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"WASTE-FREE SCHOOLS: STRATEGIES FOR BUILDING ENVIRONMENTAL AWARENESS IN HIGH SCHOOLS"

Nayla Nurul Afifah[1], Sulaiman Zuhdi[2], Wisaam Addar Hasan Pasaribu[3], Muhammad Zaidan Alawi[4], Raihan Fadhil Aiman Sadikin[5]

[1,2,3,4,5] SMAS Al-Azhar Medan, Jl. Pintu Air IV Kuala Bekala No.214, Siti Rejo I, Kec. Medan Johor, Kota Medan, Sumatera Utara 20142

Corresponding Email: naylanurulafifah20@gmail.com

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Abstract

Summary Waste management in schools is an important step in supporting environmental sustainability. This article examines the implementation of the Zero Waste Schools program in Indonesia with a focus on the application of the Reduce, Reuse, Recycle (3R) principle to reduce waste. Although there are clear positive impacts, challenges such as lack of facilities and awareness among students and teachers still hinder the success of the program. This article provides recommendations for integrating waste management into the school curriculum, providing adequate facilities and increasing school community participation. Schools are expected to become agents of change by increasing environmental awareness and creating a cleaner and more sustainable environment.

Keywords: ***waste management, Zero Waste School, Reduce, Reuse, Recycle, sustainability, environmental education, community participation.***

INTRODUCTION

Ineffective waste management has become one of the biggest challenges facing Indonesia. According to data from the Ministry of Environment and Forestry (KLHK), Indonesia produces more than 64 million tons of waste each year, of which more than 30% is not managed properly, resulting in environmental damage, pollution and threats to the environment and health (KLHK 2023). One of the most obvious impacts is the increasing amount of waste that pollutes water, air and soil, thereby reducing the quality of life of the community. The problem of waste management becomes more complex in the context of large urban areas, such as Jakarta, where population growth and rapid urbanization exacerbate the volume of waste that needs to be managed. Around 2.5 million tons of waste is generated in Jakarta each year, and although the government has implemented various waste management policies, their effectiveness is still limited.

For example, the Zero Waste School program implemented in several schools in Jakarta has shown a positive impact in reducing the amount of waste disposed of at the Final Disposal Site (TPA). However, challenges in implementing the program, such as lack of student awareness and limited supporting facilities, are still major obstacles to long-term success (Rahman 2022). Schools, as educational institutions that have a significant influence on the behavior of the younger generation, have an important role in increasing students' awareness of the importance of responsible waste management. Good waste management in schools not only has a positive impact on the environment but also provides opportunities for students to learn about sustainability and social responsibility. By implementing the principles of Reduce, Reuse, Recycle (3R), schools can be an example for the community in responsible waste management. Schools also have the potential to act as agents of change by increasing environmental awareness in the community. However, although some schools have tried to implement a better waste management system, there are still many challenges. Some of

the main obstacles in implementing the zero waste school program include the lack of adequate supporting facilities, low awareness of students and teachers about the importance of waste management, and the lack of active participation of schools in supporting this program. In addition, training students to apply the principles of waste management systematically in everyday life is often difficult. This shows that the success of waste management programs in schools depends not only on the facilities available but also on the right educational approach and the participation of the entire school community.

Therefore, this article aims to explore strategies that schools can use to manage waste effectively, with a focus on developing programs that can change students' behavior towards waste management and incorporate the concept of environmental sustainability into education. In addition, this article also aims to provide recommendations for increasing environmental awareness among students, as well as analyzing the facilities that need to be provided to support waste management programs in schools. Through this article, we hope to find practical and applicable solutions that can be applied in various schools in Indonesia, while strengthening the position of schools as actors of change in efforts to maintain environmental sustainability.

LITERATURE REVIEW

1. Waste Management Concept and 3R Principle (Reduce, Reuse, Recycle)

Effective waste management has become a major issue in efforts to achieve environmental sustainability worldwide. One of the most well-known concepts is the 3R principle, namely Reduce, Reuse and Recycle. These principles aim to minimize the amount of waste produced and reduce the environmental impact caused by waste. Reduction focuses on reducing the use of materials or products that can produce waste, Reuse aims to extend the life of an item through reuse, while Recycling is the process of recycling items that are no longer used into new, useful products. Several studies have shown that the application of the 3R principle can reduce the volume of waste sent to landfills and reduce the need for natural raw materials, helping to reduce greenhouse gases (GHG) and other negative impacts on the ecosystem (Gao et al, 2020; Geng and Doberstein, 2021). The application of the 3R principle in schools can teach students to be more responsible for the environment, integrating this concept into everyday life. For example, several studies have shown that by involving students in recycling activities, they tend to reduce their consumption of single-use items and prefer to use reusable items (Liu et al, 2022).

2. Environmental Awareness in Education

Environmental awareness is an important component in education that emphasizes understanding, attitudes and sustainable behavior towards the environment. In the context of education, environmental awareness not only includes knowledge about environmental problems but also the application of environmental principles in everyday life, so that it can help create positive behavioral changes in the Company environment. Environmental education from an early age has been shown to shape children's personalities, which can then significantly influence their habits in adulthood (Tuncer et al, 2020). The importance of environmental education from an early age not only teaches about environmental problems but also how to overcome them. Liu's (2018) research shows that children who learn about waste management from an early age tend to have better habits in reducing, reusing, and recycling waste, so that it can be applied in their lives at school and at home. Through environmental education, students can develop a responsible attitude towards the environment, which affects their habits in managing waste. The relationship between environmental awareness and waste management habits is very close. This awareness encourages individuals to engage in more responsible waste management practices. For example, students with high environmental awareness tend to be more proactive in waste management at school, such as disposing of waste in its place, sorting waste, and participating in recycling activities (Kail & Amani, 2021).

Therefore, education based on environmental awareness can create long-term behavioral changes in waste management, which is important for achieving zero-waste schools.

3. Zero Waste School: Holistic Concept and Elements of Zero Waste School Program

Zero-waste schools or also known as zero-waste schools are a concept that aims to reduce or even eliminate waste generated by school activities. This concept involves many interrelated factors, especially education, supporting facilities and active participation of school residents. The educational element is a fundamental aspect in realizing zero-waste schools. Through structured educational programs, students and school staff understand the importance of sustainable waste management and how to reduce waste in schools. According to Smith et al (2019), waste management-based education can help students realize the importance of waste sorting and introduce them to concepts such as composting, recycling, and reducing plastic use. In addition, the provision of supporting facilities is one of the keys to implementing the Zero Waste School program. Facilities such as separate bins for organic waste, inorganic waste and recyclables as well as composting places at school help students easily apply what they have learned into practice.

This has been proven in the research of Chien et al (2020), showing that the existence of adequate facilities increases the effectiveness of waste management programs in schools. The importance of school community participation in realizing the concept of zero-waste schools cannot be ignored. Active participation of students, teachers, school staff and parents plays an important role in the success of the Zero Waste School program. The participation of the school community in decision-making and waste management activities can create a more conducive environment for sustainable waste management. Gao et al. (2021) noted that schools that involve the school community in the Zero Waste program show more effective results, both in waste reduction and students' environmental awareness.

SCHOOLS' WASTE-FREE STRATEGY: A HOLISTIC APPROACH WITH IMPLEMENTATION AND REAL DATA

1. Integration of Waste Management into the Curriculum

Environmental-based learning: Environmental-based learning is an effective way to integrate waste management. For example, the Eco-Schools program in Finland teaches students to creatively recycle as part of the school curriculum. As a result, students' awareness of waste management increased by 45% in one semester (Kettunen, 2021). In Indonesia, SMA Negeri 2 Bandung has launched a “Digital Waste Bank” program that allows students to exchange plastic waste for points to get discounts on extracurricular fees (West Java Education Office, 2022). This step not only supports waste management habits but also brings direct economic benefits to students. School projects with student participation: SMA Labschool Jakarta implemented a creative recycling project that produced art objects from plastic waste. This project allowed students to gain first-hand experience in transforming waste into products with economic value (SMA Labschool Jakarta, 2023).

2. Supporting Facilities

Separate trash bins: One important element is additional work, such as separate trash bins. For example, SMAN 6 Yogyakarta, which installed 20 separate trash bins in the school area, managed to increase the consistency of student waste sorting by 70% (Pradana, 2023). School Trash Bins or Waste Bins: At SDN Pengalaman Malang, trash bins are used to convert organic waste into compost. This program helps reduce organic waste by 50 kg per month and makes a real contribution to the school garden (Hadayani, 2020). Separate trash bins: One important element is additional work, such as separate trash bins. For example, SMAN 6 Yogyakarta, which installed 20 separate trash bins in the school area, managed to increase the consistency of student waste sorting by 70% (Pradana, 2023). School Trash Bins or Waste Bins: At SDN Pengalaman Malang, trash bins are used to convert organic

waste into compost. This program helps reduce organic waste by 50 kg per month and makes a real contribution to the school garden (Hadayani, 2020).

3. School Community Participation

The role of teachers, students and parents: The success of waste management in schools is highly dependent on the cooperation of the entire school community. For example, Jakarta International School organizes an annual environmental day with the participation of students, teachers and parents. In the event, 1 ton of plastic waste is collected and turned into paving stones, thus having a real impact on the environment (Jakarta Ecological Group, 2023). Collective activities such as clean-up days: Surabaya is a pioneer in organizing Surabaya Clean-up Day, attracting thousands of high school students to participate in cleaning parks and rivers. This operation managed to reduce waste by 30% in the affected areas (Surabaya City Government, 2023).

4. Environmental Socialization and Campaign

Use social media: Digital campaigns such as the one conducted by SMA Labschool Kebayoran through #PlastikNotChoice have helped raise awareness among students and the community. An educational video created by students has been viewed more than 10,000 times, demonstrating the potential of social media in spreading environmentally friendly messages (SMA Labschool Kebayoran, 2023). Creative posters, workshops or videos: In Bali, students of SMAN 1 Denpasar created a short animation about waste management that was shown at a provincial environmental event. This initiative not only inspired other students but also encouraged the development of environmentally friendly concepts based on creativity (Bali Green School Committee, 2022).

IMPLICATIONS AND CHALLENGES IN IMPLEMENTATION AND STRATEGIES OF WASTE-FREE SCHOOLS

1. Positive Implications

The zero waste school strategy has a number of significant positive impacts, both in environmental and social contexts. Reducing the school's carbon footprint By systematically implementing the 3R principle (Reduce, Reuse, Recycle), schools can reduce the amount of waste disposed of in landfills. For example, data from the Zero Waste Schools program in Japan shows that implementing waste sorting and organic management through compost can reduce greenhouse gas emissions by 20% in one school year. In Indonesia, managing organic waste through waste banks or compost has helped schools reduce carbon emissions and create new resources, such as organic fertilizers, which can be used for school agricultural needs (Tanaka et al, 2020). Cultivating environmental awareness among students and the community Environmental awareness instilled in schools through environmental-based education will influence the behavior of students and their families. Research by Pratama and Syafitri (2021) shows that students who participate in environmental projects are more aware of the importance of waste management, 70% of whom maintain these habits at home. This educational activity also helps change the behavior of the community around the school through various campaigns and activities such as clean-up days and environmental workshops (Pratama and Syafitri 2021).

2. Challenges and Implementation

Despite its clear benefits, the implementation of a zero waste school strategy faces several challenges that require careful attention. Budget and facility constraints Many schools face budget constraints in providing supporting facilities, such as separate waste bins, compost or trash bins. For example, research on urban schools shows that only 40% of schools have adequate waste management facilities. To address this issue, some schools partner with the private sector through corporate social responsibility (CSR) programs to fund waste management projects (Purnomo 2022). Lack of involvement from the entire school community One of the biggest challenges is generating collective commitment from the entire school community. In many cases, student and teacher participation is

positive, but parental or non-teacher involvement is still minimal. An example of a case study in Surabaya shows that parental involvement only reaches 30% of school environmental activities. To address this problem, a more comprehensive approach is needed, such as a training program for the entire school community (Wijaya 2023).

CONCLUSION and RECOMMENDATIONS

1. Conclusion

The zero waste school strategy through the integration of waste management into the school curriculum, provision of adequate supporting facilities, active participation of all school residents in learning, has proven to provide a broad socialization effect and provide a significant positive impact. This program not only reduces the school's carbon footprint but also increases environmental awareness among students and the surrounding community. By implementing the 3R principle (Reduce, Reuse, Recycle), schools can create a cleaner environment and educate the younger generation to be responsible for waste management. On the other hand, challenges such as budget constraints and lack of participation from all school sectors must be overcome to ensure the sustainability and success of this program.

2. Recommendation

For other schools wishing to adopt a similar curriculum, several practical steps can be taken as follows:

1) Integrating waste management into the school curriculum Topics related to waste management can be integrated into related subjects, such as science, civics, or art. Environmental projects, such as creative recycling, can be conducted to raise students' awareness from an early age. The Zero Waste School Program can be a reference in designing school programs based on real activities in the field.
2) Providing supporting facilities Schools should provide adequate facilities, such as separate waste bins, composters and trash bins, to support effective waste management. Partnerships with external parties, such as non-profit organizations or the private sector, can help provide these facilities.
3) Increasing school community participation Participation of all sectors in schools, including teachers, students, parents, and non-teaching staff, is very important. Therefore, activities such as clean-up days and recycling competitions need to be held regularly to build an environmentally friendly culture. Parental involvement in environmental education programs is also highly recommended to increase collective awareness and commitment.
4) Call for Collaboration To achieve the broader goal of zero-waste schools, collaboration between schools, government, and non-profit organizations is needed. The government can provide incentives and regulations to support waste management in schools, while non-profit organizations can act as consultants, advisors, and provide supporting facilities. This partnership will accelerate the implementation of zero-waste school programs and provide greater benefits to the environment and society.

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