

Zero Waste-Oriented Adiwiyata Program in Developing Environmental Care Character of Madrasah Ibtidaiyah Students

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ABSTRACT: Managing plastic waste is still a big environmental problem, especially in schools where students need to learn to care about the environment from a young age. This study investigates the execution of a zero waste-oriented Adiwiyata program at an Islamic elementary school, emphasising the incorporation of zero waste principles, engagement with the school ecosystem, and the cultivation of students' environmental stewardship character. A descriptive qualitative methodology was utilised, involving 28 informants chosen via purposive sampling. We gathered data through interviews, observations, and documents, and we used the Miles and Huberman interactive model with triangulation to analyse it. The results indicate that zero waste practices, including the utilisation of personal eating utensils, daily waste sorting, and environmental activities, were effectively incorporated into the school culture through consistent habituation, promoting the internalisation of 3R principles. The program worked better because the school ecosystem, especially the students, was actively involved. The program helped cut down on plastic waste and make students more aware of the environment and more responsible. Internal commitment was more important than external funding. This research presents an innovative contribution by showcasing an integrated model of zero waste, Adiwiyata, and Islamic value-based character education at the Madrasah Ibtidaiyah level, emphasising its potential as a replicable framework for sustainability-oriented education.

Keywords: adiwiyata program, zero waste, environmental character education, plastic waste management, islamic elementary school

INTRODUCTION

Problems with the environment, especially how to deal with plastic waste, have become an urgent global issue that needs long-term, all-encompassing solutions. In Indonesia, the amount of plastic waste in cities is still high because people don't sort it well at the source. This is because they don't know enough about it, they don't have enough control over their behaviour, and social norms don't yet support the best ways to manage waste [1]. In this context, schools are important change agents because they teach kids about the environment and help them develop a sense of responsibility for the environment from a young age [2].

The Ministry of Environment and Forestry and the Ministry of Education worked together to make the Adiwiyata Program a national policy. The goal was to make schools more environmentally friendly by using four main parts: environmentally friendly school policies, environmental-based curricula, eco-friendly facilities and infrastructure, and participatory environmental activities [3]. In reality, the Adiwiyata program works not only as an administrative tool but also as a way to learn that changes people and makes them more aware of the environment through direct experience. This role works better when it is combined with the idea of zero waste and ways of managing resources that are sustainable and focus on the 3R principles of reduce, reuse, and recycle [4]. By combining these methods, schools can become effective social labs for teaching students how to care about the environment in a way that will last [5]. This viewpoint corresponds with international sustainability education frameworks that highlight schools as transformative environments for fostering pro-environmental behaviour through experiential learning and value internalisation [6].



Previous research on the Adiwiyata program and environmental character education has demonstrated considerable advancement. Mulyani and Anjarini [7] discovered that the Adiwiyata program positively influences the development of students' environmentally caring character through the consistent habituation of pro-environmental behaviour. Likewise, Siburian [8] underscored that the efficacy of the Adiwiyata program is predominantly contingent upon the uniformity of its execution and the assimilation of environmental principles into the educational culture. Amir et al. [1] stated that the implementation of 3R principles is still not very good from a waste management point of view because kids don't learn them in a systematic way from a young age. This shows how important school-based interventions are [1]. Additionally, Muntu [9] illustrated that Adiwiyata schools incorporating zero waste practices can serve as conduits for the dissemination of environmental culture beyond the educational setting. Globally, zero waste education is seen as a good way to teach young people how to be responsible with the environment and make choices that are good for the environment [10].

Even with these contributions, there are still some important gaps. The majority of studies concentrate on junior and senior high school levels, whereas research at the Madrasah Ibtidaiyah level, which incorporates Islamic values as a moral foundation, is still scarce [11, 12]. In Islamic educational institutions, environmental stewardship is fundamentally rooted in the concept of khalifah (vicegerency), which designates humans as accountable custodians of the earth [13]. This theological foundation offers a unique moral framework for ecological character development that is absent in conventional public schools. Furthermore, research focused on the execution of zero waste-oriented Adiwiyata programs and their influence on environmental character development through systematic daily habituation remains limited. The full participation of the school ecosystem, which includes parents, school vendors, and the community around the school, has not been fully studied as a factor that affects program success [14].

This study addresses existing gaps by providing a unique contribution through the examination of a zero waste-oriented Adiwiyata program within an Islamic elementary school context from an integrated perspective. This study specifically examines three interconnected aspects that have not been concurrently analysed in prior research: (1) the incorporation of zero waste principles within the Adiwiyata framework, (2) the engagement of the entire school ecosystem, and (3) the cultivation of students' environmental stewardship through habituation rooted in Islamic values. Consequently, this study seeks to deliver a thorough, evidence-based comprehension of zero waste-oriented Adiwiyata implementation as a strategy for character development at the Madrasah Ibtidaiyah level, while simultaneously providing practical guidance for the creation of contextually pertinent and value-integrated environmental education programs.

RESEARCH METHODS

Materials and Tools

This study did not involve laboratory materials. The data were collected using several research instruments, including semi-structured interview guidelines, observation sheets, and documentation tools such as a camera, audio recorder, and field notes. The interview guidelines were prepared based on the research objectives and covered three main aspects: the implementation of the Adiwiyata program, the application of zero waste practices in daily school activities, and the development of students' environmental care character.

The data sources consisted of primary data obtained from informants, namely the madrasah principal, teachers, students, and school vendors, as well as secondary data in the form of school documents related to the implementation of the Adiwiyata program.

Method of Qualitative Analysis

This research utilises a descriptive qualitative methodology to elucidate and comprehend social phenomena in depth, grounded in field data [15]. This methodology was chosen for its pertinence in examining the process of value internalisation and the development of students' environmental stewardship through the execution of a zero waste-focused Adiwiyata program at MI Assunniyyah 45 Paseban Jember. This study is conceptually based on the interconnection of three primary variables: the Adiwiyata program as a policy framework, the zero waste concept as a practical method for daily habituation, and the development of an environmentally caring character as the long-term result [16]. These variables were analysed in an integrated manner to achieve a thorough comprehension of student character development.

The research subjects were identified through purposive sampling, which is the deliberate selection of informants based on their significance and direct engagement in the program implementation [15]. This study included 28 participants, comprising 1 madrasah principal, 3 teachers, 20 students, and 4 school vendors. The number of participants was considered sufficient as data saturation was achieved,

indicated by the repetition of information and the absence of new emerging themes during the data collection process, which is a common criterion in qualitative research [17]. The characteristics of research participants are presented in Table 1.

TABLE 1. Research Sample

Research Subject	Role in Study	Number
Madrasah Principal	Key informant for Adiwiyata program policy	1 person
Teachers	Program implementers and zero waste classroom facilitators	3 persons
Students Grade IV–VI	Primary subjects of zero waste habituation	20 students
School Vendors	Supporting actors in plastic restriction practices	4 persons

The principal instrument utilised in this study was a semi-structured interview guide formulated in accordance with the research focus. The study took place in a school setting over three months, from November 2025 to January 2026. The guiding questions concentrated on three dimensions: (1) the policy and planning of the Adiwiyata program; (2) the execution and uniformity of zero waste practices in daily school activities; and (3) its impact on students' environmental attitudes and behaviours [18].

In addition, participatory observation was conducted to directly examine students' behavior, while documentation techniques were used to collect supporting data such as school policy documents, activity records, and photographs. These instruments were used complementarily to strengthen data triangulation and enhance the credibility of the findings.

We used the interactive model of Miles and Huberman [19] for data analysis, which has three steps. First, data reduction, which meant picking, coding, and sorting raw data from interviews, observations, and documents into useful groups that were related to the research focus. Second, data display, which meant putting the data into structured descriptive narratives and thematic matrices to make it easier to understand. Third, drawing conclusions and checking them, which meant looking at the results by comparing data from different sources and methods over and over again. The coding process was conducted thematically by grouping similar responses into categories related to program implementation, habituation practices, and character formation.

To ensure the trustworthiness of the data, this study applied source triangulation and technique triangulation by comparing information obtained from different informants (principal, teachers, students, and vendors) and different data collection methods (interviews, observation, and documentation) [20]. In addition, ethical considerations were carefully observed by obtaining permission from the school, ensuring voluntary participation, and maintaining the confidentiality of informants throughout the research process.

RESULT AND DISCUSSION

Result of Qualitative Analysis

This study identified three main findings: (1) the implementation of zero waste concept in the Adiwiyata program, (2) the level of school community involvement, and (3) the effectiveness of the zero waste approach in addressing plastic waste problems in the school environment.

Implementation of the Zero Waste Concept in the Adiwiyata Program

TABLE 2. Forms of Zero Waste Concept Implementation in the Adiwiyata Program

Program Aspect	Form of Activity	Zero Waste Principle
School Policy	Mandatory use of reusable eating utensils (glasses and bowls), prohibition of single-use plastics	Reduce
Supporting Facilities	Provision of reusable eating utensils and storage racks in each classroom	Reduce
Routine Activities	Daily communal cleaning and waste sorting by type	Reduce, Recycle
Environmental Facilities	Greenhouse development and cultivation of medicinal plants	Reuse, Recycle

Source: Observation and interview results, 2025

MI Assunniyah 45 Paseban Jember has implemented the zero-waste concept in a structured manner through four interrelated program aspects, including school policy, supporting facilities, routine activities, and environmental facilities. School policy requires all students to use provided bowls and

glasses when purchasing snacks and prohibits the use of single-use plastics. Supporting facilities include the provision of eating utensils and storage racks in each classroom. Routine activities consist of daily communal cleaning and waste sorting practices, while environmental facilities are represented by the development of a greenhouse used for reuse- and recycle-based learning activities. These findings are summarized in Table 2.

These findings indicate that the school's implementation of zero waste principles is very similar to the 3R framework of "reduce, reuse, and recycle." This is because the school's policies, facilities, daily activities, and environmental infrastructure all work together to support these ideas [21]. The mandatory use of personal eating utensils exemplifies the reduce principle, while the development of a greenhouse facilitates reuse and recycle-based learning [22]. These structured practices provide cognitive, affective, and psychomotor experiences, reinforcing environmental caring values through repeated habituation rather than solely cognitive instruction [4]. This finding supports Widiatmoko et al. [23], who argue that zero waste education is not merely a technical approach but a fundamental mindset shift toward responsible consumption and environmental stewardship.

In addition, the habituation process is particularly meaningful in the context of Islamic education, where students are guided to integrate ethical and moral responsibilities into daily routines [13]. The repeated practice of environmentally responsible actions corresponds with the Islamic concept of khalifah, emphasizing humans as caretakers of the earth. Consequently, students internalize environmental values not only cognitively and affectively but also spiritually, which strengthens the holistic development of character [24].

Level of School Community Involvement

The involvement of school community members was identified at four levels. Students demonstrated a very high level of involvement, actively participating in all zero waste activities. Teachers showed a high level of involvement by complying with policies and acting as role models. Parents and school vendors demonstrated moderate involvement by supporting policies both at home and within the school environment. These findings are presented in Table 3.

TABLE 3. Level of School Community Involvement in the Zero Waste Program

Component	Description	Level
Students	Active participation in all zero waste activities	Very High
Teachers	Compliance with school policies and acting as role models	High
Parents	Supporting zero waste habits at home	Moderate
School Vendors	Adjusting food services to reduce single-use plastics	Moderate

Source: Observation and interview results, 2025

The pattern shows that different school stakeholders are involved to different degrees. Students were very involved, teachers were very helpful and set a good example, and parents and vendors were only moderately involved [25]. This pattern shows that effective environmental habituation goes beyond just teaching in the classroom to include other actors in the ecosystem. The findings confirm Lickona's [26] character education framework, which asserts that moral and ethical values are internalised through repeated, participatory actions reinforced by consistent role modelling. Furthermore, the findings indicate that internal school commitment is more decisive than external funding for program success, demonstrating the critical role of school culture in sustaining environmental initiatives.

The inclusion of parents and vendors as ecosystem actors is a novel contribution of this study, extending prior research on Adiwiyata program success factors and providing empirical evidence of the importance of collaborative community involvement in fostering environmental character at the Madrasah Ibtidaiyah level [27]. This insight highlights that sustainable behavior is reinforced when multiple social agents contribute to the habituation process, creating an integrated, school-wide culture of environmental responsibility.

Zero Waste as a Solution to Plastic Waste Problems

The findings indicate that the zero waste approach effectively addressed three main plastic waste issues: high plastic use, low waste sorting, and limited environmental awareness. The implementation resulted in reduced plastic waste, improved sorting habits, and increased awareness among students. These findings are summarized in Table 4.

These findings further demonstrate that the zero waste strategy effectively addressed three primary challenges in the school environment: high single-use plastic consumption, low waste sorting practices, and limited environmental awareness [28]. Implementation of routine waste sorting and embedding environmental values into daily activities resulted in increased student awareness and habitual pro-environmental behavior [29]. These outcomes not only reinforce prior findings regarding the centrality

of habituation in value internalization by Mulyani and Anjarini [7] but also provide a concrete solution to the suboptimal application of 3R principles in Indonesian communities highlighted by Amir et al [1].

TABLE 4. Zero Waste as a Solution to Plastic Waste Problems in Schools

Plastic Waste Problem	Zero Waste Solution Applied	Identified Impact
High use of single-use plastics	Personal utensils policy	Reduction of plastic waste
Low waste sorting at the source	Daily waste sorting practices	Formation of sorting habit
Low environmental awareness	Embedding environmental values into daily practices	Increased environmental awareness

Source: Observation and interview results, 2025

By embedding environmental caring values into the school's collective identity, the Adiwiyata program achieves a deeper stage of value internalization, consistent with the habituation stage of character education. The combination of habit formation, role modeling, and religious ethical guidance creates a robust framework in which students perceive environmental stewardship as a moral and spiritual responsibility [24].

Comparison with Previous Studies

TABLE 4. Comparison of Findings with Previous Studies

Study	Main Focus	Findings	Position Relative to This Study
Mulyani and Anjarini, 2022 [7]	Adiwiyata program and environmental caring character in general	Adiwiyata positively correlates with character formation through habituation	This study demonstrates the same mechanism at the MI level
Sidik et al., 2021 [27]	Success factors of the Adiwiyata program	School community involvement and consistent school culture are key	This study adds the role of vendors and parents as new actors
Amir et al., 2022 [1]	Application of 3R principles in community behavior	3R is not optimally implemented due to absence of systematic early habituation	This study proves that 3R habituation starting at MI is an effective solution
This study (2025)	Zero waste as a solution to plastic waste in the Adiwiyata program at MI	Zero waste integrated into school culture; internal commitment more decisive than funding	Complements, deepens, and responds to all three previous studies

Source: Compiled from various sources, 2026

This study advances prior research in multiple aspects, as indicated in Table 4. It corroborates the results of Mulyani and Anjarini [7], who indicated that the Adiwiyata program positively influences environmental stewardship through habituation, by illustrating that the same mechanism is effective at the Madrasah Ibtidaiyah (MI) level. It builds on the work of Sidik et al. [27], which said that school community involvement and a consistent school culture are important for success, by adding the roles of vendors and parents as other ecosystem actors. Additionally, it addresses the concern raised by Amir et al. [1] regarding the suboptimal implementation of 3R principles in the community due to insufficient systematic early habituation, by demonstrating that initiating 3R habituation at the MI level through a zero waste-oriented Adiwiyata program offers an effective solution. In summary, this study adds to, deepens, and connects the results of earlier studies while showing that internal school commitment is more important than external funding for program success.

This research presents several distinctive contributions to the literature and yields practical insights. First, it empirically substantiates zero waste habituation at the Islamic elementary school (MI) level, a relatively neglected educational setting. Second, it shows that a school's commitment and culture are more important than its money when it comes to making a program successful. Third, the study emphasises the participation of parents and school vendors as crucial ecosystem participants, broadening the practical application of environmental education beyond traditional classroom interventions. Finally, the research emphasises the amalgamation of Islamic ethical values with character education principles, presenting a comprehensive framework that incorporates cognitive, affective, and spiritual aspects. These results offer a framework that connects environmental and moral

education, enhancing both theoretical and practical aspects. In practical terms, the results indicate that schools aiming to implement environmental education programs should emphasise structured habituation processes, consistent role modelling, and the active participation of the broader school ecosystem, including parents and vendors. Focusing on moral and spiritual guidance in addition to behavioural training can help people internalise environmental values, which will make programs more culturally relevant and long-lasting in Islamic schools.

The study offers significant insights; however, it is confined to a single Madrasah Ibtidaiyah with 28 participants. Subsequent research might replicate the study in various schools and regions to improve generalisability. Furthermore, qualitative methods restrict the quantification of behavioural modifications, indicating that mixed-method approaches may offer enhanced depth. Finally, longitudinal studies would be useful to determine the long-term viability of habituation.

CONCLUSION

The study concludes that the zero waste-oriented Adiwiyata program at MI Assunniyyah 45 Paseban Jember has been successfully implemented through the integration of 3R principles and structured habituation processes, contributing to the development of students' environmental care character. High student involvement, supported by teachers as role models and moderate participation from parents and school vendors, indicates that internal school commitment plays a more decisive role than external funding in determining program success. The implementation of zero waste practices has fostered a school culture in which environmental values are internalized as part of students' daily behavior. Furthermore, the integration of Islamic moral values strengthens character formation by embedding environmental responsibility within ethical and spiritual dimensions. This study confirms that zero waste practices at the Madrasah Ibtidaiyah level can effectively enhance environmental awareness and character development. Future research is recommended to explore broader educational contexts and examine the long-term sustainability of such programs.

Authors' contribution

- **Conceptualization:** Nini Maulani;
- **Data curation:** Nini Maulani;
- **Formal Analysis:** Nini Maulani;
- **Funding acquisition:** Nini Maulani;
- **Investigation:** Nini Maulani;
- **Methodology:** Nini Maulani;
- **Project administration:** Nini Maulani;
- **Resources:** Nini Maulani;
- **Software:** Nini Maulani;
- **Supervision:** Rizqiyah Ratu Balqis;
- **Validation:** Nini Maulani; Rizqiyah Ratu Balqis
- **Visualization:** Nini Maulani;
- **Writing – original draft:** Nini Maulani;
- **Writing – review & editing:** Nini Maulani; Rizqiyah Ratu Balqis

All authors have read and agreed to the published version of the manuscript.

Ethics Statement

This research involved human subjects who had given informed consent to participate. All participants received treatment in accordance with their rights, dignity, and applicable research ethics principles.

Data availability statement

The data will be available upon request.

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The authors have reviewed and revised the generated content and take full responsibility for the final version of this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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