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Zero Waste Water Day: Educational Strategies to Foster Awareness of Clean Water Among Students

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Abstract

This research aims to foster awareness of clean water among students through the Zero Waste Water Day Program. The method used in this research is quantitative descriptive with a One Group Pretest Posttest Design. The research subjects are the 25 students of class VB at SDN Kalongan 02. The data collection technique used pretest and posttest questionnaires. This program uses a contextual and participatory approach, thereby directly involving the students. The implementation of the Zero Waste Water Day Program received a positive response from the students; they showed high curiosity, enthusiasm, and full spirit. Based on research data, students who participated in the Zero Waste Water Day Program demonstrated a better understanding of the importance of clean water for daily needs. The N-Gain test result of 0.7178 indicates an increase in the high category. Thus, the research results indicate that the Zero Waste Water Day Program is effective in fostering awareness of clean water among students. The study recommends the integration of such hands-on programs into the elementary school curriculum.

Keywords:: *Zero Waste Water Day, Concern for Clean Water, Environmental Education in Elementary Schools*

Abstrak

Penelitian ini bertujuan untuk meningkatkan kesadaran akan air bersih di kalangan siswa melalui *Program Zero Waste Water Day*. Metode yang digunakan dalam penelitian ini adalah deskriptif kuantitatif dengan Desain One Group Pretest Posttest. Subjek penelitian adalah 25 siswa kelas VB di SDN Kalongan 02. Teknik pengumpulan data yang digunakan adalah kuesioner pretest dan posttest. Program ini menggunakan pendekatan kontekstual dan partisipatif, sehingga secara langsung melibatkan siswa. Pelaksanaan *Program Zero Waste Water Day* mendapat respons positif dari para siswa, mereka menunjukkan rasa ingin tahu yang tinggi, antusiasme, dan semangat yang penuh. Berdasarkan data penelitian, siswa yang berpartisipasi dalam *Program Zero Waste Water Day* menunjukkan pemahaman yang lebih baik tentang pentingnya air bersih untuk kebutuhan sehari-hari. Hasil tes N-Gain sebesar 0,7178 menunjukkan peningkatan dalam kategori tinggi. Dengan demikian, hasil penelitian menunjukkan bahwa *Program Zero Waste Water Day* efektif dalam menumbuhkan kesadaran akan air bersih di kalangan siswa. Studi ini merekomendasikan integrasi program langsung semacam itu ke dalam kurikulum sekolah dasar.

Kata Kunci: Hari Air Tanpa Limbah, Kepedulian terhadap Air Bersih, Pendidikan Lingkungan Sekolah Dasa.

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INTRODUCTION

Environmental education and sustainability have become very crucial issues at the elementary school level. Considering that the current environmental conditions are deteriorating due to human actions. To address environmental damage caused by irresponsible human behaviour towards nature, environmental education and sustainability need to be taught from an early age to foster collective awareness and responsibility (Ega Wardani & Nugraheni, 2024). The importance of environmental awareness values from an early age makes environmental education (EE) integrated into the elementary school curriculum. Damoah et al. (2024) revealed that integrating environmental education into the elementary school curriculum is an efficient step to equip students with knowledge so they can face future challenges. Phan Hoang & Kato (2016) revealed that environmental education at the elementary school level can be an effective way to foster concern for sustainability issues.

Throughout the history of human civilization, the water crisis has been considered a serious problem for human life. It has become a major challenge for society because it is a persistent issue. According to the World Economic Forum report, the water crisis now ranks third as the most serious global threat that needs the world's attention (Abou-Shady & El-Araby, 2021). Worldwide, there are around 2.2 billion people who still struggle to access clean and safe drinking water (World Health Organization & UNICEF, 2023). At the World Water Forum II in 2000 in The Hague, it was stated that in several countries, there would be a water crisis by 2025 (Pertiwi et al., 2015). Indonesia, despite being known as a country with abundant water resources, now faces a serious threat regarding the clean water crisis caused by climate change and poor water management systems. These effects can be seen from the high levels of water pollution and inefficient water usage. The situation is worsened by the exploitation of water for commercial gain without considering the importance of water management for the future (Weningtyas & Widuri, 2022).

Limited access to clean water has become a major challenge for communities in both rural and urban areas. This limited access negatively impacts health and daily quality of life. In rural areas, limited infrastructure makes it difficult for people living in remote regions to access clean water (Walters et al., 2022). Meanwhile, in urban areas, rapid population growth has led to an increased demand for clean water sources. The expansion of infrastructure development in urban areas can reduce water absorption areas, resulting in a higher potential for a clean water crisis in the future (World Health Organization, 2021). Another challenge is the lack of adequate sanitation. Poor sanitation will impact water quality, leading to public health issues caused by infectious diseases. This condition occurs due to the use of daily water that has already been contaminated and contains harmful bacteria (UNESCO, 2019).

Based on the research by Hardianti et al. (2023) in Pekanbaru, it is known that there are still many students who waste water, such as in activities like washing, bathing, and handwashing. The low awareness of using water wisely makes water usage inefficient, resulting in a lot of water being wasted. The research conducted by Rahmawati et al. (2025) also shows the still low number of students who have an environmental concern attitude. They do not realize that water is a limited resource and must be used wisely. Similarly, the research conducted by Rhomadiyah & Zulfadewina (2023) states that students' awareness and concern regarding water usage are still low. This is evident from the number of students who turn on the tap to play with water without realizing that it can waste water unnecessarily.

According to the cognitive development theory proposed by Jean Piaget, elementary school-aged children are at the concrete operational stage. At this stage, they will find it easier to understand the material through real practice and direct experience, not just theory, making learning more meaningful (Zikrulloh et al., 2025). Thus, in providing students with an understanding of water conservation education, a contextual and participatory approach is necessary. One way to achieve this is through educational programs that actively involve students directly in practical activities. If students are not accustomed to saving water from an early age, they will not do it on their initiative (Hardianti et al., 2023). Therefore, water conservation must become a habit in the daily lives of students. This way, students will get used to using water more wisely without having to be constantly reminded. This good habit needs to be instilled from an early age so that children can grow up to be individuals who care about the environment.

The Zero Waste Water Day program emerged as an alternative educational strategy based on real actions to address the increasingly complex issue of wastewater. This is in line with the opinion expressed by Magfiroh et al. (2020) that the zero-waste concept is a tangible and sustainable approach that can be effectively implemented in the school environment. The zero-waste water concept emphasizes reducing excessive water usage and reusing water that can still be utilized so that no waste is wasted. If liquid waste is not managed properly, it has the potential to pollute the environment, which can endanger public health (Singh et al., 2023). This approach aims to maintain water quality, prevent environmental pollution, and educate students through real actions that they can apply in their daily lives. Through this program, children become more caring and aware of the importance of using water wisely with simple steps every day. This research aims to describe the design and implementation process of the Zero Waste Water Day Program in elementary schools, as well as to analyze the impact of the Zero Waste Water Day Program on increasing students' awareness of clean water.

METHODS

This study employed a quantitative descriptive method with a One Group Pretest–Posttest Design to measure the level of pupils' concern for clean water before and after participating in the Zero Waste Water Day Programme. The research was conducted at SDN Kalongan 02, involving 25 Year 5 (Class VB) pupils as both the population and the sample, using a total sampling technique.

Instrument and Data Collection

Data were collected using a questionnaire developed based on indicators of concern for clean water, which consisted of three main aspects: knowledge, attitude, and behaviour. The instrument comprised 15 items, divided equally into five items per aspect. Table 1 presents the indicators, aspects, and sample items.

The questionnaire was administered twice, before (pretest) and after (posttest) the program implementation, using a Likert scale, in which higher scores indicated a greater level of concern for clean water.

Research Procedure

The research procedure consisted of three stages:

1. Pretest: Measuring pupils' concern for clean water before the implementation.
2. Programme Implementation: Conducting the Zero Waste Water Day Programme through contextual and participatory learning activities.

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3. Posttest: Re-administering the questionnaire to identify any changes in pupils' awareness and behaviour after the programme.

Tabel 1. Indicators of Concern for Clean Water

Aspect	Indicator	Example Item	No. of Items
Knowledge	Understanding the importance of clean water	"If we fail to conserve water, clean water resources could eventually run out."	5
Attitude	Awareness and responsibility towards water conservation	"I aim to protect the environment by conserving water."	5
Behaviour	Daily water-saving habits	"I always turn off the tap while brushing my teeth."	5

Data Analysis

Instrument validity and reliability tests were performed to ensure data accuracy and consistency. The N-gain test was used to assess the improvement in pupils' awareness levels, and the data were analysed descriptively by comparing the pretest and posttest mean scores to observe changes following the programme.

RESULTS AND DISCUSSION

Zero Waste Water Day Program Description

The Zero Waste Water Day program was held at SDN Kalongan 02, Ungaran Timur District, Semarang Regency, Central Java. This program aims to raise students' awareness of clean water. Students are invited to understand the importance of using water wisely to reduce water waste through educational activities. This program begins with a socialization activity about the concept of zero wastewater and the negative impacts if waste is not managed properly, especially the clean water sources used in daily life. After the socialization activities are completed, the students are invited to practice directly. Here are the steps for the zero waste water practice activity:

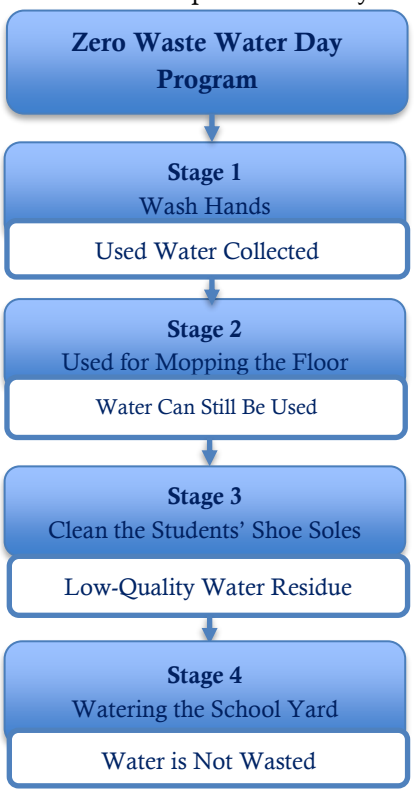

Figure 1. Flowchart of the Zero Waste Water Day Program

Stage 1: Wash Hands Together

In the first stage, students engage in a handwashing activity together. At this stage, the used handwashing water is collected in a bucket because it is still relatively clean (not containing excess soap). This collection aims to ensure that the water, which is not yet too dirty, can still be reused for things that do not fully require clean water.

Figure 2. Wash Your Hands and Then Collect the Used Water in a Bucket

Stage 2: Using Used Water to Mop the Floor

After the used handwashing water is collected, it is reused to mop the floor. This is a simple water recycling practice, where the application of water quality and cleanliness standards is still taken into account. This aims to maintain the effectiveness of floor cleaning to avoid potential health risks.

Figure 3. Use of Used Water for Mopping the Floor

Stage 3: Cleaning Students' Shoe Soles

Water whose quality has deteriorated is then reused to clean students' shoe soles. At this stage, the water quality is low, so it is used for activities that are not directly related to health. Thus, the use of water becomes more efficient and is not wasted.

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Figure 4. Cleaning Students' Shoe Soles Using a Used Mop Water

Stage 4: Watering the Schoolyard

The final step is to use water that has already been heavily degraded to water the schoolyard, which has a surface made of paving or cement. This aims to reduce dust in the schoolyard. However, it is important to remember that the chemical content in soap can reduce soil fertility and disrupt soil microorganisms. Therefore, watering should not be done directly on the soil to avoid damaging the soil structure and to remain environmentally friendly.

Figure 5. Watering the School Yard Using Water from Washing Shoe Soles

Response and participation of students towards the program

During the implementation of the Zero Waste Water Day Program, the students' response was very enthusiastic and full of spirit. They showed a high level of curiosity. This was evident from the many students who actively asked questions during the event. The student's involvement in this program is also evident at every stage of the activities. They actively participate, starting from the handwashing activity by collecting water in buckets, then the used water is used to mop the floor, the used mop water is utilized to clean the students' shoe soles from dust and dirt, and finally to water the schoolyard. They are enthusiastic about implementing sustainable water management practices. There are several students who took the initiative to remind their friends not to waste water during the practice activities.

Changes in attitudes and awareness towards clean water based on the collected data

1. Validity Test

Validity testing is conducted to determine whether the instrument is valid or not. A valid instrument ensures accurate results. If the instrument has a high level of validity, it will enhance the credibility of the research results. The instrument is declared valid if the r_hitung value > r_table (0.396). The validity of the instrument was tested using IBM SPSS Statistics 27.

Tabel 2. Results of Instrument Validity Test

Question	r-Calculated	r-Table	Description
Q1	0,515	0,396	Valid
Q2	0,56	0,396	Valid
Q3	0,51	0,396	Valid
Q4	0,403	0,396	Valid
Q5	0,535	0,396	Valid
Q6	0,452	0,396	Valid
Q7	0,431	0,396	Valid
Q8	0,472	0,396	Valid
Q9	0,674	0,396	Valid
Q10	0,418	0,396	Valid
Q11	0,493	0,396	Valid
Q12	0,454	0,396	Valid
Q13	0,448	0,396	Valid
Q14	0,703	0,396	Valid
Q15	0,574	0,396	Valid

Based on the table above, all items have a calculated r value > table r (0.396). This indicates that all items meet the validity criteria and are suitable for use as research instruments.

2. Reliability Test

Reliability testing is conducted to ensure how consistent the instruments used in the research are. To ensure that the instruments used are consistent and reliable, a reliability test was conducted using Cronbach's Alpha value. If the result is more than 0.7, it means the instrument is sufficiently good and reliable. The reliability testing in this study uses IBM SPSS Statistics 27.

Tabel 3. Results of Instrument Reliability Test

Number of Question	Cronbach's Alpha	Requirement	Description
15	0,775	0,7	Reliable

According to the reliability test results, the Cronbach's Alpha value of 0.775 indicates that the instrument is reliable and suitable for use in research. This indicates that the instrument used produces consistent data.

3. N-Gain Test

The N-Gain test is used to measure the extent of change that occurs after a treatment is applied. This test is used to observe the magnitude of change before the treatment is given (pretest) and after the treatment is given (posttest). This N-Gain test uses IBM SPSS Statistics 27.

The N-Gain test results show that the Zero Waste Water Day educational program had a positive impact, with an average N-Gain score of 0.7178. This indicates that the increase in student awareness is in the high category. The results prove that this educational strategy successfully fostered students' concern for clean water.

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Tabel 4. N-Gain Score Test

	N	Minimum	Maximum	Mean	Std. Deviation
NGain Score	25	.30	1.00	.7178	.20178
NGain Percent	25	30.30	100.00	71.7778	20.17817
Valid (N)	25				

Based on research data, students who have participated in the Zero Waste Water Day Program have shown an increased awareness of clean water, and they are becoming more understanding of the importance of clean water for daily needs. This is evidenced by the N-Gain test results, which show a significant increase and fall into the high category. This means that the treatment provided has successfully improved understanding tangible way. From the posttest results, the level of students' concern for clean water obtained a higher score compared to the pretest score before the treatment. Students who previously had little understanding of the importance of clean water in daily life, were indifferent to clean water, and often used water wastefully or did not conserve water, now show significant improvement in these aspects.

Students involved in the Zero Waste Water Day Program become more concerned about sustainable water use. They understand the negative impact of a lack of clean water, which will affect health, the environment, and socio-economics. This fosters students' awareness of saving water from an early age. This program uses a contextual and participatory approach, directly involving students. This approach allows students to understand concepts more deeply and strengthen their conceptual understanding. Thus, this approach can foster positive habits through direct experience.

Supporting and inhibiting factors in program implementation

The implementation of the Zero Waste Water Day Program is influenced by various factors, both supporting and hindering the success of the program. Supporting factors in the implementation of this program can be outlined as follows. First, the enthusiasm and active involvement of students in activities such as socialization, water management practices, and the application of the zero-waste water concept greatly support the success of the program. Second, the material on clean water is relevant to students' daily lives, making it contextual and tangible. This approach makes it easier for students to develop an awareness of the importance of preserving clean water and to adopt water-saving habits both at home and at school.

The inhibiting factors in the implementation of this program include: First, some students may feel uncomfortable using recycled water even for purposes not directly related to health, such as cleaning shoe soles or watering the yard. Second, the program is conducted in between school lesson schedules, so the time available is limited. This results in students not fully understanding the material. Third, not all schools have the facilities to support the program's success, such as buckets for collecting water and brushes for cleaning shoe soles. This condition can hinder the implementation of the program.

Comparison with previous literature and studies

According to Musdalifa (2024), research findings, it was found that direct learning about environmental issues can build students' concern for their surrounding environment. This is reinforced by research conducted by Arif Saputra et al. (2025), which states that the implementation of environmental education at Sekolah Alam Lampung has proven effective in fostering environmentally friendly attitudes, knowledge, and behaviours from an early age. Similarly, research conducted by Ilham et al. (2023) states that environmental education has been proven effective in increasing students' awareness of various

environmental issues relevant to their surroundings. Through environmental education, it can enhance care and responsibility towards the environment. The results of Karacaoğlu (2024) research reveal that the implementing a zerowaste program in elementary schools can significantly increase students' environmental awareness, particularly regarding water.

Based on the literature and previous studies, educational programs that involve hands-on practice are capable of increasing awareness and fostering positive behavioural changes toward the environment. This research was conducted to expand upon previous findings with a focus on the educational strategy of Zero WasteWater Day, emphasizing the aspect of clean water management. This study makes a significant contribution to the development of educational strategies aimed at fostering students' concern for clean water and the sustainable reuse of wastewater.

Implications of research findings for sustainability education in elementary schools

The research results show that the Zero Waste Water Day Program, through handwashing activities and the reuse of used water, can help students become more aware of the importance of conserving and using clean water wisely. This research has very important implications for sustainable education in elementary schools. First, the educational program based on real actions utilizing used water is a form of water conservation that has proven to be effective in instilling sustainability values through a contextual approach. Second, the success of this program highlights the importance of fostering care and awareness of clean water from an early age. Based on Piaget's developmental theory, elementary school-aged children are at an ideal developmental stage with great potential to instill positive habits sustainably.

Third, this educational program is highly replicable in various schools at an affordable cost while having a quite effective impact. The Zero Waste Water Day program is very suitable for the thematic learning approach that supports the implementation of the Pancasila Profile Strengthening Project (P5), especially in instilling good attitudes and a sense of responsibility towards nature. Fourth, this program supports water literacy so that it can be integrated into environmental literacy education in elementary schools. Thus, the results of this research have a tangible impact in supporting the implementation of sustainable education in elementary schools, particularly in fostering concern for clean water from an early age.

CONCLUSION

From the results of the research that has been conducted, the implementation of educational strategies through the *Zero Waste Water Day Program* proved effective in increasing students' awareness of clean water. This effectiveness can be attributed to the participatory and hands-on learning approach, which allowed students to be actively involved in real-life water conservation practices. The average N-Gain value of 0.7178 indicates that the increase in students' awareness of clean water falls into the high category. Therefore, it is recommended that schools integrate the *Zero Waste Water Day Program* into their curriculum to continuously foster students' sustainable awareness of water preservation. Future studies should investigate the long-term retention of this awareness and the program's effectiveness in different school settings.

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