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Building an Environmentally Aware Generation: Animated Video Based Waste Education for Children

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ABSTRACT
Background: *Efforts to protect the surrounding environment must start by oneself by doing small things. Education to students regarding environmental problems caused by landfills is needed to raise students' awareness so that they care more about the surrounding environment. Active participation of students can be carried out in the culture of disposing of waste in the appropriate place and according to the type of waste. This activity aims to increase environmental knowledge and awareness among children through video animation-based waste management education at the At-Taqwa Bulakan landfill.*

Methods: *This community service activity utilised a pre-post test design to evaluate knowledge improvement. The target participants were students in grades 3–6 of elementary schools. Participants were selected using saturated sampling based on inclusion criteria, resulting in 18 children participating in the activity.*

Results: *The results showed that there was an increase in participants' knowledge before being given the counseling with a p value of 0.032. The mean pre-test score of participants was 66.11 (SD 4.26) and the mean post-test score was 74.44 (SD 4.99).*

Conclusion: *Counseling using animated video-based learning methods can be considered successful in increasing understanding and skills about the importance of maintaining the surrounding environment free from rubbish for children. Animated videos are recommended as an effective environmental education medium and should be integrated into children's education programmes to shape waste-conscious behaviour.*

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INTRODUCTION

Waste is a serious environmental issue and a responsibility for all of us. As a byproduct of human activity, waste can take the form of solid, liquid, or gas, and if not managed properly, it can cause pollution that threatens the health of ecosystems and living beings (1). Waste is the discarded result of items that are no longer used (2). Solid waste can be divided into two types, namely organic waste and inorganic waste. Organic waste consists of materials that decompose easily and come from food scraps, animals, plants, and residues of other living beings naturally. This type of waste tends to rot easily because

it is broken down by microorganisms, which play an important role in the decomposition process (3).

Examples of organic waste include vegetable scraps, animal feces, rotten fruit, and dry leaves. On the other hand, inorganic waste comes from non-living objects and cannot decompose easily. Examples of inorganic waste include plastic bottles and other unused materials, used tires, and beverage cans, which take a very long time to decompose completely (2). The waste problem in Indonesia is worsening due to poor waste management and a lack of attention to the composition of waste generated each year. According to data from the Ministry of Environment and Forestry, Indonesia produced approximately 21.8 million tons of waste in 2024, with around 42% of that total being poorly managed, ending up in illegal dumping sites or polluting the environment such as rivers and seas. Although there was a reduction of about 3.6 million tons of waste around 2023 compared to the previous year (4).

The impact of waste generation remains an environmental issue that requires serious attention, so that it does not cause pollution to the environment (5). Ineffective waste management is further aggravated by the lack of adequate infrastructure, such as final disposal sites (TPA) that are often already full and limited processing technology (6). In addition, the low awareness of the community in sorting waste is a major factor that causes the mixing of organic and inorganic waste, making the management process difficult (7).

The waste problem often occurs due to the lack of awareness and knowledge in the community about waste management from an early age, which impacts the low motivation to maintain environmental cleanliness (8). Previous research shows that waste management education needs to be implemented from an early age to form positive understanding and habits in managing waste (9). Lack of education about the importance of sorting waste and sustainable management concepts, such as the 3Rs (Reduce, Reuse, Recycle), means that children and teenagers tend to lack a sense of responsibility for the environment (10). With integrated waste management learning in formal and informal education, the younger generation can develop environmental habits that will carry over into adulthood. Therefore, the involvement of schools, families, and communities is crucial in instilling environmental awareness. This ensures that future generations are more sensitive to waste issues and play an active role in maintaining the sustainability of the ecosystem (11).

The elementary school age group is the main key in implementing waste management education through the 3R principles (Reduce, Reuse, Recycle). This education not only increases students' awareness to protect the environment but also forms positive habits in reducing the use of disposable items, reusing items that are still useful, and processing waste into economically valuable items. This habit has a long-term impact, because children who are accustomed to managing waste properly will have a positive impact until adulthood (12). Therefore, schools have a strategic role in instilling environmental awareness to create a generation that cares and contributes to solving the waste problem (13).

Public Health Students of Universitas Muhammadiyah Surakarta have implemented a waste management education program for landfill children using animated video-based learning methods (14). This program is an effort to increase children's understanding of the types of waste and how to manage them, so that they can better handle waste in the landfill environment and at home. Through this counseling, it is hoped that children can

pass on good habits to family, friends, and the surrounding environment, especially in the practice of sorting waste properly (15).

The use of animation media was chosen because it has a high visual appeal, making it easier to understand and attract children's attention. With content designed in an interesting and educational way, animated videos are able to increase children's participation in learning while motivating them to care more about the environment (16). This education program not only introduces the types of waste such as organic, inorganic, and B3 (hazardous and toxic materials), but also teaches children to abandon the old habit of littering (17). Through the habituation of sorting, selecting, and categorizing waste, the program aims to reduce the amount of waste in the surrounding environment while fostering greater environmental awareness among the younger generation.

METHODS

This community service activity is a form of service for students of the Public Health Study Program. The preparation stage includes developing educational materials, producing the narrated animated video, designing pre- and post-test instruments, and coordinating with local stakeholders to ensure smooth implementation. This activity is carried out through the counseling (education) method using narrated animated video-based learning and giving pre-post tests on the introduction of types of waste and how to manage waste properly for children of At-Taqwa Bulakan Landfill, Denggungan Village, Banyudono District, Boyolali Regency.

This counseling or education is given to landfill children because they see the importance of active participation of early age students to start action in preventing waste generation around them. By providing health education, it is hoped that landfill children can build good habits for the people around them, both family and friends as an effort to keep the environment clean and healthy. The method in counseling based on the animated video learning model was chosen to make it easier for landfill children to understand the introduction of waste material and how to manage it properly.



Figure 1. Opening Event Opening Event: “Building an Environmentally Aware Generation: Animated Video-Based Waste Education for Children”

Participants were given a pre-test of 20 questions by the speaker to determine the knowledge of landfill children. The questions include material about the definition of waste, types of waste, how to process organic and inorganic waste, and the impact of waste on the environment. The next stage involved delivering the material using an animated video learning model, which lasted approximately 20 minutes with two video screenings.

At the end of the material delivery session, the speaker gave a post test of 20 questions to determine knowledge after being given material with animated video learning. In the last session, the speaker gave messages and advice to participants about the importance of the role of TPA At-Taqwa Bulukan children in maintaining a clean and healthy environment.



Figure 3. Administration of Pre- and Post-Tests

This community service activity uses a pre- and post-test approach to assess children's knowledge before and after receiving education through animated video-based learning. The population in this study were grade 3-6 elementary school children. With saturated sampling technique and participants who came as inclusion criteria, 18 children were obtained as research samples. The instruments used in the study included educational video media in the form of narrated animations and questionnaires. To see the average difference in children's knowledge before and after intervention, paired t-test was conducted.

This community service activity uses a pre- and post-test approach to assess children's knowledge before and after learning through animated videos. Children in elementary schools in grades 3-6 are the population of this study, with saturated sampling technique and participants who come as inclusion criteria, 18 children were obtained as research samples. The instruments used in the study were questionnaires and instructional video content in the form of narrative animation. By using the experimental method of paired t-test to compare the average knowledge of children before and after the intervention.

RESULTS

The participants in this community service activity were children living around the At-Taqwa Bulakan landfill, Denggungan Village, Banyudono Subdistrict, Boyolali Regency. A total of 18 children participated in this programme, with diverse educational backgrounds. Understanding the distribution of participants' educational levels is important to tailor educational materials to their learning levels and enhance the effectiveness of video-based waste management education. Table 1 shows the distribution of participants by educational level in this programme.

Table 1. Participant Class–Children of At-Taqwa Bulakan Landfill, Denggungan Village, Banyudono District, Boyolali Regency (n = 18 Children)

Class	Frequency (n)	Precentage (%)
3	7	38.9

Class	Frequency (n)	Precentage (%)
4	7	38.9
5	2	11.1
6	2	11.1
Total	18	**100**

Based on Table 1, the number of respondents consisted of 18 children, with 38.9% coming from grade 3, 38.9% grade 4, 11.1% grade 5, and 11.1% grade 6. This service program aims to introduce waste management to landfill children using animated video media as an interesting and easy-to-understand educational method.

Table 2. The Average Difference in The Level of Knowledge of Landfill Children Before and After Education Using Animated Video-Based Learning (n = 18 Children)

Knowledge	Mean	SD	p-value*
Before Education	66.11	4.26	0.032
After Education	74.44	4.99	

Note: *Paired T-Test

Table 2 showed that there was an increase in participants' knowledge before and after counseling with a p value <0.032. The mean pre-test score of participants was 66.11 (SD = 4.26) and the mean post-test was 74.44 (SD = 4.99). This community service activity shows that educational interventions can improve participants' knowledge.

DISCUSSION

Health education activities (counseling) using the animated video learning model regarding the introduction of types of waste and how to manage waste properly and correctly in the At-Taqwa Bulakan Mosque environment and in the Denggungan Village environment generally run smoothly. The mosque management and Ustadzah TPA At-Taqwa helped prepare the place and coordinate the counseling participants. The counseling participants were TPA At-Taqwa children who still have elementary school education.

The place used for the activity was one of the rooms in the At-Taqwa Mosque in Bulakan, Denggungan Village, Banyudono Subdistrict, Boyolali Regency. Before conducting the counseling activity, the speaker introduced himself first then the speaker interacted with the landfill children and tried to explore the basic knowledge of waste management. The speaker asked several questions about the definition of waste, types of waste, waste management, the impact of waste on the environment, and the planning of good and correct waste management in the At-Taqwa mosque environment.

After exploring basic knowledge, the speaker began to provide health education material regarding the introduction of types of waste and how to manage waste properly and correctly using an animated video learning model. During the counseling activities, the participants were enthusiastic and paid attention to the material content of the animated video counseling. Prior to the counseling, participants were given a pre-test of 20 questions to measure the level of knowledge of TPA children.

The results of the pre-test analysis showed an average score of 66.11, which was categorized as good knowledge but still needed improvement. Furthermore, the counseling material was delivered using an animated video-based learning model with a duration of approximately 20 minutes, which was played twice. At the end of the session,

the material ended with an evaluation and discussion to strengthen participants' understanding.

After the delivery of the material through animated video learning, participants were given a post-test of the same 20 items to measure the level of knowledge after the intervention. The results of the post-test analysis showed an average score of 74.44, which was categorized as good knowledge, indicating a significant increase in participants' understanding of waste and its treatment methods. This increase in pre-test to post-test scores indicates the effectiveness of using animated video media in improving landfill children's understanding of waste management, in accordance with previous findings stating that animation-based learning methods can increase children's understanding and awareness of environmental education materials.

Feedback and discussion conducted after the post-test also played an important role in strengthening understanding and internalizing important messages related to environmental cleanliness (19). In the closing session, the speaker conveyed messages and advice about the importance of the role of TPA At-Taqwa Bulukan children in maintaining environmental cleanliness and health. The activity ended with farewell greetings from the speaker and the provision of food gifts to all counseling participants at TPA At-Taqwa Bulakan, Denggungan Village, Banyudono District, Boyolali Regency.

Participants are TPA children with a high sense of curiosity. With animated video-based learning methods, participants are more excited and absorb more information presented (20). According to (21) the participants, the media used in the learning process will affect the children's information reception process. The increase in knowledge that occurs is expected to make landfill children understand the importance of the active role of students to start taking action to prevent waste piles around them according to the type and category of waste. So as to foster awareness and motivation that can transmit good habits to those around them, both family, friends and their environment by disposing of waste and managing waste properly and correctly.

In addition, it is important to involve parents and the surrounding community in further counseling so that awareness of waste management can be embedded more deeply. By involving families, children can pass on the good habits they have learned to those around them. Educational programs should also include the use of interactive media and educational games to make learning more interesting and fun. With a sustainable approach and involving various parties, it is hoped that awareness and actions that protect the environment can continue to grow among the younger generation (20).

Educational activities using animated videos have proven effective in increasing the knowledge of TPA children about waste management. This method can be applied in similar institutions with the support of appropriate materials, training for teachers, continuous monitoring, and cooperation with the village government to support environmental hygiene programmes. Animated videos are recommended as an effective environmental education medium and need to be integrated into children's education programmes to shape waste-conscious behaviour.

CONCLUSIONS AND SUGGESTIONS

The counseling conducted at TPA At-Taqwa Bulakan, Denggungan Village, Banyudono Subdistrict, Boyolali Regency, using the animated video-based learning method, proved successful in improving children's understanding and skills about the importance of maintaining a waste-free environment. This can be seen from the increase in participants' knowledge during the post-test compared to the pre-test. The educational

programme needs to be followed up with practical activities such as visits to waste treatment facilities. These activities provide children with real-life experience in understanding waste management. The involvement of parents and families is also very important to reinforce environmentally conscious behaviour at home. Through joint participation, children can consistently apply what they have learned and help build a culture of waste awareness within the family environment.

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DECLARATION OF USE OF AI IN SCIENTIFIC WRITING

AI tools were used solely for grammar and language editing. The authors take full responsibility for the content and integrity of the manuscript.

CONFLICT OF INTERESTS

The author states that there are no conflicts of interest.

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