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Zero-waste Culture in Sustainable Ethnopedagogy in Surabaya for SDG 12's Goals of Responsible Consumption and Production

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Abstract

This study examines the implementation of a zero-waste culture through sustainable ethnopedagogy as a contribution to achieving SDG 12's goals in Surabaya, focusing on Citraland Fresh Market, Dinoyo Keputran Waste Bank, and Keputran I Elementary School. Using a qualitative, descriptive-analytical approach, data were collected through field observations, in-depth interviews, and documentation. The Citraland Fresh Market reduces single-use plastics and promotes responsible consumption, though behavioral changes among traders and consumers remain challenging. Dinoyo Keputran Waste Bank effectively manages waste at the community level, but infrastructure and participation require improvement. Keputran I Elementary School integrates sustainable ethnopedagogy via waste management projects, fostering cooperation and environmental awareness. The study concludes that collaboration among markets, waste banks, and schools strengthens local efforts toward SDG 12's goals. Policy support and sustainable education are essential to ensure wider adoption and effectiveness of the zero-waste culture.

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Introduction

The The global environmental crisis has drawn attention to the urgency of managing natural resources more responsibly. Unsustainable consumption and environmentally

unfriendly production have led to major issues such as plastic pollution, soil degradation, climate change, and biodiversity loss (Kumar, 2021; Walker, 2021; Walker & Fequet, 2023). In response, the United Nations (UN) have designed the Sustainable Development Goals (SDGs), one of which is SDG 12's goals, focusing on responsible consumption and production.

Among the most significant environmental challenges, waste especially plastic waste poses a serious threat, particularly in developing countries like Indonesia. Indonesia ranks as one of the largest plastic waste producers globally, generating over 10 million tons of plastic waste annually (Arumdani et al., 2021; Neo et al., 2021). In this context, Surabaya, one of Indonesia's largest cities, has become a model for Zero-waste initiatives and the revitalization of Waste Banks, promoting sustainable waste management at the community level.

The Zero-waste concept, which focuses on reducing waste generation to zero through reduction, recycling, and reuse efforts, has been adopted by various stakeholders, including local governments, communities, and educational institutions in Surabaya (Wikurendra et al., 2023). Citraland Fresh Market Traditional Market serves as a concrete example of this concept in action. At this market, consumers and vendors actively engage in plastic waste reduction programs and more sustainable organic waste management (Mufida et al., 2024). However, despite various initiatives, the implementation of Zero-waste culture is not yet consistent across Surabaya. Some traditional markets, like Keputran Market, have not fully optimized the application of this concept. Additionally, Waste Banks, such as the one in Dinoyo Keputran, still face challenges in operations and community education. This indicates a need for a more systematic and comprehensive approach, particularly through an inclusive educational framework (Lestyono et al., 2024).

Effective waste management and the application of Zero-waste principles are not only crucial from an environmental standpoint but also have significant social and economic impacts. In Surabaya, the Zero-waste concept and Waste Bank management have extended beyond traditional markets to primary educational institutions through Zero-waste School initiatives, such as the one implemented at Keputran I Elementary School. This school has received recognition for its success in integrating waste management into the educational curriculum through sustainable ethnopedagogy.

Ethnopedagogy, an educational approach based on local values, is believed to enhance student and community participation in environmental preservation (Rahmawati et al., 2020; Sakti et al., 2024; Setiawan, 2021). This approach integrates traditional values like cooperation and local wisdom into education, allowing students to learn not only cognitively but also to internalize social values that support environmental sustainability. However, studies on the application of sustainable ethnopedagogy in primary education as part of efforts to support SDG 12's goals remain limited. In fact, integrating local values into formal education can play a crucial role in instilling environmental awareness from an early age, which in turn supports broader societal efforts to achieve sustainable consumption and production (Solihin & Rahmawati, 2024).

This research aims to analyze how Zero-waste culture is implemented within the Citraland Fresh Market community, as well as to examine the relationship between the application of this culture and the goals of SDG 12's goals on sustainable consumption and production. Additionally, this study will design a sustainable ethnopedagogy learning model based on local values to support environmental education in primary schools. As such, this research seeks to make a significant contribution to addressing environmental challenges while supporting SDG 12's goals through educational approaches.

The theory of Sustainable Consumption and Production (SCP) refers to consumption and production patterns that consider environmental impacts at every stage of the process (Hotta et al., 2021). SCP emphasizes the importance of waste reduction, resource efficiency, and the use of environmentally friendly materials. In the context of traditional markets, the application of SCP includes efforts to reduce plastic waste, increase the use of recycled materials, and educate consumers and vendors on responsible consumption (Liu et al., 2021). Citraland Fresh Market in Surabaya serves as an ideal example of how this theory is applied at the community level, with active participation from all stakeholders.

Moreover, the sustainable ethnopedagogy approach in primary education forms the foundation of this research. Ethnopedagogy is a pedagogical approach that emphasizes the integration of local cultural values into the learning process (Hidayat et al., 2023). In the context of environmental education, ethnopedagogy offers a more contextual and relevant way for students to understand environmental issues based on their experiences and local wisdom. This approach is particularly relevant in Indonesia, where values such as cooperation, unity, and social responsibility are ingrained in daily life. By integrating these values into formal education, it is hoped that students will not only understand the importance of environmental preservation theoretically but also be able to apply this knowledge in their daily lives.

A study by Vriend et al. (2021) highlights that Indonesia is one of the countries with the highest levels of plastic pollution in the world, with an estimated 3 million tons of mismanaged plastic waste each year. The study emphasizes the need for systematic efforts to address the waste crisis, particularly through public education and community-based waste management.

In the field of education, Kilag et al. (2023) found that integrating local values into education can increase student and community engagement in learning. Their research shows that this approach is not only effective in enhancing students' understanding of social issues but also helps them internalize values that support environmental sustainability.

Another study by Marcos et al. (2023) on sustainable consumption and production underscores the importance of SCP concepts in creating environmentally responsible societies. They emphasize that community education, particularly in traditional markets, can be key to reducing the environmental impact of daily consumption.

Method

Research design

This study employs a descriptive qualitative approach to understand the social and cultural phenomena involved in the implementation of zero-waste programs at the community and educational levels. Conducted in Surabaya, the research focused on locations with significant roles in implementing zero-waste initiatives and waste bank programs, including Citraland Fresh Market Traditional Market, known for its successful application of the zero-waste concept; Dinoyo Keputran Waste Bank, which exemplifies efforts to enhance community-based waste management; and Keputran I Elementary School, which has incorporated the Zero-waste School program into its curriculum.

Research sample

The subjects of the study consist of several groups of informants relevant to the implementation of zero-waste culture and waste management in Surabaya, including traders and visitors at Citraland Fresh Market, managers and users of Dinoyo Keputran Waste Bank, as well as teachers and students at Keputran I Elementary School. The number of research subjects will be adjusted according to the principle of saturation in qualitative research, where data collection is halted once the information becomes repetitive and no new significant findings emerge.

Research procedure

The data collection methods used in this research include several techniques; 1) In-depth Interviews will be conducted with key informants, including market managers, waste bank managers, teachers, and students at the school. This technique aims to explore their views, perceptions, and experiences in the implementation of the zero-waste program and waste management. 2) Participant observation will be used to directly observe waste management activities at the research sites, such as the plastic waste reduction process in the traditional market, waste management practices at the waste bank, and the implementation of the zero-waste program at the school. This method involves documenting the behavior of traders, consumers, waste managers, as well as students and teachers to provide a more comprehensive understanding of the zero-waste concept. 3) Documentation involves collecting relevant documents, such as local waste management policies, waste bank activity reports, zero-waste learning modules in schools, as well as photos and videos taken during the observation process.

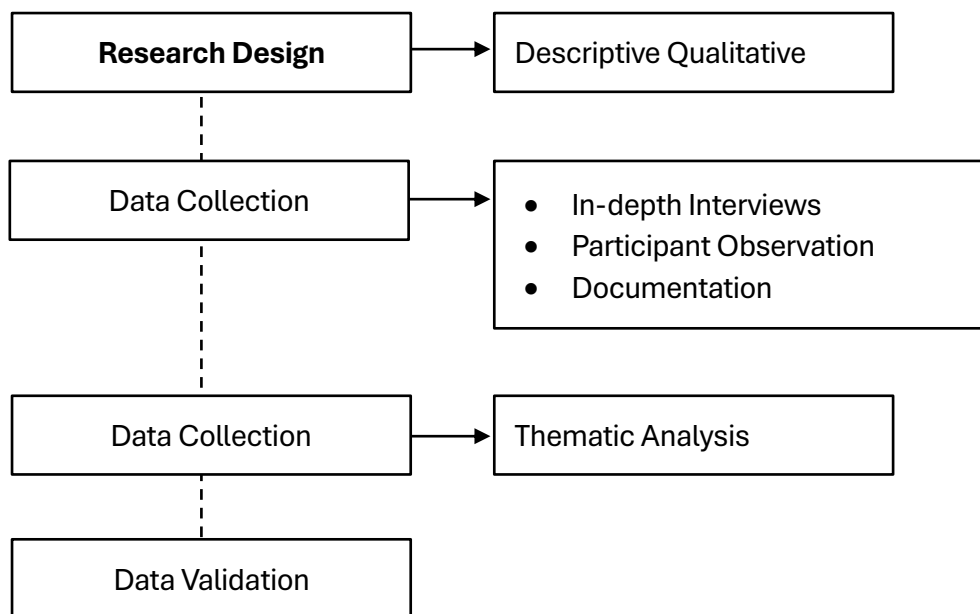


Figure 1. Research Procedure

Data analysis

The data gathered from interviews, observations, and documentation will be analyzed using thematic analysis. Thematic analysis involves identifying, analyzing, and reporting patterns or themes that emerge from the data (Naeem et al., 2023). To ensure the validity of the data, several qualitative data validation techniques will be employed, including triangulation, member checking, and audit trails.

Results and Discussion

Results

This research aims to examine the implementation of the Zero-waste culture in traditional markets, the revitalization of Waste Banks, and the application of sustainable ethnopedagogy in elementary schools in Surabaya. The findings were obtained through in-depth interviews, participant observation, and document analysis conducted in three key locations: Citraland Fresh Market, Dinoyo Keputran Waste Bank, and SDN Keputran I.

Zero-waste Culture Implementation at Citraland Fresh Market

Participation of Traders and Consumers in Zero Waste:

Most traders at Citraland Fresh Market are aware of the importance of implementing zero waste, especially in reducing plastic waste. The market policy encourages traders to avoid using

single-use plastic bags, replacing them with reusable shopping bags. Some traders even use recycled containers or natural packaging, like banana leaves, for their products. On the consumer side, many support the initiative by bringing their own shopping bags. However, some consumers are still unfamiliar with the importance of zero waste, and single-use plastic bags can still be found, though in much smaller quantities.

Challenges in Zero-waste Implementation:

Despite relative success, several challenges remain: 1) Lack of Widespread Awareness: Not all traders and consumers fully understand the zero-waste concept, with some traders still uncertain about practical steps to reduce waste, particularly regarding organic waste management. 2) Difficulty in Changing Consumer Habits: Some consumers who are accustomed to using plastic find it challenging to switch to more eco-friendly alternatives. Awareness about zero-waste has not yet fully permeated all segments of the community.

Government Support:

The Surabaya City Government, under Mayor Eri Cahyadi's policies, continues to support the zero-waste program in traditional markets. Interviews with market managers revealed that government initiatives like anti-plastic campaigns and providing waste management facilities have been instrumental in implementing the program. The market has separate waste disposal bins for organic and non-organic waste, making it easier for consumers to sort their waste.

Revitalization of Dinoyo Keputran Waste Bank

Community Participation in Waste Management:

Community participation in waste management has increased, with residents actively sorting waste at home before bringing it to the waste bank. This participation is driven by direct education from the waste bank managers through regular outreach and community cleanup activities. Waste collected at the bank is typically divided into organic and non-organic categories. Organic waste is often processed into compost, while non-organic waste that can still be reused is sold for recycling.

Environmental Awareness and Outreach:

Environmental awareness among the residents of Keputran has steadily risen due to the presence of the waste bank. Residents now understand the importance of sorting waste at home and are making efforts to reduce single-use plastics. Community collaboration in waste management has also strengthened social bonds. However, interviews revealed that some residents, especially those who have not received direct education, are still not actively involved.

Innovation in Waste Management:

The waste bank has developed social innovations in waste management, such as offering incentives to residents who actively sort waste. Residents who bring recyclable waste earn points that can be exchanged for essential goods. This innovation has successfully attracted more community participation, particularly from low-income groups.

Sustainable Ethnopedagogy Implementation at SDN Keputran I

Integration of Zero-waste Education into the Curriculum:

According to interviews with teachers and the principal, the zero-waste program has been integrated into various subjects at SDN Keputran I. For example, in mathematics, students learn to calculate the volume of waste and its environmental impact, while in science, they study composting and recycling processes. Teachers also teach students about values such as cooperation through activities like school clean-ups and waste sorting. Learning projects such as simulated traditional markets and making recycled products help students understand the importance of zero-waste in daily life.

Zero-waste School Project:

The school has a specific project that involves students in waste sorting at school. Students are encouraged to practice sorting their waste by disposing it into categorized bins (organic and non-organic). SDN Keputran I's 2023 Zero-waste School Award highlights their commitment to consistently running the program.

Student Awareness of Waste Management:

Interviews with students showed that their awareness of environmental conservation is quite high. They not only understand the importance of sorting waste but also practice it at home. As part of the school program, students are encouraged to bring reusable water bottles and food containers to reduce single-use plastic waste.

Connection Between Zero-waste Culture and SDG 12's goals

The findings across the three research sites show that the implementation of the zero-waste culture directly contributes to achieving SDG 12's goals, which focuses on responsible consumption and production. At Citraland Fresh Market, reducing plastic use and raising consumer awareness about responsible consumption are concrete steps towards supporting SDG 12's goals. Dinoyo Keputran Waste Bank supports this goal by ensuring that waste is efficiently managed through recycling and composting. The application of ethnopedagogy at SDN Keputran I plays a crucial role in educating young generations about environmental

conservation through sustainable consumption patterns, further promoting SDG 12's goals objectives.

Discussion

The findings of this research directly indicate that the application of zero-waste culture at traditional markets, revitalization of waste banks, and integration of sustainable ethnopedagogy in schools support the achievement of SDG 12's goals, which focuses on sustainable consumption and production. The implementation of zero-waste at traditional markets reduces plastic usage and promotes more responsible consumption, while the revitalization of waste banks ensures that waste is managed efficiently and recycled appropriately (Fitrianto et al., 2024). The integration of environmental education through ethnopedagogy at SDN Keputran I also contributes to achieving SDG 12's goals by cultivating a youth generation that cares about the environment. Education based on local values, such as cooperation, encourages students to actively engage in environmental activities, ultimately creating a culture of sustainability in society (Solihin et al., 2024; Yli-Panula et al., 2022).

Implementation of Zero-waste at Traditional Markets serves as a successful example of implementing Zero-waste culture in Surabaya. Research findings indicate that efforts to reduce waste, particularly plastic, have been well communicated to both traders and consumers, driven by policy and government support. The reduction of single-use plastic bags and the use of reusable shopping bags demonstrate that traditional markets can adapt to sustainability concepts (Mugobo & Ntuli, 2022). The implementation of plastic waste reduction policies at Citraland Market has shown significant success, especially in reducing the use of single-use plastic bags. This reflects the effectiveness of local policies supported by political backing from the city government. An approach that involves all stakeholders, including the government, traders, and consumers, is key to success in creating behavioral change at the local level (Barbour et al., 2022). However, despite the effectiveness of these policies, challenges remain, particularly in public awareness and education. Some consumers and traders still require deeper education regarding the importance of the zero-waste concept, necessitating further efforts to enhance public understanding and active engagement in minimizing waste.

The engagement of consumers and traders at Citraland Fresh Market underscores the importance of community participation in fostering a zero-waste culture. Research findings show that although most traders have made efforts to reduce waste, there are still gaps in implementing zero-waste practices due to a lack of understanding and resistance to changing habits. This emphasizes the necessity of ongoing educational campaigns to reach all layers of society to actively participate in this initiative. In the context of sustainable consumption theory, consumer patterns at Citraland Fresh Market are moving toward more responsible practices. With education regarding responsible consumption, consumers are beginning to understand the long-term impacts of their shopping behaviors, particularly regarding plastic waste.

Revitalization of Dinoyo Keputran Waste Bank as a Community Waste Management Solution. Dinoyo Keputran Waste Bank demonstrates that community-level waste management can provide a sustainable solution to urban waste problems. By directly involving the community in sorting and managing waste, this waste bank serves as a concrete example of community-based initiatives that support sustainable production and consumption, in line with SDG 12's goals (Roy et al., 2023). Dinoyo Keputran Waste Bank has successfully raised community awareness regarding the importance of proper waste management. Active community participation in sorting waste at the source indicates that the waste bank functions not only as a recycling center but also as an educational medium that reinforces environmental awareness at the community level. Furthermore, the introduction of social innovation in the form of incentives for residents who actively participate in the waste bank illustrates that waste management can be an economically valuable activity. This incentive model encourages community engagement, particularly among low-income groups, in recycling activities (Yang et al., 2022). This finding aligns with collective behavior theory, whereby community participation in environmental activities can be enhanced through social and economic incentives.

Although Dinoyo Keputran Waste Bank has shown success in waste management, several challenges remain, such as uneven public awareness. Some residents have not actively participated in waste sorting, indicating a need for ongoing education and more intensive socialization. Additionally, the scale of the waste bank's operations remains limited, necessitating better infrastructure support to expand waste management coverage, especially in areas that are not yet reached.

Implementation of Sustainable Ethnopedagogy at SDN Keputran I: The integration of zero-waste concepts into the curriculum through sustainable ethnopedagogy at SDN Keputran I has created relevant environmental education based on local values. This program not only teaches students about the importance of waste management but also instills values of community cooperation and environmental stewardship. The project-based learning approach implemented at SDN Keputran I demonstrates the effectiveness of ethnopedagogy in teaching students about waste management contextually. By involving students in real activities, such as simulating market management and creating recycled products, they can understand the direct impacts of their actions on the environment. The application of ethnomathematics and ethnoscience in the curriculum also creates contextual education, where students learn through experiences and projects relevant to their daily lives (Cadena et al., 2024; Sumarni et al., 2022). This aligns with constructivist learning theory, where students actively build their knowledge through direct interaction with their environment.

Through the Zero-waste School project, students are trained not only to sort and manage waste but also to become agents of change in their surroundings. This environmental education emphasizes character development in students, particularly in responsibility, discipline, and collaboration. Students actively involved in these activities demonstrate increased understanding and awareness of environmental issues (Jannah, 2023). This program also helps foster ecological awareness from an early age, which is expected to shape a generation that is

more responsible for the environment in the future. With a locally-based approach, sustainable ethnopedagogy becomes an effective means of instilling sustainability values at the elementary school level (Hidayat et al., 2023).

Based on the findings of this research, several policy implications can be taken to strengthen the application of zero-waste culture and environmental sustainability in Surabaya:

- 1) Expansion of Zero-waste Programs: The Surabaya city government needs to expand zero-waste programs to other traditional markets, especially in underserved areas (Jaya & Machdum, 2022). More intensive socialization and education must be conducted to ensure that the entire community understands the importance of responsible waste management.
- 2) Support for Waste Bank Infrastructure: The revitalization of waste banks should be supported by improved infrastructure, including enhanced waste processing facilities and wider distribution of incentives to attract community participation (Fitrianto et al., 2024).
- 3) Integration of Environmental Education in Schools: The sustainable ethnopedagogy program implemented at SDN Keputran I can serve as a model for other schools in Surabaya. The government can consider expanding this program as part of a national curriculum based on environmental education and local values (Corpuz et al., 2022).

By implementing these recommendations, it is hoped that sustainability efforts and the achievement of SDG 12's goals can be strengthened at the local level, ultimately leading to positive environmental impacts overall.

Conclusion

This research highlights the successful implementation of zero-waste culture in Surabaya across three key sectors. Citraland Fresh Market demonstrates progress in reducing plastic waste through trader participation and government support, despite ongoing challenges in changing consumer habits. The Dinoyo Keputran Waste Bank effectively promotes community-based waste management through its innovative incentive system and educational outreach. Meanwhile, SDN Keputran I successfully integrates zero-waste education into its curriculum, fostering environmental awareness among students that extends to their homes, as evidenced by their 2023 Zero-waste School Award. These initiatives collectively contribute to SDG 12's goals of responsible consumption and production, showcasing how coordinated efforts across markets, community facilities, and schools can create meaningful environmental impact. While challenges in awareness and behavior change persist, Surabaya's model provides a practical template for other cities seeking to implement comprehensive zero-waste programs.

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