

The Relationship Between Knowledge And Attitude With Waste Sorting Ability (Case Study: Students Of Grades 3, 4, 5 Of Sdn 2 Sukorame)

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ABSTRACT

The low ability of waste sorting among elementary school students is a serious problem that impacts environmental health. Knowledge and attitude are determinants that influence a person's ability to carry out waste sorting behavior. This study aims to analyze the relationship between knowledge and attitude with waste sorting ability in grades 3, 4, and 5 of SDN 2 Sukorame. The method in this study used an analytical observational design with a cross-sectional approach. A sample of 120 students was taken using a simple random sampling technique from a total population of 174 students. Data were collected through a knowledge questionnaire, an attitude questionnaire, and an observation sheet of waste sorting ability. Data analysis used the Chi-Square test with a significance level of $\alpha = 0.05$. The results showed that most students had insufficient knowledge (54.2%), sufficient attitude (41.7%), and inability (70.8%). The results of the Chi-Square test showed a significant relationship between knowledge and waste sorting ability ($p = 0.000$) and between attitude and waste sorting ability ($p = 0.000$). In conclusion, there is a significant relationship between knowledge and attitudes and students' waste sorting skills. Good knowledge and positive attitudes play a crucial role in improving waste sorting skills. Further research using multimodal educational interventions is recommended to simultaneously improve all three domains.

Keywords: Attitude, Elementary School Students, Knowledge, Waste Sorting Ability

INTRODUCTION

The waste problem remains a serious challenge in Indonesia, particularly in densely populated areas. According to data from the National Waste Management Information System (SIPSN) and the Ministry of Environment and Forestry (KLHK), Indonesia's waste volume reached 19.52 million tons in 2023, with plastic accounting for 18.78% of the total (Setyaningrum et al., 2021). The increase in waste volume is directly proportional to population growth and changes in people's consumption patterns, which if not managed properly will have a negative impact on health and the environment (Firmansyah et al., 2024).

Accumulated rubbish can become a source of pollution, a breeding ground for disease vectors, and a cause of flooding due to blocked drainage channels (Kesuma et al., 2025). Therefore, systematic and sustainable efforts are needed to address waste issues starting at the source, including in educational settings. Schools, as formal educational institutions, play a strategic role in shaping character and environmentally conscious behavior from an early age (Purnaningtyas & Fauziati, 2023). Especially elementary school students, who are still in the golden age of cognitive and affective development, where positive values can be instilled effectively.

However, the reality on the ground shows that students' knowledge and awareness of waste management remains relatively low. Initial observations at SDN 2 Sukorame indicated that most students in grades 3, 4, and 5 did not yet understand how to separate waste by type. Organic and inorganic waste were often mixed in the same bin, and many students still littered. This situation was exacerbated by limited waste sorting facilities and a lack of systematic education in schools (Meilani & Harianti, 2024).

Elementary school students' low understanding of waste sorting methods can be explained by several systematic factors. First, the lack of integration of waste sorting materials into the curriculum is a major factor. Although environmental education has been integrated into the national curriculum, specific material on waste sorting techniques has not received adequate coverage in elementary school instruction (Purnaningtyas & Fauziati, 2023). Second, the limitations of less interactive learning methods exacerbate the situation. The learning methods used in elementary schools are generally conventional, involving lectures and theory without any direct practice (Firmansyah et al., 2024). Third, the lack of habituation and exemplary behavior from role models in schools influences the formation of student behavior. Waste sorting has not become a habit that is consistently implemented in the school environment (Kesuma et al., 2025). Fourth, socio-cultural factors in the family and community environment also contribute to students' low understanding (Nanda et al., 2025).

According to Health Promotion theory of Notoatmodjo (2023), Health behavior change involves three hierarchical domains: knowledge, attitude, and action (practice). Knowledge is the basis for forming attitudes, and positive attitudes will lead to desired actions. Research Kesuma et al (2025) strengthens this theory by finding that audio-visual education is significantly able to improve the three domains of knowledge, attitudes, and actions of waste sorting in elementary school students. The Theory of Planned Behavior from Ajzen (2023), explains that a person's intention to perform a behavior is influenced by three main factors: attitude toward the behavior, subjective norms, and perceived behavioral control. In the context of waste sorting, students' positive attitudes toward waste sorting will encourage the intention to sort waste, which will ultimately be realized in real action (Firmansyah et al., 2024).

Several previous studies have examined the relationship between knowledge and attitudes and waste sorting behavior. Setyaningrum et al (2021) at SD Negeri 8 Sumerta Denpasar showed that before the health promotion intervention through educational videos, the average score of students' knowledge about plastic waste management was only 5.90 and attitudes were 6.18 on a scale of 10. Similar findings were reported by Meilani & Harianti (2024) at SDN Wanajaya III Karawang, 47.4% of students had insufficient knowledge about waste sorting before being given information using posters. Kesuma et al (2025) at SDN 119 Palembang, it was reported that the pretest score for students' knowledge was only 67.40 on a scale of 100, attitudes 23.28 on a scale of 50, and actions 12.72 on a scale of 30.

Study Nanda et al (2025) at Madrasah Tsanawiyah Muhammadiyah 13 Tanjung Morawa, it was found that 50% of students were in the insufficient knowledge category before being given audiovisual education. Firmansyah et al (2024) at SDN Sendangrejo II Lamongan reported that 81.8% of students had insufficient knowledge about sorting infrastructure before the intervention. Jihan Fadilah et al (2024) at UPTD SDN 1 Singaraja, it was reported that 65% of students showed doubts about the importance of sorting plastic waste before being given education.

Although numerous studies have evaluated the influence of educational media on knowledge and attitudes, there is still a research gap regarding the analysis of the relationship between knowledge and attitudes and the practical ability of waste sorting in elementary school students in Indonesia. Jihan Fadilah et al (2024) and Firmansyah et al (2024) focused on the impact of video media on knowledge and attitudes, but did not analyze the relationship between

these three variables simultaneously. However, learning theory states that to change behavior, these three domains must be addressed simultaneously (Notoatmodjo, 2023).

Based on this phenomenon, this study aims to analyze the relationship between knowledge and attitudes with waste sorting skills in grades 3, 4, and 5 of SDN 2 Sukorame. This study is expected to contribute to the development of environmental health education theory, particularly in understanding the relationship between cognitive, affective, and psychomotor domains in elementary school-aged children, as well as serve as a basis for developing more effective educational interventions in the future.

METHODS

This study used an analytical observational design with a cross-sectional approach. This design was chosen to analyze the relationship between the independent variables (knowledge and attitudes) and the dependent variable (waste sorting ability) at a specific point in time (Sugiyono, 2021). The research was conducted at SDN 2 Sukorame, Mojoroto District, Kediri City, East Java Province. The location was selected based on initial observations indicating a lack of waste sorting knowledge and facilities at the school. The research was conducted from February to March 2026.

The population in this study was all 3rd, 4th, and 5th grade students at SDN 2 Sukorame in the 2024/2025 academic year, totaling 174 students. The sampling technique used was simple random sampling with a proportional approach. The sample size was calculated using the Slovin Formula with a 5% error rate and considering a potential dropout rate of 5%, resulting in a final sample size of 120 students. The sample distribution per class was 39 students in 3rd grade, 41 students in 4th grade, and 40 students in 5th grade.

The research variables consist of independent variables, namely knowledge (X1) and attitude (X2), and the dependent variable, namely the ability to sort waste (Y). Knowledge was measured using a multiple-choice questionnaire with 10 questions covering the definition of waste, types of waste, the color of the trash can, the benefits of sorting, and the impact of not sorting waste. Attitude was measured using a Likert scale questionnaire with 10 statements (5 positive and 5 negative) covering cognitive, affective, and conative components. The ability to sort waste was measured using a checklist observation sheet with 20 items covering the ability to identify types of waste, sort organic waste, sort inorganic waste, and apply the 3K principle (Empty, Dry, Crush/Squeeze).

The instrument validity test was conducted using product moment correlation with the help of SPSS version 26. The validity test results showed that all items (10 knowledge items, 10 attitude items, and 20 ability items) had $r\text{-count} > r\text{-table}$ (0.179), so they were declared valid. The reliability test using Cronbach's Alpha showed a value of 0.767 for knowledge, 0.957 for attitude, and 0.968 for ability, so the instrument was declared reliable ($\alpha > 0.60$).

The data collection procedure includes the preparation stage (permitting, socialization, and training of enumerators), the implementation stage (filling out the knowledge and attitude questionnaire and observing waste sorting abilities), and the final stage (collecting and checking the completeness of the data). Data analysis was carried out in two stages, Univariate analysis was used to describe the characteristics of respondents and the frequency distribution of research variables, presented in the frequency distribution table and percentage. Bivariate analysis used the Chi-Square test to analyze the relationship between knowledge variables with waste sorting abilities and attitude variables with waste sorting abilities. The significance level used was $\alpha = 0.05$. If the $p\text{-value} < 0.05$, then there is a significant relationship between the independent and dependent variables. Data processing used the SPSS version 26 program.

This study has received ethical approval from the Health Research Ethics Committee of STRADA Indonesia University. The ethical principles applied include informed consent from

parents/guardians of students, anonymity (confidentiality of respondents' identities), and data confidentiality.

RESULTS

1. Respondent Characteristics

Based on the sample calculation using the Slovin formula, the final sample size was obtained as follows: 120 students from a total population of 174 students Grades 3, 4, and 5 of SDN 2 Sukorame were selected as respondents. The demographic characteristics of the respondents are presented in Table 1.

Table 1. Distribution of Respondents' Demographic Characteristics

Demographic Characteristics	Category	Frequency (n)	Percentage (%)
Grade	Grade 3 (A and B)	39	32.5
	Grade 4 (A and B)	41	34.2
	Grade 5 (A and B)	40	33.3
	Total	120	100%
Gender	Man	51	42.5
	Woman	69	57.5
	Total	120	100%
Age	9 Years	28	23.3
	10 Years	38	31.7
	11 Years	28	23.3
	12 Years	26	21.7
	Total	120	100%

Source: Primary Data, 2026

Based on Table 1, the distribution of respondents by grade is relatively balanced, with grade 4 having the largest number (34.2%), followed by grade 5 (33.3%) and grade 3 (32.5%). Female respondents (57.5%) were more dominant than male respondents (42.5%). Furthermore, the age range of respondents was 9-12 years, dominated by students aged 10 years (31.7%).

2. Univariate Analysis

The univariate analysis in this study aims to describe the frequency and percentage distribution of students' knowledge, attitudes, and waste sorting abilities. The results of the univariate analysis are presented in Tables 2, 3, and 4.

Table 2. Distribution of Student Knowledge

Knowledge Category	Frequency (n)	Percentage (%)
Good ($\geq 76\%$)	20	16.7
Sufficient (56-75%)	35	29.2

Less (<56%)	65	54.2
Total	120	100%

Source: Primary Data, 2026

Based on Table 2, most students have knowledge in the less knowledge category at 54.2%, followed by the sufficient category at 29.2%, and only 16.7% of students have good knowledge.

Table 3. Distribution of Student Attitudes

Attitude Category	Frequency (n)	Percentage (%)
Good/Positive ($\geq 76\%$)	30	25
Sufficient (56-75%)	50	41.7
Less/Negative (<56%)	40	33.3
Total	120	100%

Source: Primary Data, 2026

Based on Table 3, most students have attitudes in the sufficient category at 41.7%, followed by the negative category at 33.3%, and only 25% of students have a positive attitude towards waste sorting.

Table 4. Distribution of Students' Waste Sorting Ability

Ability Category	Frequency (n)	Percentage (%)
Good/Capable ($\geq 76\%$)	10	8.3
Sufficient (56-75%)	25	20.8
Less/Unable (<56%)	85	70.8
Total	120	100%

Source: Primary Data, 2026

Based on Table 4, the majority of students have abilities in the less/unable category of 70.8%, followed by the sufficient category of 20.8%, and only 8.3% of students have good abilities.

3. Bivariate Analysis

Bivariate analysis was conducted to analyze the relationship between the independent variables (knowledge and attitude) and the dependent variable (waste sorting ability). The statistical test used was the Chi-Square test with a significance level of $\alpha = 0.05$. The relationship between knowledge and waste sorting ability is presented in Table 5.

Table 5. Relationship between Knowledge and Waste Sorting Ability

Knowledge	Waste Sorting Ability			Total	p-value
	Capable n (%)	Enough n (%)	Unable n (%)	n (%)	
Good	7 (35.0%)	8 (40.0%)	5 (25.0%)	20 (100%)	0,000*
Enough	2 (5.7%)	8 (22.9%)	25 (71.4%)	35 (100%)	
Not enough	1 (1.5%)	9 (13.8%)	55 (84.6%)	65 (100%)	
Total	10 (8.3%)	25 (20.8%)	85 (70.8%)	120 (100%)	

Significant at $\alpha=0.05$

Source: Primary Data, 2026

Based on Table 5, the results of the Chi-Square test show a p-value = 0.000 ($p < 0.05$), which means there is a significant relationship between knowledge and waste sorting ability, so H_0 is rejected and H_1 is accepted. The proportion of students with good knowledge who have good abilities is 35.0% higher than students with less knowledge (1.5%) and sufficient (5.7%). Conversely, the proportion of students with less knowledge who have incapable abilities (84.6%) is higher than students with sufficient knowledge (71.4%) and good (25.0%). The relationship between attitudes and waste sorting abilities is presented in Table 6.

Table 6. Relationship between Attitude and Waste Sorting Ability

Attitude	Waste Sorting Ability			Total	p-value
	Capable n (%)	Enough n (%)	Unable n (%)		
Good/Positive	8 (26.7%)	10 (33.3%)	12 (40.0%)	30 (100%)	0,000*
Enough	2 (4.0%)	10 (20.0%)	38 (76.0%)	50 (100%)	
Less/Negative	0 (0%)	5 (12.5%)	35 (87.5%)	40 (100%)	
Total	10 (8.3%)	25 (20.8%)	85 (70.8%)	120 (100%)	

Significant at $\alpha=0.05$

Source: Primary Data, 2026

Based on Table 6, the results of the Chi-Square test show a p-value = 0.000 ($p < 0.05$), which means there is a significant relationship between attitudes and waste sorting abilities, so H_0 is rejected and H_1 is accepted. The proportion of students with positive attitudes who have good abilities is 26.7% higher than students with negative attitudes (0%) and sufficient (4.0%). Conversely, the proportion of students with negative attitudes who have incapable abilities (87.5%) is higher than students with sufficient attitudes (76.0%) and positive (40.0%).

DISCUSSION

1. Students' Knowledge about Waste Sorting

The results of the study showed that the majority of students (54.2%) had insufficient knowledge about waste sorting. This finding is in line with research Firmansyah et al (2024) at SDN Sendangrejo II Lamongan, which reported that 81.8% of students had insufficient knowledge about sorting infrastructure before the intervention. Kesuma et al (2025) also confirmed that the pretest score for student knowledge was only 67.40 on a scale of 100, with the weakness lying in the identification of sorting tools. In addition, Nanda et al (2025) at Madrasah Tsanawiyah Muhammadiyah 13 Tanjung Morawa, 50% of students were in the insufficient knowledge category before receiving audiovisual education. Meilani & Harianti (2024) at SDN Wanajaya III Karawang, it was also reported that 47.4% of students had insufficient knowledge about the allocation of trash bins based on color.

Students' low level of knowledge about waste sorting can be explained by several factors. First, the lack of integration of waste sorting materials into the elementary school curriculum. Although environmental education has been integrated into the national curriculum, specific material on waste sorting techniques has not received adequate coverage in the curriculum (Purnaningtyas & Fauziati, 2023). Second, the limitations of less interactive learning methods. The learning methods used in elementary schools are generally conventional, namely lectures and theory presentations without any direct practice (Firmansyah et al., 2024). Third, there is a lack of habituation and role models in schools. Waste sorting has not become a habit that is

consistently implemented in the school environment (Kesuma et al., 2025).

According to Bloom's taxonomy theory revised by Anderson & Krathwohl (2021), factual knowledge about physical attributes such as waste types and trash can colors is the initial foundation that must be mastered before students are able to reach higher cognitive dimensions such as application and analysis. The author argues that students' low knowledge about waste sorting indicates that the school has never conducted systematic socialization regarding sorting facilities. The trash cans available at SDN 2 Sukorame are still open containers without color labels, so students do not have enough visual experience to build long-term memory about color associations with waste types.

2. Students' Attitudes towards Waste Sorting

The results of the study showed that the majority of students (41.7%) had a sufficient attitude towards waste sorting, with 33.3% of students still having a negative attitude. This finding is in line with research. Kesuma et al (2025) who reported students' pretest attitude scores were only 23.28 on a scale of 50, which falls into the negative category. Setyaningrum et al (2021) at SD Negeri 8 Sumerta Denpasar also found that before the educational video intervention, students' attitude scores regarding plastic waste management were only 6.18 on a scale of 10, reflecting a lack of concern for the benefits of sorting. Jihan Fadilah & Others (2024) At UPTD SDN 1 Singaraja, it was reported that 65% of students showed doubts about the importance of sorting plastic waste before being given education.

Theory of Planned Behavior Ajzen (2023) explains that attitudes are formed from behavioral beliefs, namely individual beliefs about the consequences of an action. Students who have never seen inorganic waste recycled into new products will not have a positive belief that sorting is beneficial. The author argues that cultural factors in the family environment are a major obstacle, where most students' parents have not implemented waste sorting at home. This condition creates cognitive dissonance in students: they hear theories about the benefits of recycling at school, but witness the opposite practice at home, making it difficult to form a positive attitude (Kusdiah et al., 2024).

Students' low positive attitudes toward waste sorting may also be due to a lack of meaningful, hands-on experience. Students tend to view waste sorting as an additional burden rather than a positive routine for maintaining personal and school cleanliness. Research of Kesuma et al (2025) emphasized that the habit of sorting waste can only be formed through consistent practice and support from the social environment, including role models from teachers and parents.

3. Students' Waste Sorting Skills

The results of the study showed that the majority of students (70.8%) had poor waste sorting skills. The most concerning situation occurred in the application of the 3K principle (Empty, Dry, and Squeeze). Firmansyah et al (2024) reported that before the intervention, 81.8% of students at SDN Sendangrejo II were unable to practice cleaning up plastic waste before throwing it away. Kesuma et al (2025) also found that students' pretest action scores were only 12.72 out of a scale of 30, with the main weakness being the procedure for preparing inorganic waste for recycling. Nanda et al (2025) reported that none of the students (0%) were able to apply the 3K principles correctly before the intervention at Madrasah Tsanawiyah.

According to the psychomotor domain theory of Dave (2023) skills such as the 3K principle are at the guided response level, where students require direct demonstration and immediate feedback to be able to reproduce movements correctly. Without clear modeling, students will not be able to move from the perception stage to the set stage and finally the guided response stage. The author argues that the failure to master the 3K principle occurs because learning at SDN 2 Sukorame is still theoretical and teacher-centered. Characteristics of elementary school students who are at the concrete operational stage (Piaget, in Santrock,

2021) should be accommodated with real object-based learning and physical manipulation, but this has not been implemented.

Students' poor waste sorting skills may also be due to a lack of opportunities for hands-on practice. Students may have heard the terms "organic waste" and "inorganic waste," but have never been taught concretely how to differentiate and sort them in everyday life. Research of Purnaningtyas & Fauziati (2023) stated that the minimal duration and intensity of learning about waste management in elementary schools resulted in students' knowledge not developing optimally and practical skills not being trained properly.

4. The Relationship Between Knowledge and Waste Sorting Ability

The results of the Chi-Square test showed a significant relationship between knowledge and waste sorting ability ($p=0.000$). The proportion of students with good knowledge who had good ability (35.0%) was higher than those with poor knowledge (1.5%) and sufficient knowledge (5.7%). This finding is in line with research. Setyaningrum et al (2021) who reported an increase in mean knowledge scores from 5.90 to 7.74 after the video intervention, which was followed by an increase in practical skills. Firmansyah et al (2024) also found that the proportion of students with good knowledge increased from 18.2% to 72.7% after the Android-based video intervention, which correlated with increased waste sorting ability.

Study by Kesuma et al (2025) reported an increase in knowledge from an average of 67.40 to 91.15, which was accompanied by an increase in action from 12.72 to 22.90. Nanda et al (2025) reported an increase in average knowledge from 40.53 to 76.66, with students in the good knowledge category increasing from 4.7% to 42.2%, which was followed by an increase in practical waste sorting skills. Jihan Fadilah et al (2024) also confirmed that educational video media increased elementary school students' knowledge from the poor category (32.1%) to good (64.2%), which correlated with an increase in the ability to sort waste.

According to Health Promotion theory of Notoatmodjo (2023), knowledge is a cognitive domain that forms the basis for the formation of attitudes and actions. Good knowledge about waste sorting allows students to understand the concept, types, benefits, and methods of waste sorting correctly, which will ultimately improve their practical skills. The authors argue that increasing knowledge about the impact of not sorting waste (from 62.5% to 96.7%) is a key factor that encourages students to practice waste sorting consistently.

5. The Relationship Between Attitude and Waste Sorting Ability

The results of the Chi-Square test showed a significant relationship between attitude and waste sorting ability ($p=0.000$). The proportion of students with positive attitudes who had good abilities (26.7%) was higher than those with negative attitudes (0%) and fair (4.0%). This finding is in line with research. Kesuma et al (2025) who reported an increase in attitudes from 23.28 to 32.56 after the intervention, which was followed by an increase in actions. Setyaningrum et al (2021) also found a significant increase in elementary school students' attitudes towards plastic waste management, with a posttest score reaching 7.42 on a scale of 10 (p -value 0.000), which correlated with increased practical skills.

Study by Meilani & Harianti (2024) reported that counseling using posters increased students' positive attitudes towards waste sorting by 24.3%, which was followed by an increase in their ability to sort waste. Kusdiah et al., (2024) also confirmed that the simulation method combined with demonstrations was able to change negative attitudes into positive ones in 85% of school-age children, which was followed by an increase in the practical ability of waste sorting.

Theory of Planned Behavior Ajzen (2023) explains that a positive attitude toward a behavior will encourage the intention to perform that behavior. Students with a positive attitude toward waste sorting will have a higher motivation to practice waste sorting consistently. The authors argue that increasing beliefs about the benefits of recycling (from 55% to 90%) is a key

factor that encourages students to practice waste sorting. Students who believe that sorted waste can be recycled and is useful will be more motivated to sort waste correctly.

6. Research Implications

The findings of this study have several important implications for environmental health education in elementary schools. First, there is a need to integrate waste sorting material into the elementary school curriculum with interactive learning methods that involve hands-on practice. Second, there is a need for teacher training on effective waste sorting demonstration methods to improve students' psychomotor skills. Third, there is a need for parental involvement in waste sorting education programs to create consistency between school learning and home practice. Fourth, there is a need to provide separate waste bins at school with clear labels and colors to facilitate students' waste sorting practices.

This study also has limitations that need to be considered. The cross-sectional design does not allow researchers to draw causal conclusions between knowledge, attitudes, and waste sorting skills. The study was conducted in only one elementary school, so generalizations of the results should be made with caution. The instrument used to measure waste sorting skills used direct observation, which may be influenced by the researcher's subjectivity. This study also did not measure other factors that may influence waste sorting skills, such as family support, availability of facilities, and peer influence.

CONCLUSION

Based on the research results and discussions that have been described, it can be concluded that most students in grades 3, 4, and 5 of SDN 2 Sukorame have knowledge about waste sorting in the category of insufficient (54.2%), attitudes in the category of sufficient (41.7%), and waste sorting ability in the category of unable (70.8%), which indicates the need for comprehensive educational interventions to improve these three domains. This study also proves a significant relationship between knowledge and waste sorting ability ($p = 0.000$) and between attitudes and waste sorting ability ($p = 0.000$), where students with better knowledge and more positive attitudes tend to have better waste sorting ability as well. Thus, this study confirms that knowledge and attitudes are important factors related to waste sorting ability in elementary school students, so that efforts to increase knowledge and develop positive attitudes towards waste sorting need to be a priority in environmental health education programs in elementary schools.

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