"Waste management go to school" program and its relationship with students' environmental information literacy

Yunus Winoto[1]*, Falih Ijlal Septian[2], Shamila Mohamed Shuhidan[3]

[1]Library Study Program, Faculty of Communication Sciences, Universitas Padjadjaran, Ir. Soekarno Street KM 21, Sumedang, 45363, Indonesia

[2]Islamic Library and Information Science, Faculty of Adab and Humaniora, UIN Sunan Gunung Djati Bandung, A.H. Nasution Street No. 105, Bandung, 40614, Indonesia

[3]School of Information Science, College of Computing, Informatics and Mathematics, University MARA Technology (UiTM), Malaysia.

*Corresponding author, email: yunus.winoto@unpad.ac.id

Article History
Received: 28 April 2025
Revised: 22 May 2025
Accepted: 2 June 2025
Published: 30 June 2025

Keywords
Citarum River
Environmental literacy
Waste management

Abstract
This research looks at how the "Waste Management Go to School" program impacts students' environmental information education. The study took place in schools involved with the environmental education effort run by the Bening Saguling Foundation in West Bandung Regency, Indonesia. Through simple random sampling, 370 students were selected using a quantitative approach. Questionnaires were used to collect information which was then analyzed with the Structural Equation Modeling–Partial Least Squares (SEM-PLS) method. The researchers looked at three main parts of communication: the person speaking, the message and the channel for delivering the message. The results indicate that knowledge, awareness and attitudes, as well as skills, were all significant factors in student environmental information literacy. Having credible sources was found to be fairly important in helping students become more literate about the environment, according to the communicator variable. Media reports suggested that the right media can increase how interested and knowledgable students are about environmental matters. Also, the message part was found to matter most, pointing out that educational content should be both clear and involve the students. The results indicate that giving priority to strategic communication in schools should help enhance students' environmental literacy. Research conducted here aids institutions in adopting better ways to teach environmental issues and serves as a reference for introducing sustainability into the curriculum at schools

How to cite: Winoto, Y., Septian, F. I., & Shuhidan, S. M. (2025). "Waste management go to school" program and its relationship with students' environmental information literacy. *Journal of Environment and Sustainability Education, 3*(2). 223–235. doi: 10.62672/joease.v3i2.84

1. Introduction

More than 15 million residents in West Java depend on the Citarum River for their water (Waqi & Kusumo, 2023). Even though it has an important role, the river is severely contaminated by domestic waste, discharge from factories and low environmental awareness among communities (Rahayu et al., 2023). World Bank experts once listed the Citarum among the dirtiest rivers in the world (Fayza et al., 2024). According to research by environmental departments, the river has E. coli levels that go way above what is acceptable for the environment (Satgas Pengendalian Pencemaran Citarum, 2018; Zulhadi et al., 2023)

For that reason, attempts at river restoration have been made. The Citarum Harum initiative from the government tries to cut pollution and bring back a cleaner environment through teamwork. In addition, local projects have started to advance environmental literacy for people in their communities. As an example, the Bening Saguling Foundation began the "Waste Management Go to School" program. Established in 2014, the foundation collaborates with public and private institutions including PLN Indonesia Power and several universities to promote education, waste reduction, and social empowerment in communities along the Citarum watershed (Fitriana & Mulyono, 2019; Nastia et al., 2024)

Research on environmental education has grown over the years. Several studies have shown that early exposure to environmental issues fosters awareness and responsible behavior in students (Ilhami, 2019; Maesaroh et al., 2021). However, most existing literature focuses on general empowerment or behavioral outcomes without specifically exploring the communication elements embedded in educational programs. These components, such as the credibility of the communicator, the clarity of the message, and the type of media

doi: 10.62672/joease.v3i2.84

ISSN: 3025-0714

used, are crucial in shaping how environmental information is received and applied by students (Atmaja & Dewi, 2018; Hariyadi et al., 2021; Miterianifa & Mawarni, 2024)

This study addresses that gap. It investigates how the communication aspects of the "Waste Management Go to School" program influence students' environmental information literacy. This includes their knowledge, awareness, attitudes, and practical skills. The findings are expected to inform the development of more effective school-based environmental education models that can support broader sustainability goals in Indonesia.

2. Method

This study employed a quantitative approach with an explanatory survey design aimed at identifying the relationship between communication components and environmental information literacy. The research was conducted in West Bandung Regency, specifically targeting students who participated in the "Waste Management Go to School" program initiated by the Bening Saguling Foundation.

There were 4,800 students from 32 junior high schools (SMP) and senior high schools (SMA) taking part in the program in this study. In order to have a representative sample, the data was collected using proportional stratified random sampling. At first, participants were sorted into junior or senior high school groups and after that, students were randomly picked from each group to ensure similar numbers in all groups. I used Slovin's formula with a margin of error set at 5% to calculate the sample size which ended up being 370 students.

Participants were given a structured questionnaire that they completed using Google Forms. Four reliable tools measured the participants on four major constructs: (1) communicator credibility, (2) how much media they access, (3) how well they understand the messages and (4) their knowledge about environmental topics. Knowledge, awareness, attitude and pro-environmental behavior were the four sub-dimensions used to assess the latter. To improve the understanding of the environment, other forms of data were also gathered through watching, talking to participants and studying important documents.

PLS-SEM was used on the data with SmartPLS version 3 to analyze the results. This method was selected due to its ability to process models with many latent factors, smaller data sets and data that usually do not suit the assumptions behind multivariate normality. Since both models can be tested together, causal studies using this method are suitable for research in education and social sciences.

A reflective measurement model was used in this study. Each latent variable was measured by several observed indicators that represent the concept itself. Convergent validity was assessed through factor loadings and Average Variance Extracted (AVE), while discriminant validity was examined using the Heterotrait-Monotrait Ratio (HTMT). Reliability was confirmed through Cronbach's Alpha and Composite Reliability values. The structural model was evaluated by examining the magnitude and significance of the relationships between latent variables, using bootstrapping procedures. The strength of these relationships was represented by standardized beta coefficients (β), supported by t-values and p-values to determine significance.

Study This use approach quantitative namely approach research that uses data in the form of number or statistics to explain phenomenon. Approach This aiming for measure variable in a way objective, testing hypothesis, and search for connection intervariable with use instrument standardized like questionnaire or survey (Hancock & Algozzine, 2006). While type research used use method survey explanation. As for method explanation survey is one of the forms approaches quantitative used for explain connection causal (cause and effect) between variable in population certain through data collection in systematic with questionnaire. According to (Creswell & Creswell, 2020; Kothari, 2019; Singh, 2006) method survey explanation has a number of characteristics among them aiming for explaining connection or influence between variables; data collected with use sample big to represent population, using instrument standards and analysis statistics as well as can done generalization.

Population in study this are the students involved in "Waste Management Go to School" program activities. The number of participants who participated in activity This based on data from 4800 students spread across from 32 junior high schools and senior high schools in West Bandung Regency. For the sampling technique the sample use the technique probability sampling or sample opportunity, where all member population own equal opportunity for selected become sample. While For count amount sample, researchers use Slovin's formula in (Abdullah et al., 2021; Zulfikar et al., 2024) namely as follows (Eq. 1).

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

$$n = \frac{4.800}{1+4800(0.05\%)^2}$$

$$n = \frac{4.800}{13}$$

$$n = 369{,}231 \approx 370$$

Description:

n= Total sample

N= Total population study

α= Error rate sample (alpha) is 0.05%

So, based on count formula the obtained sample as much as 369,231 so from That amount sample rounded up become 370 people.

Then For technique collection the data done through questionnaire or questionnaire as the main instrument in this study. As for the meaning questionnaire is a series question or drafted statement for measure variables certain in accordance with objective research. For distribution the questionnaire done online with use Google Form. While For technique supporting data collection researchers also conducted data collection through interviews, observations, FGDs and through analysis document (Abdullah et al., 2021; Creswell & Creswell, 2020)

About technique analysis data, researchers using the Structural Equation Model (SEM) test with use of one of the types of SEM method, namely Partial Least Square (SEM-PLS). The SEM-PLS method is used for overcoming limitations analysis regression multiple with allow ability for estimate connection between a number of variable predictors and variables dependent (Sihombing et al., 2024) . Besides that, also SEM – PLS allows researcher for analyzing measurement models in a way simultaneously with structural models and allows researcher for adopt a more comprehensive research model complex with connection moderation and mediation (Rahadi, 2023; Soesana et al., 2023).

3. Results and Discussion

As stated in the introduction, this research aimed to explore the influence of the "Waste Management Go to School" program on students' environmental information literacy. This program, initiated by the Bening Saguling Foundation in collaboration with PT. PLN Indonesia Power Saguling and various environmental literacy activists and volunteers, has been implemented in 32 junior high schools (SLTP) and senior high schools (SLTA) in West Bandung Regency as of 2024. Within the program, researchers adopted the SMCR communication model by David K. Berlo, which emphasizes four elements: source (communicator), message, channel (media), and receiver (Atmaja & Dewi, 2018; Irwanti, 2023). It is believed that effective communication needs these features, specifically in extension education like at school-based environmental programs.

The factor being studied in this research is environmental information literacy. Here, we consider individuals or groups' capacity to pick up, assess, make sense of and use information from the environment to decide wisely and sustainably (Ilhami, 2019; Maesaroh et al., 2021; Miterianifa & Mawarni, 2024). Based on (Roth, 1992) description in (Hariyadi et al., 2021), there are four foundational aspects to environmental information literacy. To begin, the possibility to gather environmental information via the media, the internet, published journals or reports from agencies. In addition, learning to determine if the information is accurate, credible and important, as well as knowing how to tell wrong information from the genuine. In addition, being able to understand environmental data in relation to its effects on nature, society and the earth's upcoming changes. In addition, being able to act on what is learned by conserving energy, managing waste and supporting environmental rules and policies (Hariyadi et al., 2021). As soon as data is collected, it must be processed. Two different forms of analysis were performed in this study. The initial method is descriptive statistical analysis which helps to make data easy to explain, summarize and display. The second method is inferential statistics which helps analyze the link between research variables and draws general conclusions or forecasts from the collected data sample (Abdullah et al., 2021; Zulfikar et al., 2024).

This agrees with (Famiola et al., 2024), who pointed out how Indonesian transformation-based social organizations mix education, empowerment and entrepreneurship to ensure sustainability. The Waste Management Go to School program, which comes from a foundation with comparable beliefs, puts stress on both learning and helping the community. Accordingly, (Sumirat et al., 2023) found that environmental literacy among rural elementary students is quite low, due to limited resources for teachers, few ways teachers use and limited community engagement. The results suggest that using a structured method such as the SMCR model, is important to address the issues surrounding these contextual barriers. (Sarbaini et al., 2022) underline that including local cultural information and environmental topics in education systems is important. The

researchers indicate that students pay more attention and learn more about the environment when what they learn is related to their daily lives. This method works well with the goals of the present study, as it tries to fit environmental messages into community-driven education.

To explore sustainable household consumption behaviors further, the authors studied the findings reported by (Ma et al., 2023). According to their analysis, students involved in structured environmental education were much more likely to practice resource conservation at home. As a result, the program fulfills its core goal by working with students on things they need to do in the school yard every day. According to (Estrada-Araoz et al., 2023), meaningful learning about the environment is strongly linked to more environmentally friendly behavior by students in Peru. The study showed that students who felt their environmental education was thorough were generally more likely to act sustainably, save resources and recycle. All of these insights point to the need for focused and context-appropriate environmental education programs such as those looked at in this study.

3.1. Respondent Data

The respondent data in this study consisted of gender and class level. Respondents were grouped into two levels: First Level Secondary School (SLTP), which includes Class VII, VIII, and IX; and Senior High School (SLTA), which includes Class X, XI, and XII. Based on the results of data processing, the distribution is as follows (Figure 1).

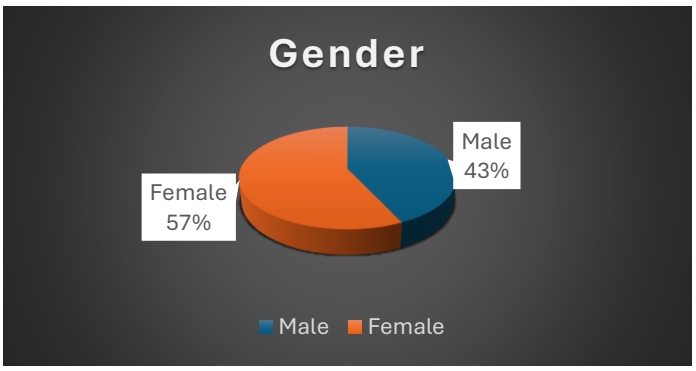

Figure 1. Gender (Source: Researcher Data Processing Results, 2025)

Figure 1 shows the gender distribution of respondents. Of the total 370 students surveyed, 57% were female and 43% were male. This indicates a higher participation rate among female students. The tendency for more female respondents is supported by school records and was further confirmed by several class teachers who noted that female students are more actively involved in school activities. Figure 2 illustrates the class distribution of respondents. The distribution appears relatively balanced across all class levels. However, there is a slight drop in participation among Class XII students, which may be due to their academic responsibilities and examination schedules. Overall, the respondents came from both SLTP and SLTA levels, ensuring representation across the targeted school grades.

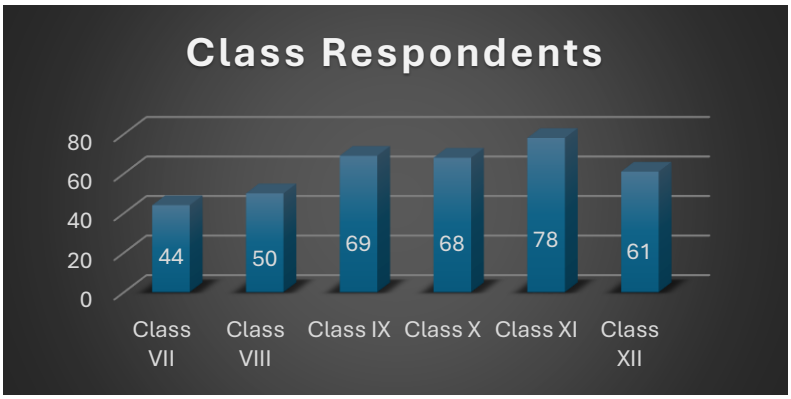

Figure 2. Class Respondents (Source: Researcher Data Processing Results, 2025)

3.2. Hypothesis Testing Results

Next, for the purpose of inferential analysis, hypothesis testing was conducted to determine the influence of the program on students' environmental information literacy. The main hypothesis proposed in this study is as follows: H_0: The "Waste Management Go to School" program does not significantly influence students'

environmental information literacy. H_1: The "Waste Management Go to School" program significantly influences students' environmental information literacy.

In addition to the main hypothesis, the study also tested three sub-hypotheses: H_0: The communicator aspect of the program does not influence students' environmental information literacy. H_1: The communicator aspect of the program has a significant influence on students' environmental information literacy.

H_0: The message aspect of the program does not influence students' environmental information literacy. H_1: The message aspect of the program significantly influences students' environmental information literacy.

H_0: The media aspect of the program does not influence students' environmental information literacy. H_1: The media aspect of the program significantly influences students' environmental information literacy.

To test these hypotheses, researchers applied Structural Equation Modeling - Partial Least Squares (PLS-SEM), a variance-based statistical approach suitable for complex models involving latent variables (Rahadi, 2023; Sihombing et al., 2024). The SmartPLS software was used to run the analysis. Related with the use of SEM-PLS is several stages in structural use (Structural Equation Modeling - Partial Least Squares (PLS), ie as follows:

3.3. Evaluation of Measurement Model (Outer Model)

Convergent validity measures the extent to which the measurement of a concept is positively correlated with other concepts that are related to the theory. This assessment involves factor loadings (correlations of items and constructs) and average variance extracted (AVE). The ideal factor loading value is more than 0.7, with a minimum limit of 0.5, and the AVE value is more than 0.5. The following Figure 3., shows the measurement model diagram (Outer Model) used to determine the loading factor value on SmartPLS in this study:

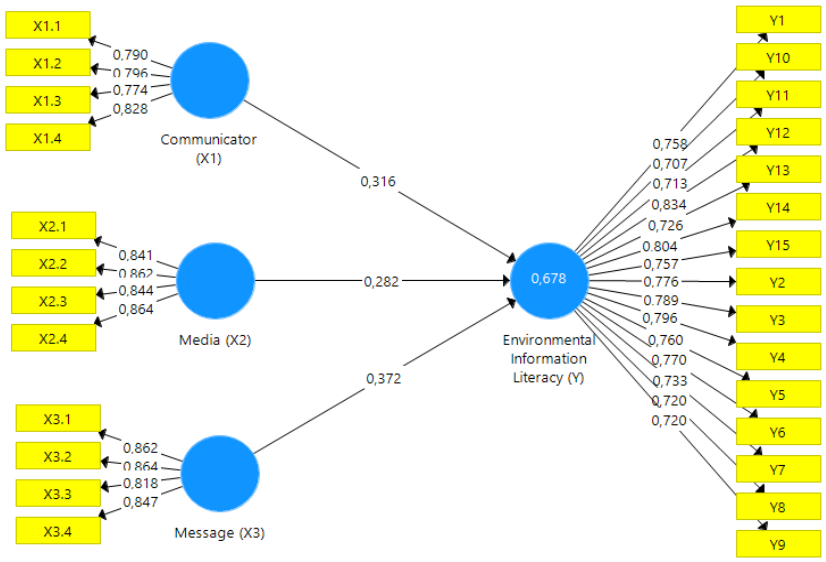

Figure 3. Measurement Model (Outer Model)

Based on results in Table 1. Variables Communicator (X1) is measured with 4 valid items, with outer loading values range between 0.774 to 0.828. This shows that all measurement items are valid in describe variable Communicator. Highest outer loading value is contained in item X1.4 with value 0.828. The Media Variable (X2) is measured with 4 valid items, with outer loading values between 0.841 and 0.864, which indicates that all items are valid in the measure of Media variable. Item X2.4 has highest outer loading value of 0.864. For Message variable (X3), which is measured with 4 valid items, the outer loading value is in the range of 0.818 to 0.864, indicating that all measurement items are valid. Item X3.2 has highest outer loading value of 0.864. Finally, the variable Literacy Information Environment (Y) is measured with 15 valid items, with outer loading values range between 0.707 to 0.834. All measurement items are valid, with item Y12 having the highest outer loading value of 0.834

Table 1.Outer Loading Value Results

Variables	Measurement Items	Outer Loading	Result
Communicator (X1)	X1.1	0,790	Valid
	X1.2	0,796	Valid
	X1.3	0,774	Valid
	X1.4	0,828	Valid

Variables	Measurement Items	Outer Loading	Result
Media (X2)	X2.1	0,841	Valid
	X2.2	0,862	Valid
	X2.3	0,844	Valid
	X2.4	0,864	Valid
Message (X3)	X3.1	0,862	Valid
	X3.2	0,864	Valid
	X3.3	0,818	Valid
	X3.4	0,847	Valid
Literacy Information Environment (Y)	Y1	0,758	Valid
	Y2	0,776	Valid
	Y3	0,789	Valid
	Y4	0,796	Valid
	Y5	0,760	Valid
	Y6	0,770	Valid
	Y7	0,733	Valid
	Y8	0,720	Valid
	Y9	0,720	Valid
	Y10	0,707	Valid
	Y11	0,713	Valid
	Y12	0,834	Valid
	Y13	0,726	Valid
	Y14	0,804	Valid
	Y15	0,757	Valid

Discriminant validity ensures that every construct in different latent models from other variables. This is can rated through Average Variance Extracted (AVE) and Heterotrait-Monotrait Ratio (HTMT). Validity discriminant achieved If AVE root for every construct bigger from correlation construct the with construct others, with AVE value > 0.5 is considered good. In addition, HTMT must be < 0.90; if bigger, means there is problem validity discriminant between constructs.

Based on results in Table 2 and Figure 4. Average Variance Extracted (AVE) values for each variable show that all variables own validity good convergence. Variables The communicator (X1) has AVE value of 0.636, which even though A little lower from ideal threshold 0.7, still considered valid because AVE value is higher big from 0.5. The Media Variable (X2) has AVE value of 0.727, which indicates validity good convergence, with mark bigger from 0.5 and approaching 0.7. Message (X3) also has a good AVE value, of 0.719, which indicates that construct this is valid in measured dimensions message. Lastly, Literacy Information Environment (Y) has AVE value of 0.575, which meets the requirements criteria validity convergent Because AVE value is higher big from 0.5. In overall, all variable in study This show validity good convergence, with AVE value that meets the recommended minimum limit.

Table 2. Results of Average Variance Extracted (AVE) Values

Variables	Average Variance Extracted (AVE)	Results
Communicator (X1)	0,636	Valid
Media (X2)	0,727	Valid
Message (X3)	0,719	Valid
Literacy Information Environment (Y)	0,575	Valid

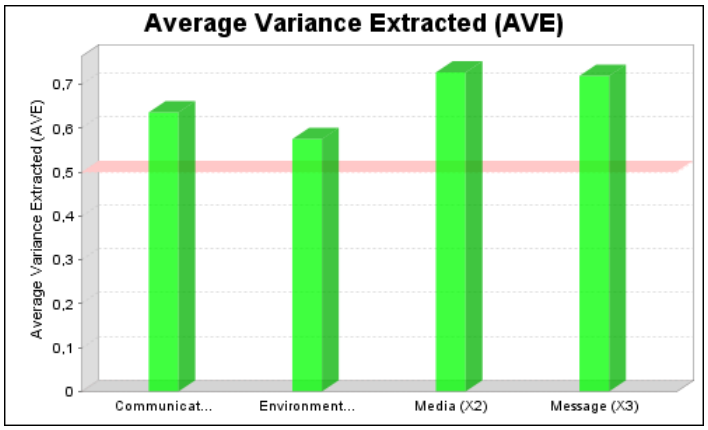

Figure 4. Average Variance Extracted (AVE) value Histogram

Based on results in Table 3. and Figure 5. HTMT testing, all partner variables show more value low from threshold of 0.90, which indicates that validity discriminant achieved between the construct being tested. The HTMT value for partner Communicator (X1) and Literacy Information Environment (Y) is 0.800, while For Communicator (X1) and Media (X2) amounted to 0.678, Communicator (X1) and Message (X3) amounted to 0.741, Literacy Information Environment (Y) and Media (X2) are 0.711, Literacy Information Environment (Y) and Message (X3) were 0.775, and Media (X2) and Message (X3) were 0.608. All mark the smaller from 0.90, which indicates that constructs the own clear differences, so that validity discriminant in this model achieved with Good.

Table 3. Results of the Heterotrait-Monotrait Ratio (HTMT) Test

	Communicator (X1)	Literacy Information Environment (Y)	Media (X2)	Message (X3)
Communicator (X1)				
Literacy Information Environment(Y)	0,800			
Media (X2)	0,678	0,711		
Message (X3)	0,741	0,775	0,608	

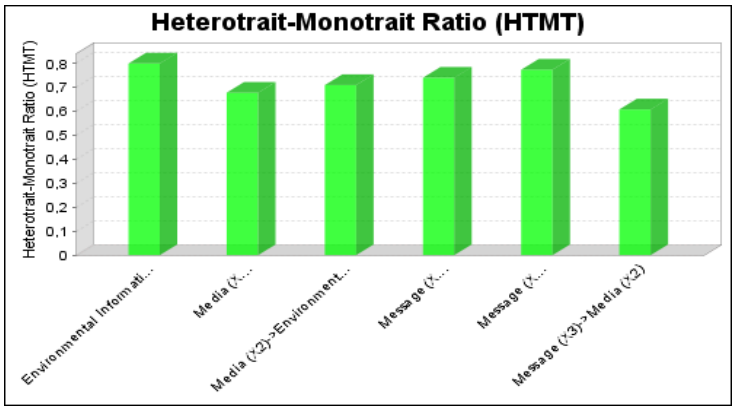

Figure 5. Heterotrait-Monotrait Ratio (HTMT) Test Results Histogram

Reliability testing is a statistical method used to evaluate the consistency of the results produced by a measuring instrument. In research this, reliability measured using two approaches, namely Cronbach's alpha and Composite Reliability. As shown in Table 4 and Figure 6, all variables meet the reliability criteria. The Cronbach's Alpha values for Communicator (X1), Environmental Information Literacy (Y), Media (X2), and Message (X3) are 0.809, 0.947, 0.875, and 0.870 respectively, all of which exceed the recommended minimum of 0.7. This indicates a high level of internal consistency among the items for each construct. Similarly, Composite Reliability values for Communicator (0.875), Environmental Information Literacy (0.953), Media (0.914), and Message (0.911) also exceed the threshold of 0.7. These results confirm that all constructs in this study demonstrate very good reliability, in accordance with the commonly accepted standards.

Table 4.Reliability Test Results

Variables	Cronbach's Alpha	Composite Reliability	Rule of Thumb	Results
Communicator (X1)	0,809	0,875	0,700	Relliable
Literacy Information Environment (Y)	0,947	0,953	0,700	Relliable
Media (X2)	0,875	0,914	0,700	Relliable
Message (X3)	0,870	0,911	0,700	Relliable

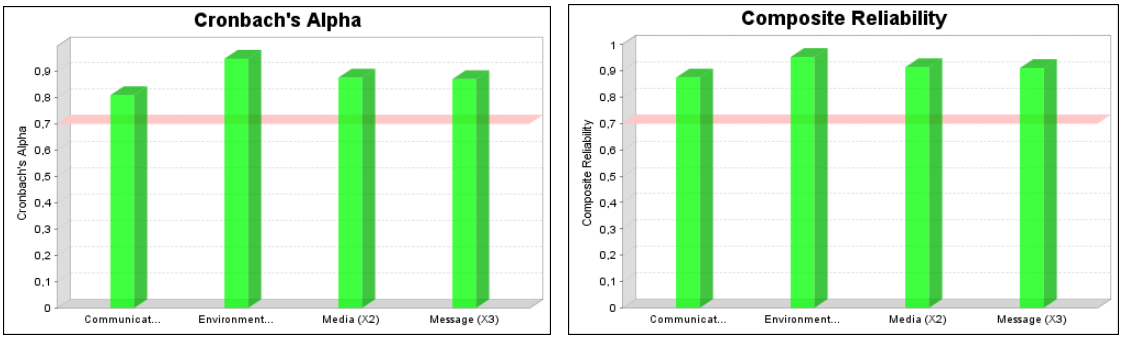

Figure 6. Results of Cronbach's Alpha and Composite Reliability Values

3.3.1. Structural Model Evaluation (Inner Model)

After confirming validity and reliability, the next step is to evaluate the structural model drawn in Figure 7. This process aims to assess the causal relationships among latent variables by using bootstrapping procedures in Partial Least Squares Structural Equation Modeling (PLS-SEM), as explained below this:

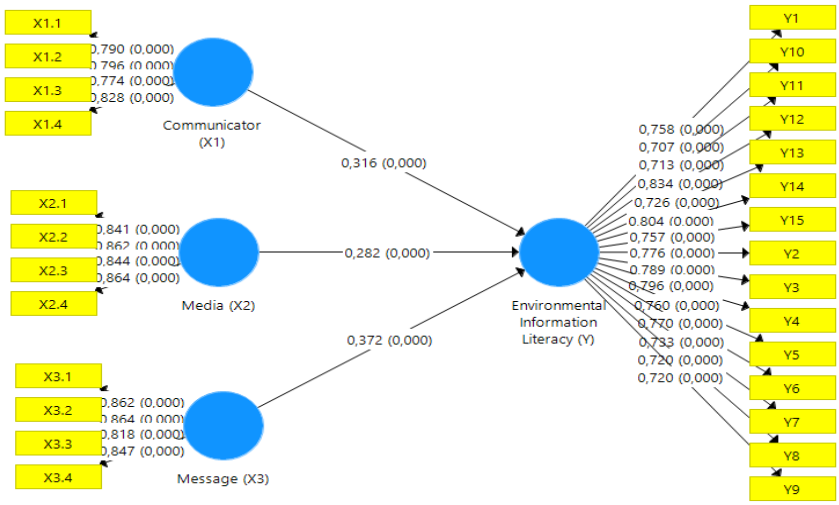

Figure 7. Inner Model Test using Bootstrapping

Structural model evaluation done through three stages main. First, the inspection multicollinearity between variables use Inner. Variance Inflation Factor (VIF) measure. If the VIF value for variable not enough from 5, then can conclude that there is no significant multicollinearity between variables. Stage second is testing hypothesis between variables, which are done with see t- statistic value or p-value. If the t- statistic value bigger from t- table value or p-value is higher small from 0.05, then connection between variables is considered significant. In addition, it is important to convey mark coefficient track along with 95% confidence intervals for those parameters. Stage final is measurement f-square value, which is used for evaluate influence direct variables in the structural model. The f-square value is categorized based on level its influence, namely: low (0.02), moderate (0.15), and high (0.35). The results of the Inner Variance Inflation Factor (VIF) values in Table 5.

Table 5. Results of Inner Variance Inflation Factor (VIF) Values

	Literacy Information Environment (Y)
Communicator (X1)	1,875
Media (X2)	1,602
Message (X3)	1,757

Based on the results in Table 5. the Inner Variance Inflation Factor (VIF) value for each variable is as follows: Communicator (X1) with VIF value of 1.875, Media (X2) with VIF value of 1.602, and Message (X3) with VIF value of 1.757. All these VIF values be under threshold 5, which indicates that there is no problem with significant multicollinearity between variables in this model. This indicates that connection between variables in the structural model can be analyzed without existence disturbance from multicollinearity, and results testing connection between variable can trusted. The results of the direct effect hypothesis test can be seen in Table 6.

Table 6. Test Results Hypothesis Influence Direct

Hypothesis	Path Coefficients	P Values	95% Path Coefficient Confidence Interval		F Square
			Lower Limit	Upper Limit	
Communicator (X1) -> Literacy Information Environment (Y)	0,316	0,000	0,215	0,399	0,165
Media (X2) -> Literacy Information Environment (Y)	0,282	0,000	0,183	0,383	0,154
Message (X3) -> Literacy Information Environment (Y)	0,372	0,000	0,277	0,458	0,245

Based on the results of the hypothesis testing in the table, the following is known: The first hypothesis (H1) that tests the influence of Communicators (X1) on Environmental Information Literacy (Y) is accepted. The results of the analysis show a path coefficient value of 0.316 with a p-value of 0.000 (p-value <0.05), which

indicates a significant influence between Communicators (X1) and Environmental Information Literacy (Y). This means that any change in the Communicator variable will contribute to increasing Environmental Information Literacy. Practically, this shows that the role of communicators in conveying information related to the environment is very important in shaping public understanding and awareness of environmental issues.

In the 95% confidence interval, the influence of Communicators (X1) on Environmental Information Literacy (Y) is estimated to be in the range of 0.215 to 0.399. This range illustrates that although the influence is positive and significant, the level of influence varies depending on the context and other external factors that may affect people's understanding of environmental issues. Therefore, it is important to create a more effective communication program, so that the positive influence can be at the upper limit and increasingly maximized. Furthermore, the f-square value for this relationship is 0.165, which is included in the moderate category ($0.15 \leq f^2 < 0.35$). This shows that although Communicators (X1) have a significant influence on Environmental Information Literacy (Y), the influence is at a moderate level. This indicates that Communicators play an important role in improving environmental information literacy, but their contribution is not yet dominant when compared to other variables in the model. To increase this influence, more intensive interventions such as more frequent communicator training, broader social campaigns, and strengthening the role of the media can increase its positive impact.

Hypothesis second (H2) which tests influence of Media (X2) on Literacy Information Environment (Y) is also accepted, with the path coefficient result is 0.282 and the p-value is 0.000 (p-value <0.05). This shows that the Media (X2) has a significant influence on Environmental Information Literacy (Y). This means that the more effective the media is in conveying messages related to environmental issues, the higher the environmental information literacy possessed by the community. In other words, the media plays an important role in shaping public perception and knowledge of existing environmental issues. In the 95% confidence interval, the influence of Media (X2) on Environmental Information Literacy (Y) lies between 0.183 to 0.383. This range shows that although the influence of media on environmental information literacy is significant, the level of influence varies. Therefore, to maximize its impact, the strategy of disseminating information through the media must be designed more focused and adjusted to the target audience, and carried out sustainably.

The f-square value for influence This is 0.154, which is included in category moderate ($0.15 \leq f^2 < 0.35$). This indicates that Media (X2) provides moderate influence on Literacy Information Environment (Y) in the structural model. Although the role of media in increase literacy information environment Enough significant, its influence Can more reinforced with enlarge frequency and quality delivery message through more media various, such as social media, campaigns public, or educational programs media based.

Hypothesis third (H3) which tests the influence of Message (X3) on Literacy Information Environment (Y) is accepted, with the path coefficient value is 0.372 and the p-value is 0.000 (p-value <0.05). This shows that there is a significant influence between Message (X3) and Environmental Information Literacy (Y). This means that the more effective the message conveyed regarding environmental issues, the greater the increase in environmental information literacy in the community. This indicates that the quality and method of delivering clear and precise messages will have a positive impact on increasing public understanding and awareness of the importance of environmental issues. In the 95% confidence interval, the effect of Message (X3) on Environmental Information Literacy (Y) is between 0.277 to 0.458. This range shows that although the effect of Message (X3) is significant, there are variations in the level of influence that can be influenced by various factors, such as the way the message is delivered and the audience's response. Therefore, it is important to ensure that the message delivered is clear, easy to understand, and relevant to the social and cultural conditions of the target audience.

The f-square value for this influence is 0.245, which is included in the high category ($0.35 \geq f^2 \geq 0.15$). This shows that Message (X3) has a high influence on Environmental Information Literacy (Y). In other words, Message (X3) has a significant impact in shaping environmental information literacy. To further increase this influence, a more diverse message delivery approach, such as through media campaigns, workshops, or the use of digital technology, can be carried out to increase the reach and effectiveness of the message.

3.3.2. Model Fit Evaluation

R Square describes how much big variation from endogenous variables (in matter this, Literacy Information Environment (Y)) which can be explained by variables exogenous (such as Communicator (X1), Media (X2), and Message (X3)) in the model. Based on the analysis results in Table 7. R Square value for Literacy Information Environment (Y) is 0.678. According to (Chin, 1998), the R Square value of 0.678 indicates that this model own influence moderate, because is at in range 0.33 – 0.66. Thus, Communicators (X1), Media (X2), and Messages (X3) together are able to explain around 67.8% of the variation in Environmental Information Literacy (Y). This shows that the combination of the three variables has a significant contribution in explaining public understanding and awareness of environmental issues.

Table 7. Results of R Square and Q Square

	R Square	Q Square
Literacy Information Environment (Y)	0,678	0,378

R Square describes how much big variation from endogenous variables (in matter this, Literacy Information Environment (Y)) which can be explained by variables exogenous (such as Communicator (X1), Media (X2), and Message (X3)) in the model. Based on the analysis results in table 7. R Square value for Literacy Information Environment (Y) is 0.678. According to (Chin, 1998), the R Square value of 0.678 indicates that this model own influence moderate, because is at in range 0.33 – 0.66. Thus, Communicators (X1), Media (X2), and Messages (X3) together are able to explain around 67.8% of the variation in Environmental Information Literacy (Y). This shows that the combination of the three variables has a significant contribution in explaining public understanding and awareness of environmental issues.

Q Square, on the other hand, measures the predictive accuracy of the model, that is, how well changes in an exogenous or endogenous variable can predict changes in other endogenous variables. The Q Square value for Literacy Information Environment (Y) is 0.378, which is bigger than 0.25, but smaller than 0.50. Based on (Hair et al., 2019), the Q Square value of 0.378 indicates that the model has predictive relevance moderate, which means this model capable predicts Literacy Information Environment (Y) with sufficient accuracy good. This indicates that combination variable Communicators, Media, and Messages can predict level literacy information environment with Enough accurate, though There is room for more improvement more carry on.

Standardized Root Mean Square Residual (SRMR) is size used for evaluating to what extent the model fits the empirical data, with method compare difference between matrix observed and predicted correlations by the model. SRMR value below 0.08 indicates that the model has good compatibility. This is reinforced by (Hair et al., 2021) who also stated that higher SRMR value small from 0.08 shows that the model is suitable and can accepted. Table 8 shows the results of the Standardized Root Mean Square Residual (SRMR).

Table 8. Standardized Root Mean Square Residual (SRMR) Results

	Model Estimation
SRMR	0,069

According to (Schermelleh-Engel et al., 2003), SRMR values between 0.08 and 0.10 indicate that the model own compatibility that can acceptable fit. Based on results analysis in study This SRMR value is obtained is 0.069, which shows that the model used own good compatibility with empirical data. This SRMR value supports that the model applied capable explain connection between variable with good and giving indication that the proposed model can accepted in context study.

Overall, the results confirm that the "Waste Management Go to School" program positively influences students' environmental information literacy. The communication components of the program including communicator, message, and media play significant roles in shaping student knowledge and behavior related to environmental issues. Related with the "waste management go to school" program being implemented in cooperation with the Bening Saguling Foundation with PT.PLN Indonesia Power Saguling. This finding is reinforced by the program's implementation, which involves systematic and continuous activities including education on waste management, reduction, sorting, recycling, and utilization, as outlined in environmental education models (Faizah, 2008; Widyatmoko & Moerdjoko, 2002). The emergence of rubbish needs proper handling based on amount perpetrators, types and activities. Handling on the spot or Handling waste at source is treatment to the trash that is still own mark economics that is done before rubbish arrives at the place disposal.

Handling rubbish in place gives significant influence to Handling garbage at stage next. Activities Handling covering sorting, utilization reuse and recycle recycle aims for reduce the magnitude embossment waste (reduce). Collection rubbish is activities carried out from housesor source embossment rubbish going to to Place Shelter While (TPS) before done transportation or transfer rubbish from TPS to location processing end (TPA) (Cerya & Evanita, 2021). As for type rubbish that myself (Daniel, 2009; Juniartini, 2020) grouping become three (3) groups namely as follows:

a. Organic waste: waste consisting of materials that can be decomposed naturally/biologically, such as food scraps and fallen leaves. This type of waste is also commonly called wet waste.

b. Rubbish inorganic: waste consisting of difficult ingredients unraveled in a way biological. The process of destruction needs more Handling in place special, for example plastic, cans and styrofoam. This type of waste is also commonly called dry waste;

c. Hazardous and toxic waste or also called B3 waste: waste from hazardous and toxic materials such as hospital waste, factory waste and others.

Then in handling the waste itself there are several steps or forms of action known as the 5 R's, namely as follows:

a. Reduce (reduce): start to reduce the production of waste produced by yourself, in practice such as bringing your own shopping bag to reduce plastic bag waste or bringing a drink bottle instead of buying packaged drinks;

b. Reuse (use): use return goods that have been No used, for example like use plastic used for wrapper later day, wear can used as a plant pot, or clothes used as a rag, crafts hands, and others

c. Recycle (recycle repeat): Handling special in utilise innovation technology in process or recycling repeat rubbish certain become things that can used back, for example paper from magazines and letters news articles used, metal from can and spoon used, glass from bottles and glasses used, and others.

d. Replace (replace): namely to strive for use goods friendly environment that can be used more from very usage, for example replace pocket plastic plastic bag with bag shopping other so that can used repeatedly, avoiding packaging Styrofoam with other alternatives.

e. Repair (repair): repair damaged goods, with thus goods the can used back. For example, goods broken electronics fixed with appropriate components for the fix, however This needs skill special (Kusminah, 2018; Sugiarti & Aliyah, 2015).

Through the implementation of the " Waste Management Go to School " program, it is hoped that it can raise awareness of the importance of preserving the environment, especially in relation to how to manage and handle waste around them, or in other words, through this program, it can foster environmental information literacy among students.

4. Conclusion

This study aimed to examine the impact of the "Waste Management Go to School" program on students' environmental information literacy. The research was conducted in collaboration with the Bening Saguling Foundation and was grounded in the SMCR communication theory by David K. Berlo. According to this theory, communication effectiveness is influenced by the communicator, message, and media. These three aspects represent the X variables in the study. The Y variable, Environmental Information Literacy, is based on Charles E. Roth's theory, which describes it as consisting of knowledge, awareness, attitude, skills, and action.

The results of the hypothesis testing show that the program significantly influences students' environmental information literacy. The communicator aspect was shown to have a meaningful effect, indicating the importance of reliable information sources in shaping students' understanding and environmental awareness. The media aspect also demonstrated a significant effect, suggesting that the use of diverse and accessible media platforms contributes to the spread and impact of environmental messages. Finally, the message aspect had the highest influence, underscoring the importance of clear, engaging, and relevant messages in encouraging students to adopt environmentally responsible behaviors.

These findings confirm that all three components of communication play a significant role in enhancing students' environmental literacy. The quality and precision of messages, the trustworthiness of communicators, and the strategic use of media all contribute to increased awareness and action among students regarding environmental issues.

Through the implementation of the "Waste Management Go to School" program, it is hoped that students will not only gain knowledge but also develop the motivation and ability to apply that knowledge in real-world settings, particularly in waste management practices. This program has the potential to foster long-term environmental responsibility through education and active engagement.

Author Contributions

Study This consists of from three (3) people , namely : 1) Dr. Drs. Yunus Winoto , M.Pd. Contribution in study This that is on duty in prepare literature , preparing proposals, conducting data collection and preparing research output ; 2) Falih Ijlal Septian , M.I.Kom , in charge of in prepare literature , do data processing , preparing literature supporters and together with team other authors compose articles ; and Prof. Assoc. Shamila Mohamed Shuhidan , P.hD. on duty in prepare literature, do discussion results data processing, doing

preparation Supporter literature for compilation article as well as translate draft article. All authors have equal contributions to the paper. All the authors have read and approved the final manuscript.

Funding

This research is one of a series of UNPAD Internal grant research, namely the Padjadjaran University Lecturer Competency Research (RKDU) for the 2024-2026 budget year. The research is funded from internal funds from Padjadjaran University, Bandung.

Declaration of Conflicting Interests

The research team hereby declares that it has no conflicts of interest with other parties.

Acknowledgement

Gratitude to the parties involved in this research, including the Head of the Environmental Communication Center, the Head of the Department of Communication and Information, Faculty of Communication Sciences, Padjadjaran University, and the Directorate of Research, Downstreaming and Community Service (DRHPM) of Padjadjaran University who have given chance for involved in activity study.

References

Abdullah, K., Jannah, M., Aiman, U., Hasda, S., Fadilla, Z., Taqwin, M., Ardiawan, K. N., & Sari, M. E. (2021). Metodologi penelitian kuantitatif (N. Saputra). *Yayasan Penerbit Muhammad Zaini*.

Atmaja, S., & Dewi, R. (2018). Komunikasi Organisasi (Suatu Tinjauan Teoritis Dan Praktis). *Inter Komunika: Jurnal Komunikasi*, *3*(2), 192. https://doi.org/10.33376/ik.v3i2.234

Cerya, E., & Evanita, S. (2021). Strategi Komunikasi Lingkungan dalam Membangun Kepedulian Masyarakat dalam Pengelolaan Sampah Rumah Tangga. *JRTI (Jurnal Riset Tindakan Indonesia)*, *6*(2), 136. https://doi.org/10.29210/3003977000

Chin, W. W. (1998). The partial least squares approach for structural equation modeling. In *Modern methods for business research.* (pp. 295–336). Lawrence Erlbaum Associates Publishers.

Creswell, J. W., & Creswell, J. D. (2020). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). SAGE Publications.

Daniel, V. (2009). *Easy Green Living*. Hikmah.

Estrada-Araoz, E. G., Gallegos Ramos, N. A., Paredes Valverde, Y., Quispe Herrera, R., & Mori Bazán, J. (2023). Examining the Relationship between Environmental Education and Pro-Environmental Behavior in Regular Basic Education Students: A Cross-Sectional Study. *Social Sciences*, *12*(5), 307. https://doi.org/10.3390/socsci12050307

Faizah. (2008). *Pengelolaan sampah rumah tangga berbasis masyarakat*. Program Pascasarjana Universitas Diponegoro.

Famiola, M., Aldianto, L., Putra, R. E., & Anggahegari, P. (2024). Transforming movement for sustainability into a formal impact-oriented organisation: case of Indonesia. *Cogent Business & Management*, *11*(1), 1–17. https://doi.org/10.1080/23311975.2024.2390687

Fayza, W., Pangaribuan, P., & Fuadi, A. Z. (2024). Sistem Pemantauan Sampah Pada Prototype Perangkap Dan Pengangkat Sampah. *E-Proceeding of Engineering*, *11*(1), 360–364.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. Springer International Publishing. https://doi.org/10.1007/978-3-030-80519-7

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Hancock, D. R., & Algozzine, R. (2006). *Doing Case Study Research: A Practical Guide for Beginning Researchers*. Teachers College Press. https://books.google.co.id/books?id=LyAmAQAAIAAJ

Hariyadi, E., Maryani, E., & Kastolani, W. (2021). Analisis literasi lingkungan pada mahasiswa pendidikan geografi. *Gulawentah:Jurnal Studi Sosial*, *6*(1), 1. https://doi.org/10.25273/gulawentah.v6i1.6685

Ilhami, A. (2019). Kontribusi Budaya Lokal Terhadap Literasi Lingkungan : Studi Kasus di SMP Pandam Gadang Sumatera Barat. *Journal of Natural Science and Integration*, *2*(2), 1. https://doi.org/10.24014/jnsi.v2i2.7788

Irwanti, M. (2023). *Manajemen Krisis Komunikasi: (Tinjauan Teoritis dan Praktis)*. Widina Media Utama.

Juniartini, N. L. P. (2020). Pengelolaan Sampah Dari Lingkup Terkecil dan Pemberdayaan Masyarakat sebagai Bentuk Tindakan Peduli Lingkungan. *Jurnal Bali Membangun Bali*, *1*(1), 27–40. https://doi.org/10.51172/jbmb.v1i1.106

Kothari, C. R. (2019). *Research Methodology: Methods and Techniques* (4th ed.). New Age International Publishers.

Kusminah, I. L. (2018). Penyuluhan 4r (Reduce, Reuse, Recycle, Replace) dan Kegunaan Bank Sampah Sebagai Langkah Menciptakan Lingkungan yang Bersih dan Ekonomis di Desa Mojowuku Kabupaten Gresik. *Jurnal Pengabdian Masyarakat LPPM Untag Surabaya*, *1*, 22–28.

Ma, L., Shahbaz, P., Haq, S. ul, & Boz, I. (2023). Exploring the Moderating Role of Environmental Education in Promoting a Clean Environment. *Sustainability*, *15*(10), 8127. https://doi.org/10.3390/su15108127

Maesaroh, S., Bahagia, B., & Kamalludin, K. (2021). Strategi Menumbuhkan Literasi Lingkungan Pada Siswa. *Jurnal Basicedu*, *5*(4), 1998–2007. https://doi.org/10.31004/basicedu.v5i4.1048

Miterianifa, M., & Mawarni, M. F. (2024). Penerapan Model Pembelajaran Literasi Lingkungan dalam Meningkatkan Pengetahuan dan Kesadaran Lingkungan. *Jurnal Sains Dan Edukasi Sains*, *7*(1), 68–73. https://doi.org/10.24246/juses.v7i1p68-73

Rahadi, D. R. (2023). *Pengantar Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Lentera Ilmu Madani.

Rahayu, F., Aulia Pratama, M., Ananda Widiantika, S., & Sofiani, N. F. (2023). Pengaruh Partisipasi Masyarakat terhadap Program Citarum Harum Bestari. *Konferensi Nasional Ilmu Administrasi 8.0*, *7*(1), 331–336.

Roth, C. E. (1992). *Environmental Literacy: Its Roots, Evolution and Directions in the 1990s.* ERIC/CSMEE Publications.

Sarbaini, Hernawan, A. H., Darmawan, D., & Ali, M. (2022). Environmental Education Based on Local Values: Its Integration in the Indonesian Elementary School Curriculum. *International Journal of Education and Practice*, *10*(4), 322–333. https://doi.org/10.18488/61.v10i4.3174

Satgas Pengendalian Pencemaran Citarum. (2018). *Rencana Aksi Pengendalian Pencemaran Dan Kerusakan DAS Citarum 2019-2025* . Ringkasan Eksekutif.

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74.

Sihombing, P., Arsani, A., Oktaviani, M., Nugraheni, R., Wijaya, L., & Muhammad, I. (2024). *Aplikasi SmartPLS 4.0 untuk Statistisi Pemula*. Minhaj Pustaka.

Singh, Y. K. (2006). *Fundamental of Research Methodology and Statistics*. New Age International.

Soesana, A., Subakti, H., Karwanto, Fitri, A., Kuswandi, S., Sastri, L., Falani, I., Aswan, N., Hasibuan, F. A., & Lestari, H. (2023). *Metodologi Penelitian Kuantitatif*. Yayasan Kita Menulis.

Sugiarti, R., & Aliyah, I. (2015). Budaya Pengelolaan Sampah berbasis masyarakat melalui metode 5R untuk mewujudkan lingkungan bersih dan sehat di Kabupaten Sukoharjo. *Cakra Wisata*, *16*(2).

Sumirat, F., Sa'ud, U. S., Sopandi, W., & Supriatna, N. (2023). Brave to Green: Are There Environmental Literacy Problems in Rural Areas Public Elementary Schools? *Jurnal Penelitian Pendidikan IPA*, *9*(5), 3758–3764. https://doi.org/10.29303/jppipa.v9i5.3489

Waqi, L. A., & Kusumo, R. A. B. (2023). Partisipasi Masyarakat Terhadap Implementasi Program Citarum Harum. *Jurnal Sosek Fakultas Pertanian Univeritas Padjadjaran*, *2*(2), 285–302. http://bappeda.jabarprov.go.id

Widyatmoko, & Moerdjoko, S. (2002). *Menghindari, mengolah dan menyingkirkan sampah*. Abadi Tandur.

Zulfikar, R., Sari, F. P., Fatmayati, A., Wandini, K., Haryati, T., Jumini, S., Nurjanah, N., Annisa, S., Kusumawardhani, O. B., Mutiah, R., Linggi, A. I., & Fadilah, H. (2024). Metode Penelitian Kuantitatif (Teori, Metode Dan Praktik). In E. Damayanti (Ed.), *CV WIDINA MEDIA UTAMA*. CV WIDINA MEDIA UTAMA.

Zulhadi, Z., Pitono, A., & Wargadinata, E. L. (2023). Collaborative Governance Dalam Pengelolaan Kawasan Citarum Harum di Kabupaten Bandung. *Jurnal Pendidikan Dan Konseling (JPDK)*, *5*(1), 1244–1255. https://doi.org/https://doi.org/10.31004/jpdk.v5i1