4.** Project and Evaluation

## CONCLUSION AND RECOMMENDATIONS

The community service program in Tambakasri Village successfully implemented the Montessori approach by using recycled materials to support the development of children, particularly in language skills, fine motor skills, and social development. Creative activities such as puzzle assembly games, as well as drawing and coloring, were included. Additionally, this program also raised community awareness about the importance of waste management and the use of recycled materials, providing dual benefits for both education and the environment. The support of parents, educators, and health cadres played a crucial role in the success of this program. This program has the potential to serve as an inspiring model for other villages facing similar challenges, while also strengthening awareness of child-friendly education and sustainability.

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