Enhancing E-Waste Management Awareness and Campaign in Schools and Communities in the Philippines

Dwi Sulisworo[1] Ika Maryani[2] Siti Mahsanah Budijati[3] Nhelbourne K Mohamad[4] Abdul Jabbar Abdullah[5] Ummu Qurrota Ayun[6] Nur Hidayah[7] Hindun Yafa Chotijah[8]
Study Program of Doctoral Education, Faculty of Teacher Training and Education, Universitas Ahmad Dahlan, Yogyakarta, DIY, Indonesia[1,2,6,7,8]
Study Program of Industrial Engineering, Faculty of Industrial Technology, Universitas Ahmad Dahlan, Yogyakarta, DIY, Indonesia[3]
Faculty of Education, Western Philippines University, Puerto Princesa, Philippines[4]
Ummul Qura Qurtuba Boarding School, Rio Tuba, Philippines[5]
Email: dwi.sulisworo@uad.ac.id[1] ika.maryani@pgsd.uad.ac.id[2] smbudijati@ie.uad.ac.id[3] nhelbournekm29@gmail.com[4] llantoabduljabbar@gmail.com[5] 2336082003@webmail.uad.ac.id[6] nur.hidayah@pgsd.uad.ac.id[7] hindun0709@gmail.com[8]

Abstract
This study aims to raise awareness and promote ethical e-waste management based on Islamic principles. It seeks to educate students and local communities on the importance of sustainable electronic waste disposal while integrating environmental responsibility with religious values. The study was conducted at Western Philippines University and an Islamic boarding school in Rio Tuba, Palawan, Philippines. It involved educational workshops, field surveys, and collaboration with organizations such as Muhammadiyah Philippines and Palawan Muslim Consultative & Da'wah. Due to the hazardous nature of e-waste, hands-on recycling activities were replaced with location assessments for future management projects. The program successfully enhanced students' understanding of e-waste issues and the ethical responsibility of managing electronic waste. Participants engaged in discussions, site visits, and project planning, fostering a strong commitment to sustainable practices within their communities. This study was limited by the inability to conduct hands-on recycling activities due to safety concerns. Additionally, the research focused on a specific educational setting, which may affect the generalizability of the findings. This study contributes to environmental education, particularly in integrating Islamic values with sustainability efforts. It provides a framework for ethical e-waste management that can be applied in educational institutions and community development programs. The findings are relevant to educators, policymakers, and environmental researchers seeking to promote sustainable waste management through religious and ethical perspectives.
Keywords: Community participation, E-waste management, Environmental education, Sustainability

INTRODUCTION

In the era of rapid technological advancement, the use of electronic devices has significantly increased, leading to a growing amount of electronic waste (e-waste). E-waste consists of discarded electronic devices such as smartphones, computers, batteries, and other electrical appliances that are no longer functional or needed (Ghulam & Abushammala, 2023; Pont et al., 2019). The improper disposal of e-waste poses serious environmental and health risks due to the presence of hazardous substances like lead, mercury, and cadmium (Beula & Sureshkumar, 2021; Pinto, 2008; Rawat et al., 2020). These toxic materials can contaminate soil and water, threatening ecosystems and human health (Alengebawy et al., 2021). However, electronic waste management remains suboptimal, particularly in schools. Many educational institutions face challenges in disposing of and repurposing outdated digital devices (Dayaday & Galleto, 2022). Without an effective e-waste management system, obsolete electronics often

accumulate in school storage rooms, creating clutter and potential health hazards for students and staff (Maphosa, 2021). In addition to affecting the school's environmental aesthetics, improper e-waste disposal may also contribute to long-term pollution. Environmental issues related to e-waste have become a priority concern. Schools and communities recognize the need for better e-waste handling, yet they often lack the necessary knowledge and resources (Debrah et al., 2021). To address this challenge, a sustainable e-waste management program has been initiated, focusing on collection, recycling, and repurposing electronic devices (Ahirwar & Tripathi, 2021). This initiative aims not only to educate students about environmental responsibility from an Islamic perspective but also to raise awareness about the dangers of e-waste. The prioritization of digital literacy and e-waste management as key issues stems from their interconnectedness within modern education and environmental sustainability (Moradi et al., 2024). As technology becomes an integral part of daily life, addressing these concerns is essential in ensuring a healthy learning environment.

Schools have acknowledged the importance of tackling these issues to create a cleaner, more sustainable educational space while fostering Islamic values among students (Begum et al., 2021). By integrating digital literacy with environmental awareness, this program is expected to have a positive impact on both students and the surrounding community. The objective of this program is to raise awareness and encourage active student participation in environmental conservation by introducing the concepts of recycling and repurposing electronic devices that are still functional. By integrating these practices into the school environment, students will develop a deeper understanding of the importance of sustainability and responsible e-waste management. This initiative aims to instill eco-friendly habits and a sense of responsibility toward waste reduction, aligning with the principles of sustainability. Through education and hands-on involvement, students will be empowered to contribute to a cleaner environment and promote sustainable practices within their communities.

RESEARCH METHODS

This program emphasizes environmental education with an Islamic approach, integrating sustainability with religious values to foster a sense of responsibility toward nature. The implementation consists of several key phases (See Figure 1).

Figure 1. The Community Engagement Activities

Workshop on Electronic Waste Management

The program begins with educational workshops where participants learn about different types of e-waste and the importance of proper disposal based on Islamic principles. These sessions highlight the responsibility of preserving nature as a trust from the Creator, encouraging students to manage electronic waste ethically and sustainably. This activity takes place at Western Philippines University, involving 46 students and 12 lecturers from various faculties. The keynote speaker for this event is Prof. Dr. Siti Mahsanah Budijati.

E-Waste Recycling Campaign

A recycling campaign is conducted to raise awareness of a healthy environment, including the management of electronic waste. Hands-on activities cannot be carried out due to the presence of hazardous materials. Instead, the activities involve surveying potential locations for e-waste management projects. This phase aims to enhance awareness and promote sustainable practices within the school and the broader community. The organizations involved in this initiative include Muhammadiyah Philippines, Palawan Muslim Consultative & Da'wah, and Western Philippines University.

School-Based Working Groups and Community Collaboration

At the school level, working groups are formed to collaborate with local communities in implementing e-waste management projects. These groups play an active role in organizing recycling initiatives, repurposing usable electronics, and spreading awareness about sustainable waste management. Through community engagement, students can apply Islamic values in practical environmental conservation efforts, ensuring long-term benefits for both the school and society. This activity takes place at an Islamic values-based boarding school in Rio Tuba, Palawan, Philippines. Through these phases, the program seeks to cultivate environmental consciousness among students while reinforcing the importance of sustainability from an Islamic perspective. The success of this program is determined by two main factors: increased knowledge and improved skills among participants.

First, the enhancement of knowledge plays a crucial role in ensuring the effectiveness of e-waste management education. Through workshops and awareness campaigns, students gain a deeper understanding of electronic waste, its environmental and health impacts, and the importance of sustainable disposal methods. Additionally, incorporating an Islamic perspective strengthens their sense of responsibility, reinforcing that protecting the environment is a moral duty. When students understand these concepts, they are more likely to adopt responsible behaviors and advocate for better waste management practices in their schools and communities. Second, the improvement of practical skills is essential in translating knowledge into action. By actively participating in recycling campaigns and school-based waste management projects, students develop hands-on experience in sorting, repurposing, and properly disposing of electronic waste. These activities equip them with the necessary skills to engage in sustainable practices, not only in school but also in their daily lives. As their competence in managing e-waste increases, they become more capable of making informed decisions and contributing to long-term environmental solutions. By focusing on both knowledge and skill development, this program ensures that students are not only aware of e-waste issues but also empowered to take meaningful action in creating a sustainable and environmentally responsible society.

RESEARCH RESULTS AND DISCUSSION

In this e-waste management initiative, the team began by conducting a survey and situational analysis to identify the primary challenges faced by schools and communities. Situational analysis helps in distinguishing existing problems and consolidating them into a single critical issue requiring an effective solution. This step was crucial as it enabled the team to develop targeted, efficient, and practical interventions. After the survey, the team identified key challenges and discussed them with stakeholders, particularly concerning the lack of an effective e-waste management system in schools and the surrounding community. The analysis revealed that many schools lack structured e-waste disposal systems, leading to the accumulation of outdated electronic devices (Dayaday & Galleto, 2022). The awareness

regarding the environmental and health impacts of improper e-waste disposal was found to be low (Debrah et al., 2021). Following the problem identification phase, the team and stakeholders agreed to conduct a series of educational and practical interventions, including workshops on e-waste management, awareness campaigns, and the formation of school-based e-waste working groups. These interventions aimed to enhance knowledge and skills related to sustainable e-waste disposal, recycling, and reuse practices.

Workshop on E-Waste Management

The workshop on e-waste management introduced participants to the environmental and health hazards of e-waste, including soil and water contamination from toxic heavy metals (Alengebawy et al., 2021), and emphasized proper disposal based on sustainability principles. Integrating an Islamic ethical perspective, it highlighted environmental stewardship as a moral responsibility and the duty to preserve nature as a trust from the Creator (Begum et al., 2021). This session addressed the knowledge gap in schools, where outdated digital devices often accumulate without proper disposal, creating environmental risks. By fostering awareness and ethical responsibility, the workshop significantly increased student engagement and reinforced the importance of sustainable waste management. Participants gained insights into the long-term impact of e-waste and were encouraged to adopt responsible practices in their communities. This initiative laid the foundation for more comprehensive e-waste management efforts in schools, ensuring environmental consciousness and action among students. Some Comments: This is an inspiration for us (WPU) to support the SDGs Corner program. There are many relevant activities to do including the e-waste issue. (LEC1) We also have programs related to farming and fishery which are certainly closely related to the environment. Good e-waste management can encourage a healthy environment. (LEC2)

Figure 2. The participants of the training (left) and the resource person share the idea on e-waste management (right) in Western Philippines University

E-Waste Recycling and Awareness Campaign

The second phase involved an awareness campaign to promote the importance of recycling and repurposing electronic devices. Participants engaged in activities such as sorting electronic waste, identifying reusable components, and understanding recycling techniques. The campaign also provided hands-on experience in safe disposal methods, ensuring that hazardous materials within electronic devices were handled responsibly. Through these activities, students and school staff became more conscious of the environmental impact of improper e-waste disposal. Practical sessions included sorting electronic components and identifying reusable materials. Studies suggest that such hands-on activities can enhance environmental literacy and influence long-term sustainable behaviors (Moradi et al., 2024). Participants also learned about circular economy principles, which advocate for the reuse of materials to reduce waste generation (Ahirwar & Tripathi, 2021). Some Comments: This

activity is very useful and can be a sustainable activity in the social work program at Western Philippines University. (LEC3) *Sa ngayon ay naisip natin na ang mga Islamic boarding school ay limitado sa pag-aaral ng relihiyon. Lumalabas na maraming aktibidad na kapaki-pakinabang para sa maraming tao.* (So far we thought that in Islamic boarding schools it was only limited to studying religion. It turns out there are many activities that are useful for many people.) (DES1) *Ang mga aktibidad ay kawili-wili at gusto kong matuto pa.* (The activities are interesting and I want to learn more.) (STU1)

Figure 3. Improving the e-waste management awareness at Western Philippines University (left) an Islamic boarding school in Rio Tuba, Palawan (right)

Establishment of School-Based E-Waste Working Groups

To ensure the sustainability of the program, school-based e-waste working groups were established. These groups collaborated with local communities and environmental organizations to implement long-term e-waste management projects. Their responsibilities included organizing regular e-waste collection drives, promoting awareness of sustainable waste disposal practices, and encouraging student participation in recycling initiatives. By engaging the community, the program aimed to foster a culture of environmental responsibility that extended beyond the school environment. Similar community-driven approaches have proven effective in other regions, highlighting the success of collaborative waste management strategies (Ahirwar & Tripathi, 2021). Additionally, authorities with broader jurisdiction have committed to supporting the program by implementing initiatives to strengthen environmental awareness within schools and campuses. Some Comments: In the future, it is necessary to continue with wider stakeholder involvement. Cooperation between WPU and Muhammadiyah Philippines can be strengthened not only on this issue (e-waste), but also in other areas. (AUT1) *Sa katunayan, sa paligid ng Islamic boarding school na ito ay maraming potensyal na maaaring mabuo. Ang nayon ay handang magsagawa ng iba't ibang kapaki-pakinabang na aktibidad.* (In fact, around this Islamic boarding school there are many potentials that can be developed. The village is willing to facilitate various useful activities.) (DES1)

Figure 3. Meeting with the Islamic community authority (left) and picture with the organizing in front of the Blue Mosque in Manila

Challenges and Future Directions

The success of this program was measured by two key factors: improved knowledge and enhanced practical skills among participants. The workshops and campaigns significantly increased participants' understanding of e-waste issues. Students and school staff gained awareness of the dangers of improper e-waste disposal, the importance of recycling, and the ethical responsibility of managing electronic waste sustainably. By integrating religious values, the initiative strengthened the motivation to engage in responsible environmental practices. Participants showed a deeper understanding of the environmental risks of e-waste, the importance of sustainable disposal methods, and the ethical considerations of waste management (Rawat et al., 2020). This aligns with prior research indicating that educational interventions significantly improve environmental awareness (Debrah et al., 2021). Beyond theoretical knowledge, participants acquired hands-on skills in sorting, repurposing, and safely disposing of e-waste. Through active involvement in recycling activities and working group initiatives, students developed practical competencies that empowered them to take action within their schools and communities. These skills ensured that e-waste management efforts could be sustained beyond the initial intervention. Hands-on recycling activities equipped participants with practical skills in sorting and reusing e-waste, increasing their ability to implement sustainable waste management practices in their daily lives (Ghulam & Abushammala, 2023). Despite its successes, the program encountered several challenges. One major issue was the lack of infrastructure for large-scale e-waste recycling in schools. Additionally, there was resistance to change due to limited awareness and concerns about the complexity of e-waste handling. To address these issues, further capacity-building programs and partnerships with local recycling facilities are recommended (Beula & Sureshkumar, 2021). Overall, this initiative has laid a strong foundation for sustainable e-waste management by fostering environmental awareness, developing practical skills, and encouraging community collaboration. Future efforts should focus on integrating digital literacy with environmental responsibility to ensure long-term success in responsible e-waste disposal and recycling efforts (Pont et al., 2019).

CONCLUSION

The activities related to e-waste management have successfully provided a positive impact on improving awareness and skills in handling electronic waste. The workshops and campaigns conducted have helped students and school staff understand the importance of proper e-waste management, including recycling and reusing electronic devices in alignment with sustainability principles. Additionally, the formation of working groups and collaborations with local communities has enhanced practical applications of Islamic environmental ethics in addressing e-waste challenges. Although there were challenges, such as limited knowledge and resources for e-waste processing, the evaluation showed that participants felt satisfied and experienced significant benefits from the training and awareness programs. Plans for follow-up activities, including further training, demonstrate a commitment to continue supporting schools and communities in developing effective e-waste management systems. With continued efforts in education and collaboration, schools have a significant opportunity to become role models in responsible electronic waste disposal and sustainability practices. This initiative provides a tangible contribution to community empowerment and the promotion of a cleaner and healthier environment.

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