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Learning Environmental Education to Students in Reducing Plastic Use Towards Zero Waste Indonesia

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Abstract

All sectors have realized that waste, especially plastic waste, has become a complex and serious environmental problem, not only in Indonesia, but also around the world. Plastic waste has a major impact on public health and environmental sustainability. In Indonesia, this negative impact is increasingly felt, with an increase in the amount of plastic waste that is not properly managed, polluting nature and damaging ecosystems. For this reason, there needs to be strategic efforts to reduce the use of plastic, one of which is through environmental education. This research explores the role of environmental education as a strategy to instill environmental awareness in students, so that they are more concerned about the impact of plastic waste. The method used in this study is library research, by analyzing various literature and previous research. The results show that environmental education can increase students' awareness of the dangers of plastic waste and the importance of better waste management. In addition, environmental education can also motivate students to apply the 3R (Reduce, Reuse, Recycle) principles in their daily lives. Practice-based learning and real actions have proven to be effective in arousing students' enthusiasm to reduce plastic waste. By involving students in activities directly related to waste management, they can feel the benefits and be motivated to participate in preserving the environment. Sustainable environmental education has great potential in shaping student behavior as agents of change towards a waste-free Indonesia in the future.

Keywords : environmental education, learning, plastic, waste, zero waste

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1. Introduction

Almost every sector of society recognizes the environmental dilemmas that have risen to global concern, alongside the dangers associated with these environmental challenges. The origin of environmental degradation is attributed to many factors, one of which is the proliferation of waste generated by societal activities (Martini & Widarto, 2020). As the human population expands, coupled with increased mobility and rising activity levels, the continued reliance on plastics contributes to a situation where waste generation remains insurmountable or is exacerbated. The continuous accumulation of waste, which grows larger every day, reduces available space and disrupts human activities (Masruroh, 2021). Every year, millions of tons of waste are generated, with most of it inadequately managed, resulting in a large number of adverse effects on the environment and public health (Zitri et al., 2022).

Waste has become one of the complex problems faced by both developing and developed countries in the world. This waste problem seems to have become a universal phenomenon in various countries in the world. This problem is very visible in Indonesia (Masruroh, 2021). According to data provided by the Ministry of Environment and Forestry's National Waste Management Information System (SIPSN) in 2023, input from 367 districts or cities across Indonesia revealed that the total number of landfills nationwide reached 38.4 million tons. It is known that 18.4 tons are handled in landfills. However, only 61.1% of the



waste is managed and 38.4% of the waste is unmanaged. Within this large volume of waste, food waste is the dominant 41.60%, while plastic waste represents 18.71%. According to Juniartini (2020), Indonesia has risen to the position of the second largest contributor of plastic waste globally after China, and is faced with an urgent crisis often described as a "plastic waste emergency."

There is no denying that every day, Indonesians are inundated with plastic waste, as if plastic has become a part of an individual's life. Initiatives aimed at reducing plastic waste through the use of eco bags during shopping may have been implemented to reduce the consumption of conventional plastic bags. Nonetheless, the fact remains that the public largely remains oblivious to the idea that buying things equates to generating waste, especially when it comes to single-use items. The prevalence of plastic bags in traditional markets, along with the presence of plastic utensils derived from food containers, toothbrushes, and other similar items, serve as a small illustration of the continuous utilization of plastic products in daily life that we continue to observe. Ultimately, plastic products will culminate in non-biodegradable waste that accumulates beyond the ecological capacity of the environment to absorb and thus threatens the environment (Valentine, 2019).

This problem is not only a homework for the government, but all Indonesian people are responsible for this problem. Reducing plastic waste is an urgent necessity, if not taken seriously the current environmental damage will worsen and impact future generations. Efforts to reduce plastic waste that have been made by various initiatives by the government, nongovernmental organizations, and the environmental community have not been carried out optimally because they have not been implemented consistently at all levels of society, whether young or old. Involving the younger generation in this effort is a preventive measure. Given that the younger generation will be the nation's successors and agents of change, it is imperative to integrate environmental education into their learning from an early age, as a means to reduce plastic consumption (Manyullei et al., 2022).

Learning environmental education to school students can be a good first step. Environmental education is an educational program to foster students to have understanding, awareness, attitudes, and rational and responsible behavior about the mutual influence between society and the environment in various aspects of human life (Rahayu et al., 2023). Environmental education will play a major role in achieving long-term sustainability in reducing plastic waste by instilling the value of sustainability and environmental awareness from an early age. Through environmental education, students' characters are formed through experiential learning, thus facilitating the adoption of habits of environmental care (Lestari et al., 2023). The learning process related to environmental education significantly affects student behavior regarding waste management practices. Through the application of appropriate and effective approaches, students can gain knowledge about the principles of sustainability, which include the important concepts of reduce, reuse, and recycle (3R), which are related to reducing the use of plastic waste. In addition, the environmental education process can effectively inspire students to adopt a zero waste lifestyle.

Zero waste, or zero waste philosophy, represents a lifestyle paradigm that advocates more thoughtful waste management practices. The ultimate goal is to minimize waste production as far as possible, ideally approaching a state of zero. The zero waste approach is essentially a straightforward methodology that aims to significantly limit the generation of plastic waste; hence, zero waste emerges as an aspirational framework to address waste-related issues (Mirda et al, 2024). By engaging in environmental education and actively adopting a zero waste lifestyle to address the challenges posed by plastic pollution, it is anticipated that a generation with high environmental awareness will be cultivated. This initiative can be an important starting point for Indonesia in its journey towards achieving zero waste. Through a review of the above background, the learning of environmental education towards students in the reduction of plastic use towards a zero waste Indonesia is the main focus of this research.

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2. Method

The research method used in this research is the library research method (library research) where in this research there will be a series of activities related to library data collection methods, reading, recording, and analyzing data. The management of research materials will be explained descriptively, namely the description of data in an organized and easy-to-understand manner for readers (Efendi & Sholeh, 2023). Data sources for this research were obtained through national journals, web pages, and other sources published within the last 5 years. It has relevance and is considered relevant to environmental education learning for students on reducing plastic use towards Indonesia zero waste. After the data is obtained, it will be thoroughly reviewed and the results synthesized to provide comprehensive information. The research design used in this study is a library research method, which relies on data collection through literature available in various written sources. This method includes a series of activities, namely reading, recording, and analyzing data obtained from various relevant library sources. In this study, data was collected by searching national journals, web pages, and other sources published in the last five years. The selection of this time frame aims to ensure that the data used has relevance and actuality in accordance with the research topic on environmental education, especially related to efforts to reduce the use of plastic and support the "zero waste" lifestyle in Indonesia. In the management of research materials, the data will be explained descriptively. This means that the data obtained will be organized and arranged in such a way that it is easy to understand and can provide a clear picture for readers. A structured description will allow the reader to follow the flow of information better and gain a deeper understanding of the topic being discussed. Once the data is collected, the next step is to analyze and review the entire data in depth. The results of this analysis will then be synthesized, which will be combined to provide comprehensive information on the role of environmental education in reducing plastic waste and supporting the waste-free Indonesia movement. Thus, this study aims to present a broader insight into environmental education efforts as a solution to the plastic waste problem.

3. Results and Discussion

Environmental education is a systematic educational framework that aims to equip students with a comprehensive understanding, heightened awareness, positive attitudes, and responsible behaviors regarding the intricate interrelationships between society and the environment across multiple dimensions of human existence. The implementation of environmental education in the student population is anticipated to foster a character characterized by habits of environmental stewardship and the adoption of a zero-waste lifestyle. It is envisioned that students will develop into catalysts for societal transformation, promoting awareness regarding the imperative of reducing plastic waste. This initiative is particularly salient in the context of Indonesia, which currently ranks among the top contributors to global waste generation.

Based on a documentation study, this research takes the results of previous research and has been tested over the past 5 years. The basis of acquisition through national journals, web articles from search results or searches that have been selected, selected, and searched using selected Google Scholar, Garuda, Crossef, and Semantic Scholar media. Through environmental education learning for students in reducing plastic waste towards Indonesia zero waste. This is evident from some of the literature whose research has been summarized as follows.

Table 1. List of literature summaries

No	Author	Research Title	Article Error Years	Research Results
1	Sukma, Elfia, Syahrul Ramadhan, and Vivi Indriyani.	Integration of Environmental Education in Elementary Schools	2020	This research emphasizes the importance of incorporating environmental education into the existing curriculum, so that students can

				understand environmental issues early on environmental education.
2	Martini & Windarto	²² Pemberdayaan Sekolah Dalam Pengelolaan Sampah Sebagai Bahan Pembelajaran Pendidikan Lingkungan (PLH)	2020	This research not only teaches students how to manage waste, but also teaches them how to see waste in economic value and as an opportunity. Through activities such as waste sorting, exhibitions, and waste management competitions are expected to foster environmental awareness and practical skills that they can apply in their daily lives.
3	³ Mochammad Ronaldy Aji Saputra & Heri Budianto	Peran Siswa Dalam Pendidikan Lingkungan Hidup melalui Program Adiwiyata di MAN SUMENEP Dalam Menyongsong Era Society 5.0	2022	This research shows that students participate in various environmental activities that made, such as saving energy by turning off the fan after use, bringing their own shopping bags to reduce plastic, and planting trees to maintain the beauty of the school. They also manage waste using the 3R principle (Reduce, Reuse, Recycle), produce compost, and separate organic and inorganic waste. Students are involved as environmental cadres through the socialization of the Adiwiyata program, enabling them to recognize and address problems environment in their school.
4	¹⁵ Yelfira Sari, Nurkhairo Hidayati, dan Sumandar	Zero Waste Lifestyle Guna Mencapai Lingkungan Bebas Sampah Dengan Menenrapkan 3R (Reduce, Reuse, Recycle)	2023	In this study, students were provided with educational materials and posters, followed by an interactive quiz through the Quizizz platform to measure their understanding. Which shows the results that zero waste education through socialization methods and interactive materials can increase student motivation to reduce, reuse and recycle waste. Proven by the small things most students have brought their own drinking bottles as a small start to reduce the use of waste plastic.
5	² Siti Baro'ah, Siti Mazidatul Qonita	Penanaman CiLi (Cinta Lingkungan) Pada Siswa Melalui Program Lingkungan Sekolah Tanpa Sampah Plastik	2020	The program successfully increases students' awareness and positive attitude towards the environment by applying the zero waste principle of reducing, reusing and recycling (3Rs). Through practical activities such as using eco-friendly bottles and shopping bags, students learn to manage waste sustainably. This program demonstrates that actionbased education in schools can effectively shape environmentally friendly behaviors in students from a young age early.
6	² Jufri, Jumarddin La Fua, dan Ratna Umi Nurlila	Pendidikan lingkungan di Sekolah Dasat Negeri 1 Baruga Kota Kendari	2019	This research states that through the integration of environmental materials in thematic learning, extracurricular activities focus on environmental management, as well as ongoing socialization, students introduced to the

				practice of protecting and preserving the environment. This demonstrates the effectiveness of environmental education in building early environmental awareness amongst students.
7	Yulia Indahri	Pengembangan Pendidikan Lingkungan Hidup Melalui Program Adiwiyata (Studi di Kota Surabaya)	2020	This study states that the Adiwiyata Program not only increases students' knowledge of environmental issues, but also emphasizes the importance of student involvement in concrete activities, such as recycling and waste reduction. The study also found that the support from the school and the involvement of The community is instrumental in the success of the program.
8	Tiara Silvia	Peranan Pendidikan Lingkungan Dalam Mendorong Keasadaran Siswa Terhadap Pentingnya Mengurangi Sampah Plastik Di Sekolah	2024	The results of the research conducted by Tiara show that environmental education not only increases students' knowledge about the negative impact of plastics on the environment, but also encourages more sustainable behavior change. Students involved in environmental education programs tend to have a more caring attitude towards the environment, reduce the use of single-use plastics, and be active in activities recycling.
9	Rhavy Ferdyan, Vauzia, Zulyusri, Tomi Apra Santosa, dan Abdul Razak	Model Pendidikan Lingkungan Hidup: Kegiatan Pembelajaran pada Siswa Sebagai Bagian dari Lingkungan di Era New Normal	2021	This study illustrates that the adoption of a novel environmental education framework significantly enhances students' consciousness regarding ecological concerns and fosters a sense of accountability towards environmental preservation through the minimization of single-use plastic consumption as an initial measure.
10	Pramudya Dwi Andieny, Amatullah Mufidah, millati azka, Sofiyana Khoirunnisa, Yaqut Amjad Adillah Raharjo, Grhasta Dian Perestroika	Program Grow Green Upaya Zero Waste Action pada Siswa SMP Negeri 5 Surakarta	2023	The results of this study successfully showed that the "Grow Green" program succeeded in raising students' awareness about the importance of waste management and the environment. Through various activities, such as education about the concept of zero waste, students are taught to reduce, use, and eliminate waste. reuse, and recycle (3R) waste. These activities, including training on how to process organic waste into compost, as well as making creative products from plastic waste.
11	Edysyah Putra, Nurhasanah, Nazla Asyifah Siregar, dan Julia Ananda Siregar	Pengenalan gaya hidup zero waste terhadap siswa sekolah dasar	2022	Researchers developed socialization and education on the concept of zero waste at the elementary school level. The activities involve not only theoretical understanding, but also concrete actions that can be done at home and at school to reduce the use of plastic and non-biodegradable waste.

				The results show that through the introduction of the zero waste concept, students can better understand the importance of waste reduction in everyday life and are encouraged to participate together in realizing community empowerment for the better.
12	Syeftian Pranata, dan M uhammad Zubair	Implementasi Program Zero Waste untuk Membentuk Warga Negara Ekologis (Studi Kasus Upaya Pengelolaan Sampah di SMA Negeri 1 Mataram)	2022	The results showed that the program was effective in raising students' awareness of the importance of waste management and environmental conservation. Students are not only taught about waste reduction, but also act as agents of change for the environment. This zero waste program focuses on building the character of students who are responsible for the environment, with a positive impact in increasing their awareness and active participation in waste management.
13	Ni Kadek Supadmini, I Komang Wisnu Budi Wijaya, dan Ida Ayu Diah Larashanti	Implementasi Model Pendidikan Lingkungan UNESCO Di Sekolah Dasar	2020	Through this research, it was found that the application of UNESCO-based environmental education model in elementary schools is quite effective in increasing students' awareness and knowledge of environmental issues. Most students showed improvement in terms of understanding the importance of environmental conservation and simple ways. Through school cleaning, greening, and waste management programs that involve students directly. Students are invited to be more active in keeping the school environment clean.

Source: Research Data

Research conducted (Sukma et al., 2020) focuses on the integration of environmental education into the elementary school curriculum to increase students' awareness of environmental issues from an early age. This study shows that teachers play an important role in the implementation of environmental education. Teachers not only function as information providers, but also as facilitators who are able to inspire students to think critically about their surrounding environment. Thus, the implementation of environmental education in primary schools aims to equip students with relevant understanding and skills so that they can start practicing environmental care behavior early on. Later, it will have an impact on how students can slowly reduce the use of plastic. They emphasized that environmental learning should be part of basic education so that students can better understand the impact of actions on the environment, while building a foundation of environmentally friendly behavior.

The study conducted by (Martini & Windarto, 2020) mainly examines the concept of school empowerment in the context of waste management within the framework of Environmental Education. In this paradigm, students are educated to consider waste as having economic significance. Furthermore, the researchers found that through direct waste management, students can gain a practical understanding of environmental consequences. Environmental education instruction, as delivered by educators, serves an important function by incorporating waste issues into the curriculum, thus nurturing a sense of environmental

responsibility among students from an early age. This educational strategy not only contributes to the establishment of a cleaner school environment but also fosters sustainable behavior in students.

Research conducted by (Mochammad et al., 2022) shows that students are proactively involved in environmental education through initiatives aimed at facilitating the reduction of plastic waste, which is in line with the goals of Indonesia's Zero Waste initiative. Initiatives such as utilizing personal shopping bags, participating in tree planting, and implementing waste management through the 3R principles (Reduce, Reuse, Recycle) instill a sense of environmental responsibility among students. The program underscores the importance of prudent waste management practices and raises students' awareness regarding environmental sustainability, in addition to reducing the use of plastic within educational institutions as a component of transitioning towards an eco-friendly culture.

The investigation conducted by Yelfira et al. (2023) highlighted that environmental education incorporating a zero-waste paradigm can increase students' understanding and motivation towards mitigating plastic consumption. In this study, participants were provided with instructional resources relating to zero-waste lifestyles, which were disseminated through educational posters and engaging quizzes facilitated by the Quizizz platform. Findings showed that this pedagogical approach was efficacious in raising students' awareness regarding plastic waste reduction. An important change observed is that students have started using their own reusable drinking vessels, representing a modest yet significant progress in the effort to reduce plastic usage.

Research conducted by (Baro'ah and Qonita, 2020) explained that the "CiLi" initiative, which instills the principle of zero waste (i.e., reduction, reuse, and recycling), significantly increased students' awareness on plastic waste management. Through experiential learning activities such as the utilization of eco-bottles and reusable shopping bags, students were instructed in strategies to minimize plastic consumption and advocate for sustainable waste management practices. A study conducted by (Jufri et al., 2019) articulated that findings derived from environmental education, disseminated to students through thematic learning materials, extracurricular activities geared towards environmental management, and ongoing socialization efforts, have acquainted students with practices necessary for environmental maintenance and preservation. The program fosters initiatives aimed at reducing plastic use by providing students with the essential significance of effective waste management.

A survey conducted by (Yulia, 2020) emphasized that the Adiwiyata Program in Surabaya City not only increased students' understanding of environmental challenges but also galvanized their active participation in pragmatic efforts such as recycling and waste reduction. The findings of this investigation underscore the important role of institutional support from schools as well as community involvement in strengthening the program. Through this learning experience, students are cultivated to embody the values of environmental stewardship, thus contributing to initiatives aimed at reducing plastic waste, which is in line with Zero Waste Indonesia's goal. Research conducted by Silvia (2024) examined the significant impact of environmental education in reducing plastic waste in educational settings. This investigation showed that environmental education plays an important role in raising students' awareness about the damaging effects of plastics on the ecosystem. In addition to increasing knowledge, it also triggers a transformation in student behavior towards sustainability. Students who engage in environmental education show high concern for environmental issues, reduce their dependence on single-use plastics, and actively participate in recycling initiatives.

Research conducted by (Rhavy et al., 2021) showed that the implementation of innovative environmental education models during the new normal era fostered increased awareness among students about environmental dilemmas. Students were motivated to assume responsibility for environmental preservation through early actions such as the reduction of single-use plastics. Evidence suggests that adaptive environmental education methodologies can effectively cultivate student awareness and foster positive behaviors that support sustainability. Research conducted by (Pramudya et al., 2023) through the "Grow Green" program has effectively increased students' awareness about reducing plastic use

through the application of the zero waste principle. Through environmental education, students are instructed in the principles of the 3Rs (reduce, reuse, recycle), including the processing of organic waste into compost and the recycling of plastic waste into innovative products. This program proves that practice-based environmental education can play a role in promoting behavioral change among students towards a more environmentally-friendly lifestyle.

Research conducted by (Putra et al., 2020) aims to identify the introduction of zero waste lifestyle among elementary school students and its impact on their understanding and behavior change related to waste management. Where the results showed that the introduction of the concept of zero waste through practical activities such as sorting waste and using environmentally friendly goods can increase students' awareness of the importance of responsible waste management. Students involved in this learning showed behavioral changes, such as reducing the use of single-use plastics, and can become agents of change in their families and communities. This research also emphasizes the importance of environmental education implemented from an early age to shape the character of environmental care in the younger generation.

Research conducted by (Pranata & Zubir, 2022) focuses on shaping citizens who care about the environment through better waste management. The results showed that the implementation of the Zero Waste program in schools successfully increased the awareness of students' participation in reducing waste, especially plastic waste and contributed greatly in shaping students' characters as more ecological citizens who care about environmental sustainability. This research also emphasizes that the success of the program must also be supported by the existence of school policies that support effective waste management.

Research conducted by (Supadmini et al., 2020) implementing the UNESCO Environmental Education Model in Elementary Schools aims to find out how the environmental education model promoted by UNESCO can be applied at the elementary school level to increase student awareness of environmental issues. Where the results of this study state that the implementation of the model approach can increase students' understanding and involvement in environmental conservation efforts. Through an approach based on UNESCO principles, such as experiential learning and integrating environmental values in daily learning activities, students are not only given knowledge, but also equipped with skills to overcome existing environmental problems. This research also involves activities such as tree planting, waste management, and biodiversity conservation, which teach students to become agents of change in society. In addition, more interactive learning activities, such as group discussions and environment-based projects, are also integrated in the educational process. The study concludes that the implementation of UNESCO's environmental education model in primary schools not only improves students' understanding of environmental issues, but also shapes positive pro-environmental attitudes and behaviors among students.

4. Conclusion

Through environmental education, it has proven to be an effective tool to increase students' awareness and involvement in plastic waste management and adoption of a zero waste lifestyle that will help Indonesia achieve zero waste. When environmental education is implemented with a practical and action-oriented approach, it facilitates the understanding and attitude of environmental care in students from an early age. Also, through interactive learning methods, it can be shown that students who receive environmental education are more motivated to apply the 3R principles (reduce, reuse, recycle) and reduce the use of single-use plastics in their daily lives. Thus, environmental education plays an important role in encouraging changes in student behavior towards a waste-free Indonesia, making students agents of change in society.

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