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## INITIAL STUDENT UNDERSTANDING ANALYSIS OF WASTE MANAGEMENT IN THE CONTEXT OF THE STUDENT PANCASILA PROFILE STRENGTHENING PROJECT

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### ABSTRACT

The strengthening project of the Pancasila student profile is an integral part of the latest curriculum in Indonesia. One important aspect of it is the understanding of sustainable lifestyles and responsibility towards waste management. This study aims to analyze the initial understanding of students regarding waste management in the context of strengthening the Pancasila student profile. The research method used is a qualitative approach with data collection through questionnaires distributed to 794 10th-grade students from all vocational programs at SMK Negeri 2 Kabupaten Tangerang, Banten, Indonesia. The results of the analysis indicate that students' initial understanding of waste management is still somewhat limited, although awareness of the importance of waste management has emerged. This understanding has implications for strengthening the character of Pancasila students, who need to be empowered to understand the environmental impacts of their actions. Factors such as more structured environmental education and active participation in waste management programs at school can enhance students' initial understanding and contribute to the strengthening of the Pancasila student profile.

**KEYWORDS:** Strengthening the Pancasila Student Profile, Initial Student Understanding, Waste Management, Character Education, Environment

### 1. INTRODUCTION

The importance of character education has become a primary focus in shaping the younger generation with moral integrity, ethics, and social awareness [1]. The transformation of the education curriculum in Indonesia from the 2013 curriculum to the Merdeka curriculum is an integral part of educational change efforts [2]. One of its goals is to redefine students' character so they become lifelong learners [3]. Within the context of this curriculum, the Pancasila Student Profile is emphasized as a significant component (Nurhayati et al., 2022). This Pancasila Student Profile outlines the criteria for character and competencies that learners are expected to acquire based on the pure values of Pancasila [4].

In the Merdeka Belajar curriculum, there are four main learning activities [5]. First, there are intracurricular activities that encompass learning content in the form of learning experiences [6]. Second, extracurricular activities aim to develop students' interests and talents [7]. Third, there is the Pancasila Student Profile Development Project, which involves interdisciplinary projects [8]. This project is conceptualized contextually and based on the needs of the community and the issues in the educational unit's environment [9]. The fourth aspect is the culture of the educational unit, which includes the educational unit's climate, policies, interaction patterns, communication, and norms [8]. One of the themes addressed in the Pancasila Student Profile Strengthening Project is sustainable lifestyle. In this context, SMK Negeri 2 Kabupaten Tangerang, the research location, chose to implement activities related to waste management.

In this context, waste management becomes an issue that cannot be ignored [10]. The increase in waste production and its negative impact on the environment require serious attention from all segments of society, including students [11]. As future leaders, students need to understand the importance of waste management and its environmental consequences [12]. However, this understanding might not be evenly distributed among students, especially in the context of the Pancasila Student Profile Strengthening Project.

The aim of this research is to analyze students' initial understanding of waste management within the context of the Pancasila Student Profile Strengthening Project. By examining students' initial understanding of waste management, this research aims to identify the extent to which students comprehend their responsibility toward the environment through waste management practices.

The relevance of this research lies in its contribution to character education development based on the Pancasila Student Profile Strengthening Project. By identifying students' understanding of waste management, this research can provide targeted insights for stakeholders. Furthermore, the findings of this research can serve as a foundation for the development of more effective programs to strengthen the Pancasila student profile, enabling a deeper understanding and awareness among students regarding the environment and Pancasila values. Thus, this research holds significant relevance in addressing environmental challenges and supporting the formation of high-quality student character.

## **2. RESEARCH METHOD**

### **2.1. Research Design:**

This research adopts a qualitative approach with a case study design. This approach enables the researcher to deeply explore students' initial understanding of waste management in the context of strengthening the Pancasila student profile.

### **2.2. Research Participants:**

The research participants consist of tenth-grade students from SMK Negeri 2 Kabupaten Tangerang, Indonesia. The total number of participants is 794, who were selected based on inclusion criteria that include students actively involved in the Pancasila student profile strengthening project at the school.

### **2.3. Research Instruments:**

The instrument employed in this study is a questionnaire. The questionnaire is used to acquire students' initial understanding of waste and its processing methods. It is designed to collect data regarding students' comprehension of the researched topic.

### **2.4. Data Collection Process:**

Data collection is carried out by distributing the questionnaire to respondents through the Google Form platform. This method allows participants to fill out the questionnaire online, facilitating data collection from a large number of students involved in the research.

### **2.5. Data Analysis:**

The collected data is analyzed using a descriptive approach. This analysis involves describing the percentage of students who chose each statement in the questionnaire items. The purpose of this approach is to provide a clear depiction of students' understanding concerning waste management.

## **3. FINDINGS AND DISCUSSION**

The initial understanding of students regarding waste management is the primary focus of this research. Using a qualitative approach in the form of a case study design, this study aims to deeply explore students' comprehension of waste management aspects within the context of strengthening the Pancasila student profile. The research participants consist of 794 tenth-grade students from SMK Negeri 2 Kabupaten Tangerang, Indonesia, selected based on inclusion criteria as students actively engaged in the Pancasila student profile strengthening project at the school. Through the utilization of a questionnaire as the main instrument, this research gathers data concerning students' perspectives on waste and its processing methods. The collected data is analyzed using descriptive methods, with a focus on the percentage of students selecting each statement in the questionnaire. Thus, this research will provide a comprehensive overview of students' initial understanding related to waste management, which can contribute to efforts to strengthen the Pancasila student profile and environmental awareness among students.

**Table 1. Respondents' Feedback Results**

Number	Description	Students' Understanding			
		Very Understand	Understand	Slightly Understand	Do not understand
1	The students know the types of waste in the school environment.	86 (10,8%)	561 (70,7%)	140 (17,6%)	7 (0,9%)
2	Students are aware of organic waste.	79 (9,9%)	596 (75,1%)	113 (14,2%)	6 (0,8%)
3	Students are aware of inorganic waste.	72 (9,1%)	572 (72,0%)	141 (17,8%)	9 (1,1%)
4	Students are aware of the dangers posed by organic waste.	45 (5,7%)	465 (58,6%)	246 (31,0%)	38 (4,8%)
5	Students are aware of the dangers posed by inorganic waste.	59 (7,4%)	480 (60,5%)	223 (28,1%)	32 (4,0%)
6	Students know the difference between organic and inorganic waste.	110 (13,9%)	557 (70,2%)	115 (14,5%)	12 (1,5%)
7	Students are aware of proper waste management in the school environment.	75 (9,4%)	491 (61,8%)	211 (26,6%)	17 (2,1%)
8	Students understand reuse.	33 (4,2%)	327 (41,2%)	321 (40,4%)	113 (14,2%)
9	Students understand reduction.	39 (4,9%)	359 (45,2%)	295 (37,2%)	101 (12,7%)
10	Students understand recycling.	33 (4,2%)	345 (43,5%)	322 (40,6%)	94 (11,8%)
11	Students understand the benefits of organic waste management.	47 (5,9%)	491 (61,8%)	236 (29,7%)	20 (2,5%)
12	Students understand the benefits of inorganic waste management.	46 (5,8)	468 (58,9%)	260 (32,7%)	20 (2,5%)
13	Students understand the Takakura composting method.	13 (1,6%)	128 (16,1%)	446 (56,2)	207 (26,1%)
14	Students understand the production of high-protein animal feed.	23 (2,9%)	187 (23,6%)	417 (52,5%)	167 (21,0%)
15	Students are aware of solutions to reduce the amount of waste in the school environment.	134 (16,9%)	536 (67,5%)	107 (13,5%)	17 (2,1%)
16	Students know the method of waste sorting in the school environment.	58 (7,3%)	474 (59,7%)	242 (30,5%)	20 (2,5%)
17	Students know the process of making ecobricks.	17 (21,1%)	143 (18,0%)	428 (53,9%)	206 (25,9%)
18	Students understand the benefits of ecobricks.	19 (2,4%)	166 (20,9%)	412 (51,9%)	197 (24,8%)
19	Students understand paper waste recycling.	39 (4,9)	454 (57,2%)	263 (33,1%)	38 (4,8%)
20	Students understand the waste management system at the school.	51 (6,4%)	408 (51,4%)	291 (36,6%)	44 (5,5%)

Based on the data results provided in Table 01, out of nine instruments, they can depict the condition of understanding waste management in the school environment as follows:

**3.1. Students are aware of the dangers posed by inorganic waste.**

The majority of students have demonstrated a good understanding of the types of waste present in the school environment. This data provides a fundamental overview of the extent to which students comprehend environmental issues and how waste management is conducted within the school

environment. The detailed data results indicate three different levels of understanding among the students.

A total of 86 students, or 10.8% of the surveyed student population, have shown a very strong understanding of the types of waste present in the school environment. This group likely possesses in-depth knowledge about various types of waste, including their environmental impacts, as well as effective methods to manage and recycle these wastes.

The majority of students, comprising 561 students, or 70.7% of the surveyed student population, have demonstrated a fairly good level of understanding of the types of waste. Students in this group probably have a general understanding of various types of waste commonly found in the school environment and are able to accurately identify these types of waste.

However, there are 140 students, or 17.6% of the total student population, who admit to having an inadequate understanding of the types of waste in the school environment. This group might require more information and education regarding types of waste, the introduction and identification of waste types, as well as the importance of proper waste management within the school environment.

Only a small number of students, specifically 7 students, or 0.9% of the surveyed student population, acknowledged their lack of understanding about the types of waste in the school environment. Although this is a very small group, it is still important to provide special attention to enhance their education and knowledge about environmental issues and the importance of participating in proper waste management efforts.

Overall, the obtained data results indicate that the majority of students have a good understanding of the types of waste in the school environment. Nonetheless, a small group of students still requires further attention to enhance their understanding of environmental issues and waste management.

### **3.2. Students are aware of organic waste.**

The majority of students have a solid understanding of the concept of organic waste. This data provides a deeper insight into students' knowledge regarding the type of organic waste as well as their ability to identify and comprehend the characteristics and appropriate treatment of this waste type in their surrounding environment. The detailed data results reveal variations in the level of understanding among students.

A total of 79 students, or 9.9% of the surveyed student population, demonstrate a very strong understanding of the concept of organic waste. This group likely possesses a deep understanding of what organic waste entails, examples of different types of organic waste, and effective methods for managing and recycling such organic waste.

The majority of students, specifically 596 students, or 75.1% of the surveyed student population, exhibit a good understanding of organic waste. This group likely holds a general understanding of the concept of organic waste, including its various types and the importance of composting or natural decomposition processes in organic waste management.

However, there are 113 students, or 14.2% of the total student population, who admit that their understanding of organic waste is still inadequate. This group may require further information and explanations about the concept of organic waste, including how to identify, separate, and efficiently manage organic waste.

On the other hand, only a small number of students, namely six students, or 0.8% of the surveyed student population, acknowledge that they completely lack an understanding of the concept of organic waste. This group needs a specific approach to providing explanations and education about organic waste, as well as the importance of proper treatment of this waste type.

Overall, the obtained data results indicate that the majority of students have a strong understanding of the concept of organic waste. However, there are still a number of students who require additional attention in their efforts to enhance their understanding of this waste type.

### **3.3. Students are aware of inorganic waste.**

The majority of students have successfully grasped the concept of inorganic waste with a good level of understanding. This data provides an in-depth overview of the extent to which students' knowledge spans various aspects of inorganic waste, as well as their comprehension of ways to identify and manage this waste type within their surrounding environment.

In the description of the provided data results, it is found that a total of 72 students, or approximately 9.1% of the overall student population surveyed, demonstrated a very strong understanding of inorganic waste. This group likely possesses deep knowledge about the definition and various variations of inorganic waste, including effective methods for managing and minimizing its environmental impact.

Meanwhile, the majority of students, specifically 572 students, or about 72.0% of the surveyed student population, exhibit a good level of understanding regarding the concept of inorganic waste. They probably have a general understanding of the characteristics of inorganic waste, including examples of waste types falling into this category. They also understand the importance of recycling practices and appropriate management methods within the context of inorganic waste.

However, it was also found that 141 students, or about 17.8% of the total surveyed student population, admitted that their understanding of inorganic waste is still somewhat inadequate. This group may require increased information and further explanations about the types of inorganic waste,



methods of identification and sorting, and the importance of proper management approaches for inorganic waste.

Notably, there is a minority group consisting of nine students, or about 1.1% of the overall student population, who responded that they lack an understanding of inorganic waste. It's important to provide extra attention to this group by offering explanations and further education about the concept of inorganic waste along with appropriate management practices.

Overall, the detailed analysis of the data results indicates that the majority of students have an adequate level of understanding regarding inorganic waste. However, there are some students who require improvement in their understanding of the concepts and practices related to the management of inorganic waste.

### **3.4. Students are aware of the dangers posed by organic waste.**

It is evident that the majority of students have a relatively good understanding of the hazards that can arise from organic waste in the environment. This data provides a comprehensive overview of students' awareness levels regarding the potential negative impacts that may result from organic waste and their understanding of the necessity for proper management approaches for this waste type.

In the detailed presentation of the data results, it is clear that 45 students, or approximately 5.7% of the total student population surveyed, demonstrate a very strong understanding of the potential hazards caused by organic waste. This group likely possesses an in-depth comprehension of the negative impacts that can arise from improper accumulation or disposal of organic waste, such as environmental pollution and threats to human health.

Meanwhile, the majority of students, specifically 465 students, or about 58.6% of the surveyed student population, exhibit a good understanding of the dangers posed by organic waste. They likely have a general understanding of the potential negative effects that might occur if organic waste is not managed properly.

However, there is also a group of students, totaling 246 individuals, or about 31.0% of the total surveyed student population, who admit that their understanding of the hazards posed by organic waste is somewhat inadequate. This group may require more information and education about the potential negative consequences that may arise from inadequate management of organic waste.

Furthermore, there is a minority group consisting of 38 students, or about 4.8% of the total surveyed student population, who acknowledge that they lack an understanding of the dangers posed by organic waste. This group needs further attention through the delivery of more intensive explanations and education about the potential negative impacts that may occur due to improper treatment of organic waste.

Overall, the detailed analysis of the data results indicates that the majority of students have a sufficient level of understanding regarding the potential dangers posed by organic waste. However, there are still some students who require improvement in their understanding of the potential negative impacts that may arise and the importance of appropriate management approaches for organic waste.

### **3.5. Students are aware of the dangers posed by inorganic waste.**

It is evident that the majority of students have a good understanding of the potential hazards that inorganic waste can pose to the environment. This data provides an overview of the extent to which students are aware of the negative impacts that can result from inorganic waste and how they recognize the importance of proper management for this waste type.

Detailed data results show various levels of students' understanding regarding the dangers of inorganic waste. First, there is a group of students who are very understanding (59 students or 7.4%). This group seems to possess deep knowledge about the potential negative impacts that can arise from the improper accumulation or disposal of inorganic waste. These impacts include environmental pollution, habitat destruction, and health issues. Their ability to identify and understand these consequences reflects a high level of awareness.

The majority of students fall into the category of understanding (480 students, or 60.5%). They have a good understanding of the potential negative effects that might occur due to improper treatment of inorganic waste. While they might not be as thorough as the first group, this group has a general understanding sufficient to recognize the importance of proper management of inorganic waste.

However, there is also a group of students who are less understanding (223 students or 28.1%). This group admits to having an inadequate understanding of the hazards posed by inorganic waste. They may require more information and education about the potential negative impacts that can arise from improper management of inorganic waste. Their limited understanding indicates the potential for increased awareness through more intensive educational efforts.

Additionally, there is a minority group that does not understand (32 students, or 4.0%). This group acknowledges their lack of understanding about the dangers posed by inorganic waste. They need further attention in the form of explanations and deeper education about the potential negative impacts that can arise from mishandling inorganic waste. Special efforts should be made to assist this group in enhancing their awareness of this environmental issue.

Overall, the data results indicate that the majority of students are aware of the potential dangers posed by inorganic waste. However, there are still some students who require improvement in their



understanding of the potential negative impacts that may occur and the importance of proper management of inorganic waste.

### **3.6. Students are aware of the difference between organic and inorganic waste.**

The majority of students have a good understanding of the distinction between organic and inorganic waste. This data provides an overview of students' knowledge regarding the characteristics and properties of each waste type, as well as their ability to recognize and differentiate between them.

Detailed data results indicate students' understanding levels of the differences between organic and inorganic waste. First, there is a group of students who are very understanding (110 students, or 13.9%). This group possesses deep knowledge about the specific attributes that set these waste types apart and the importance of separating and managing them appropriately. Their ability to recognize these differences in a more comprehensive context indicates a high level of awareness.

The majority of students fall into the category of understanding (557 students, or 70.2%). They have a good understanding of the differences between organic and inorganic waste. Their understanding encompasses the characteristics and properties of each waste type as well as the ability to differentiate them in everyday practice. While they might not be as thorough as the first group, this group is still capable of recognizing these differences quite well.

However, there is also a group of students who are less understanding (115 students, or 14.5%). This group admits to having an inadequate understanding of the differences between organic and inorganic waste. They require further explanations about the characteristics and examples of both organic and inorganic waste types to enhance their ability to differentiate them. Additional efforts in terms of education and clarification are needed to assist this group in improving their understanding.

Additionally, there is a minority group that does not understand (12 students, or 1.5%). This group acknowledges their lack of understanding about the differences between organic and inorganic waste. This group needs extra attention in the form of explanations and education about the unique characteristics of both waste types. Special efforts should be made to help this group enhance their understanding of these differences.

Overall, the data results indicate that the majority of students have a good understanding of the differences between organic and inorganic waste. While there are some students who require further understanding, most students have been able to recognize the characteristics and the importance of distinguishing between these waste types.

### **3.7. Students are aware of proper waste management in the school environment.**

The majority of students have a good understanding of proper waste management in the school environment. This data provides an overview of students' knowledge about effective ways to manage waste correctly, especially within their school surroundings.

Detailed data results indicate students' understanding levels of appropriate waste management in the school environment. First, there is a group of students who are very understanding (75 students, or 9.4%). This group possesses deep knowledge about the steps to take for sorting, collecting, and recycling waste correctly within the school environment. They can identify practices necessary to maintain cleanliness and sustainability in the school environment.

The majority of students fall into the category of understanding (491 students, or 61.8%). They have a good understanding of proper waste management in the school environment. Their understanding includes general knowledge about the importance of managing waste properly, separating waste types, and supporting recycling efforts. Although they might not be as thorough as the first group, this group can still recognize essential practices in waste management within the school environment.

However, there is also a group of students who are less understanding (211 students, or 26.6%). This group admits to having an inadequate understanding of proper waste management in the school environment. They require further information about the steps that can be taken to manage waste correctly and how they can contribute to maintaining cleanliness in the school environment. Additional efforts are needed to help this group improve their understanding.

Additionally, there is a minority group that does not understand (17 students, or 2.1%). This group acknowledges their lack of understanding about proper waste management in the school environment. This group needs extra attention in the form of explanations and education about the importance of managing waste correctly and their role in maintaining cleanliness in the school environment. Special efforts should be made to help this group understand relevant practices.

Overall, the data results indicate that the majority of students have a good understanding of proper waste management in the school environment. However, further education and socialization efforts are still needed to ensure that all students have sufficient knowledge about effective waste management practices in the school environment and the importance of contributing to the cleanliness and sustainability of the school environment.

### **3.8. Students understand the concept of reuse.**

It is evident that the majority of students have a good understanding of the concept of "reuse," or using items again to reduce waste. This data provides an overview of students' knowledge about the importance of this principle in waste reduction and environmental conservation efforts.

Detailed data results indicate students' understanding levels of the "reuse" concept. Firstly, there is a group of students who have a very strong understanding (33 students, or 4.2%). This group possesses a deep understanding of how to take previously unused items and give them new purposes, thereby reducing the amount of waste generated. Their ability to redesign the use of items reflects a high level of awareness of the "reuse" concept.

The majority of students fall into the category of understanding (327 students, or 41.2%). They have a good understanding of the "reuse" concept. Their understanding includes general knowledge about the importance of reusing items to reduce waste as well as potential ways to implement this principle in daily life. Although they might not be as thorough as the first group, this group still recognizes the importance of contributing to waste reduction through "reuse" practices.

However, there is also a group of students who are less understanding (321 students, or 40.4%). This group admits to having an inadequate understanding of the "reuse" concept. They require further information about the "reuse" principle and real-life examples of how to reduce waste through reusing items. Additional efforts in the form of in-depth education are needed to help this group improve their understanding.

Furthermore, there is a minority group that does not understand (113 students, or 14.2%). This group acknowledges their lack of understanding about the "reuse" concept. This group needs extra attention in the form of explanations and education about the importance of reusing items to reduce the environmental impact of producing new goods. Special efforts should be made to help this group understand the significance of the "reuse" principle in environmental preservation efforts.

Overall, the data results indicate that the majority of students have a good understanding of the "reuse" concept. Although some students require further understanding, most students have been able to recognize the importance of this principle in waste reduction and contributing to environmental conservation efforts. Nevertheless, further educational efforts are still necessary to ensure that all students understand practical ways to implement the "reuse" principle in their daily lives.

### **3.9. Students understand the concept of recycling.**

It appears that the majority of students have a good understanding of the concept of recycling. This data provides an overview of students' knowledge about the importance of recycling materials to reduce environmental impact and conserve natural resources.

Detailed data results indicate students' understanding levels of the "recycle" concept. Firstly, there is a group of students who have a very strong understanding (39 students, or 4.9%). This group possesses a deep knowledge of how to recycle various types of materials to reduce the use of new resources and minimize waste. Their ability to identify and comprehend the recycling process reflects a high level of awareness of sustainable practices.

The majority of students fall into the category of understanding (359 students, or 45.2%). They have a good understanding of the "recycle" concept. Their understanding includes general knowledge about the importance of recycling as well as potential types of materials that can be recycled and their benefits for the environment. Although they might not be as thorough as the first group, this group still recognizes the significance of contributing to waste reduction through recycling practices.

However, there is also a group of students who are less understanding (295 students, or 37.2%). This group admits to having an inadequate understanding of the "recycle" concept. They require further information about practical ways to recycle materials, their benefits, and their positive environmental impacts. A more in-depth educational approach is needed to help this group improve their understanding.

Furthermore, there is a minority group that does not understand (101 students, or 12.7%). This group acknowledges their lack of understanding about the "recycle" concept. This group needs extra attention in the form of explanations and education about the importance of recycling, as well as practical ways to implement it in daily life. Special efforts should be made to help this group understand the principle of recycling.

Overall, the data results indicate that the majority of students have a good understanding of the "recycle" concept. Although some students require further understanding, most students have been able to recognize the importance of recycling materials to conserve the environment and natural resources. However, further educational and promotional efforts are still needed to ensure that all students have sufficient knowledge about the recycling principle and how to implement it in their daily lives.

### **3.10. Students understand the concept of reduction.**

It is evident that the majority of students have a good understanding of the concept of reducing, or reducing the use of goods to minimize waste. This data provides an overview of students' knowledge about the importance of cutting down on consumption of goods and materials to preserve the environment and mitigate the negative impacts of production.

Detailed data results indicate students' understanding levels of the "reduce" concept. Firstly, there is a group of students who have a very strong understanding (33 students, or 4.2%). This group possesses a deep knowledge of how to reduce the use of unnecessary items and adopt a simpler lifestyle to minimize their ecological footprint. Their ability to design a more controlled consumption pattern reflects a high awareness of the importance of sustainable practices.

The majority of students fall into the category of understanding (345 students, or 43.5%). They have a good understanding of the "reduce" concept. Their understanding includes general knowledge about the importance of decreasing consumption of goods and materials as well as the potential

positive impacts on the environment. Although they might not be as thorough as the first group, this group still recognizes the significance of contributing to waste reduction through "reduce" practices.

However, there is also a group of students who are less understanding (322 students, or 40.6%). This group admits to having an inadequate understanding of the "reduce" concept. They require further information about the principles of "reduce" and practices that can be adopted to decrease the use of items and the environmental impact of excessive consumption patterns. In-depth efforts are needed to help this group improve their understanding.

Furthermore, there is a minority group that does not understand (94 students, or 11.8%). This group acknowledges their lack of understanding about the "reduce" concept. This group needs extra attention in the form of explanations and education about the importance of reducing consumption and its positive environmental impact. Special efforts should be made to help this group understand the "reduce" principle in the context of environmental preservation.

Overall, the data results indicate that the majority of students have a good understanding of the "reduce" concept. Although some students require further understanding, most students have been able to recognize the importance of reducing the consumption of goods and materials to minimize environmental impact and promote a more sustainable lifestyle. However, further educational efforts are still needed to ensure that all students understand practical ways to implement the "reduce" principle in their daily lives.

### **3.11. Students understand the benefits of organic waste management.**

It appears that the majority of students have a good understanding of the benefits of organic waste management. This data provides an overview of students' knowledge about the importance of comprehending and properly managing organic waste to preserve the environment and contribute to sustainability.

Detailed data results describe students' understanding of the benefits of organic waste management. Firstly, there is a group of students who have a very strong understanding (47 students, or 5.9%). This group possesses a deep knowledge of how properly decomposing organic waste can result in useful compost for soil and plant growth. Their ability to connect organic waste management with sustainable agriculture reflects a high awareness of the significance of the ecological cycle.

The majority of students fall into the category of understanding (491 students, or 61.8%). They have a good understanding of the benefits of organic waste management. Their understanding includes general knowledge about the positive impacts of proper organic waste management, such as waste reduction, compost production, and improved soil quality. Although they might not be as thorough as the first group, this group still recognizes and appreciates the importance of their contribution to environmental preservation.

However, there is also a group of students who are less understanding (236 students, or 29.7%). This group admits to having an inadequate understanding of the benefits of organic waste management. They require further information about the advantages of appropriate organic waste management and how to contribute to it in their daily practices. A deeper educational approach is necessary to help this group improve their understanding.

Furthermore, there is a minority group that does not understand (20 students, or 2.5%). This group acknowledges their lack of understanding about the benefits of organic waste management. This group needs extra attention in the form of explanations and education about the importance of organic waste management for environmental preservation and sustainable agriculture. Special efforts should be made to help this group thoroughly comprehend the concept of organic waste management.

Overall, the data results indicate that the majority of students have a good understanding of the benefits of organic waste management. However, further educational efforts are still needed to ensure that all students have a thorough understanding of how proper organic waste management can contribute to environmental sustainability and overall societal benefits.

### **3.12. Students understand the benefits of inorganic waste management.**

It appears that the majority of students have a good understanding of the benefits of inorganic waste management. This data provides an overview of the students' level of knowledge regarding the importance of correctly managing inorganic waste to reduce environmental impacts and maintain sustainability. The detailed data results depict students' understanding of the benefits of inorganic waste management. Firstly, there is a group of students who have a very clear understanding (46 students, or 5.8%). They possess in-depth knowledge about how proper inorganic waste management can reduce environmental pollution and minimize the negative effects of improper disposal. Their ability to connect inorganic waste management with environmental sustainability reflects a high awareness of the importance of preserving the ecosystem. The majority of students fall into the category of understanding (468 students, or 58.9%). They have a good understanding of the benefits of inorganic waste management. Their understanding encompasses general knowledge about the significance of appropriately managing inorganic waste, including recycling practices that can reduce the use of new resources. Although they might not be as thorough as the first group, this group is still able to recognize and appreciate the importance of their contribution to environmental sustainability efforts. However, there is also a group of students who have a limited understanding (260 students, or 32.7%). This group admits to having inadequate comprehension of the benefits of inorganic waste management. They require further information about the positive impacts of proper management of inorganic waste as well as how these practices can be applied in daily life. A more in-depth educational approach is needed to assist this group in improving their understanding. Furthermore, there is a minority group that does not understand (20 students, or 2.5%). This group acknowledges



their lack of understanding about the benefits of inorganic waste management. This group needs more attention in the form of explanations and education regarding the importance of managing inorganic waste to preserve the environment and support sustainability. Special efforts must be made to help this group understand the benefits of inorganic waste management comprehensively. Overall, the data results indicate that the majority of students have a good understanding of the benefits of inorganic waste management. While some students require further comprehension, additional educational efforts are still necessary to ensure that all students fully grasp how proper inorganic waste management can contribute to a cleaner and more sustainable environment.

### **3.13. Students understand the process of making Takakura compost.**

It is evident that the majority of students have varying degrees of understanding about the process of making Takakura compost. Takakura composting is a method originating in Japan and used for sustainably recycling organic materials. This data provides an overview of the extent to which students comprehend the process and practices of making Takakura compost. Data analysis reveals variations in the level of students' understanding of the process of making Takakura compost. Some students have a very clear understanding (13 students, or 1.6%). This group demonstrates a strong comprehension of the process of making Takakura compost. They likely possess in-depth knowledge of the necessary steps to correctly create Takakura compost, including the materials used and appropriate techniques. Their abilities reflect their dedication to understanding the concept and practices of sustainable composting. Meanwhile, a number of students fall into the category of understanding (128 students, or 16.1%). They possess a good understanding of the process of making Takakura compost. While they might not be as thorough as the previous group, they have a general knowledge of the process, although it might lack detailed specifics. This group could serve as a source of knowledge for others who require assistance in comprehending this composting method. However, the majority of students fall into the category of limited understanding (446 students, or 56.2%). This group acknowledges having inadequate comprehension of the process of making Takakura compost. Further information about the process and techniques of making Takakura compost, as well as its environmental benefits, is needed to help this group enhance their understanding. An educational approach focused on providing clear and relevant information can assist in improving the comprehension level of this group. Additionally, there is a minority group that does not understand (207 students, or 26.1%). This group admits their lack of understanding about the process of making Takakura compost. They need more attention in the form of explanations and education about this composting method, including its objectives and the practical steps involved. Intensive education and an inclusive approach will help this group achieve a better understanding. Overall, the data results show significant variation in students' knowledge of the process of making Takakura compost. While some students have a good understanding, a substantial number of students still require further information and education about this composting method. An appropriate and effective educational approach needs to be implemented to enhance students' understanding of the process of making Takakura compost as well as its benefits for the environment and sustainability.

### **3.14. Students understand the process of producing high-protein animal feed.**

It is apparent that the majority of students have varying degrees of understanding about the process of producing high-protein animal feed. This data provides an overview of the extent to which students comprehend the process and practices of making animal feed rich in protein. Data analysis indicates significant variation in students' levels of understanding about the process of producing high-protein animal feed. Some students fall into the category of having very clear understanding (23 students, or 2.9%). This group exhibits a strong understanding of the process of making high-protein animal feed. They likely possess in-depth knowledge about the nutritional composition required to create animal feed with a high protein content. Their abilities might be supported by a keen interest in and further research in the field of animal husbandry. Meanwhile, a number of students fall into the category of understanding (187 students, or 23.6%). They possess a good understanding of the process of producing high-protein animal feed. While they might not be as thorough as the previous group, they have a general knowledge of the essential nutritional components in animal feed and how to combine them to produce feed with abundant protein. This group might have taken relevant courses or have relevant experience. However, the majority of students fall into the category of limited understanding (417 students, or 52.5%). This group acknowledges having inadequate comprehension of the process of producing high-protein animal feed. Further information about the nutritional composition required in high-protein animal feed and the techniques involved in its production might be necessary to help this group enhance their understanding. An adequate educational approach needs to be implemented to provide clear and detailed explanations. Additionally, there is a minority group that does not understand (167 students, or 21.0%). This group admits their lack of understanding about the process of producing high-protein animal feed. This group needs more attention in the form of explanations and education about the importance of high-protein animal feed as well as the necessary steps in its production. These efforts will help them understand the nutritional needs of animals and the significance of protein-rich feed in the livestock industry. Overall, the data results demonstrate significant variation in students' knowledge of the process of producing high-protein animal feed. While some students have a good understanding, a substantial number of students still require further information and education about the nutritional composition of animal feed and the process of producing protein-rich feed. An appropriate educational approach needs to be implemented to enhance students' understanding of the production of high-protein animal feed and its benefits in the livestock industry.

### **3.15. Students are aware of solutions to reduce waste in the school environment.**

It is evident that the majority of students have a good understanding of solutions to reduce waste in the school environment. This data provides an overview of the students' level of knowledge regarding the actions that can be taken to address the waste issue in their surroundings. Data analysis indicates that most students have gained adequate understanding regarding solutions to reduce waste in the school environment. The group categorized as having a very clear understanding (134 students or 16.9%) exhibits a high level of comprehension. They might have creative ideas and a deep

understanding of ways to tackle waste issues, including practical steps that can be taken. The abilities of this group to identify and design solutions demonstrate collaborative potential in maintaining the cleanliness of the school environment. Meanwhile, the majority of students fall into the category of understanding (536students, s or 67.5%). They possess a good understanding of solutions to reduce waste in the school environment. This group likely has general knowledge about some effective ways to reduce waste, such as recycling, reducing plastic usage, and other environmentally friendly practices. This understanding, although at a broader level, still holds potential for making a significant contribution to waste reduction. However, a number of students fall into the category of limited understanding (107students, s or 13.5%). They admit to having inadequate comprehension of solutions to reduce waste in the school environment. Further information about various options that can be taken to reduce waste, as well as how to implement these solutions, might be necessary to help this group enhance their understanding. Additionally, there is a minority group that does not understand (17students, s or 2.1%). This group acknowledges their lack of understanding about solutions to reduce waste in the school environment. This group needs more attention in the form of explanations and education about the importance of contributing to waste reduction and providing ideas for potential solutions. These efforts will help them understand the active role they can play in maintaining the cleanliness of the school environment. Overall, the data results demonstrate that the majority of students have a good understanding of solutions to reduce waste in the school environment. However, further educational efforts and collaboration in implementing these solutions are still necessary to ensure that students actively engage in maintaining the cleanliness of the school environment and reducing the negative impacts of waste.

### **3.16. Students are aware of waste separation methods in the school environment.**

It is evident that the majority of students have a good understanding of waste separation methods in the school environment. This data provides an overview of the students' level of knowledge regarding the importance of properly sorting waste to reduce negative environmental impacts and promote recycling practices. Data analysis indicates that most students have gained adequate understanding regarding waste separation methods in the school environment. The group categorized as having a very clear understanding (58students, s or 7.3%) exhibits a high level of comprehension. They likely possess in-depth knowledge about classifying various types of waste, proper separation practices, and the positive impacts of these practices. The abilities of this group to comprehend and implement correct separation steps have the potential to serve as an example for other students in their efforts to maintain the cleanliness of the school environment. The majority of students fall into the category of understanding (474students, s or 59.7%). They possess a good understanding of waste separation methods in the school environment. This group likely has general knowledge about the importance of waste separation to support recycling and waste reduction efforts. Although at a broader level, this understanding still holds this potential to support broader recycling and waste reduction practices in the school environment. However, there is a group of students who fall into the category of having limited understanding (242students, s or 30.5%). They admit to having inadequate comprehension of waste separation methods in the school environment. This group needs

further information about proper separation practices, the types of waste that should be separated, and the environmental benefits. Specialized educational efforts can assist this group in developing a better understanding. Additionally, there is a minority group that does not understand (20 students, or 2.5%). This group acknowledges their lack of understanding about waste separation methods in the school environment. This group needs more attention in the form of explanations and education about the importance of waste separation practices and the necessary steps to be taken. This approach will help them understand the active role they can play in maintaining the cleanliness of the school environment and reducing the negative impacts of waste. Overall, the data results demonstrate that the majority of students have a good understanding of waste separation methods in the school environment. However, a sustained educational approach and consistent practices need to be adopted to ensure that all students have a deep understanding of the importance of waste separation and how to implement it in their daily lives.

3.17. Students are aware of the process of making ecobricks.

It is evident that the majority of students have varying degrees of understanding about the process of making ecobricks. Ecobricks are a creative method to transform plastic waste into building materials that can be used for various purposes. This data provides an overview of the extent to which students comprehend the process and practices of making ecobricks. Survey analysis indicates a significant variation in students' understanding of the process of making ecobricks. In the very clear understanding category, there are 17 students, or 21.1% of the total student population, who demonstrate strong comprehension. This group likely possesses in-depth knowledge about the required materials, the steps involved, and the benefits of creating ecobricks as a form of plastic waste reduction. The expertise of this group can inspire other students to adopt this practice. The majority of students fall into the category of understanding (143 students, or 18.0%). They possess a good understanding of the process of making ecobricks. Although at a broader level, this understanding can help students grasp the initial steps in making ecobricks and the benefits of this practice. However, there is a group of students who fall into the category of limited understanding (428 students, or 53.9%). They admit to having inadequate comprehension of the process of making ecobricks. This group requires further information about the required materials, the involved process, as well as the benefits and usage of ecobricks. Specific educational efforts and hands-on practice can help this group enhance their understanding. Additionally, there is a minority group that does not understand (206 students, or 25.9%). This group acknowledges their lack of understanding about the process of making ecobricks. This group needs more attention in the form of explanations and education about this creative method and how students can contribute to making ecobricks. Improving the understanding of this group will play a role in shaping a sustainable attitude and responsibility towards the environment. Overall, the data results demonstrate significant variation in students' knowledge of the process of making ecobricks. While some students have a good understanding, a substantial number of students still require further information and education about the process and benefits of making ecobricks. An appropriate educational approach needs to be implemented to enhance students' understanding of ecobricks and their potential positive impact on

reducing plastic waste. By strengthening students' understanding, the practice of making ecobricks can become a crucial tool in efforts to reduce the impact of plastic waste and promote active participation in maintaining environmental cleanliness.

### **3.18. Students understand the benefits of ecobricks.**

It is evident that the majority of students have varying degrees of understanding about the benefits of ecobricks. Ecobricks are a creative solution to address the issue of plastic waste by transforming it into reusable building materials. This data provides an overview of the extent to which students comprehend the benefits of using ecobricks. Survey analysis indicates a significant variation in students' understanding of the benefits of ecobricks. In the very clear understanding category, there are 19 students, or 2.4% of the total student population, who demonstrate strong comprehension. This group likely possesses in-depth knowledge about the ecological and social benefits of using ecobricks, including plastic waste reduction and the potential use of ecobricks in construction. The positive contribution of this group to understanding these benefits can motivate other students to engage more deeply in this practice. The majority of students fall into the category of understanding (166 students, or 20.9%). They possess a good understanding of the benefits of ecobricks. Although at a broader level, this understanding can help students comprehend the benefits of using ecobricks to reduce negative environmental impacts and promote recycling practices. This group has the potential to become pioneers in advocating for the benefits of using ecobricks in environmental conservation efforts. However, there is a group of students who fall into the category of limited understanding (412 students, or 51.9%). They admit to having inadequate comprehension of the benefits of ecobricks. This group requires further information about the ecological and social benefits of using ecobricks, as well as the positive impacts that can result from this practice. More specific educational efforts and guidance can help this group understand these crucial benefits. Additionally, there is a minority group that does not understand (197 students, or 24.8%). This group acknowledges their lack of understanding about the benefits of ecobricks. This group needs more attention in the form of explanations and education about the significant benefits of using ecobricks to reduce plastic waste and support environmental conservation efforts. Improving the understanding of this group will assist in shaping their awareness and responsibility for environmental preservation. Overall, the data results demonstrate significant variation in students' understanding of the benefits of ecobricks. While some students have a good understanding, a substantial number of students still require further information and education about the ecological and social benefits of using ecobricks and the importance of contributing to plastic waste reduction efforts. By strengthening students' understanding, the positive benefits of using ecobricks can be effectively integrated into their awareness regarding environmental protection and sustainability.

### **3.19. Students understand paper waste recycling.**

The majority of students have a good understanding of paper waste recycling. Recycling paper waste is an important practice in waste reduction efforts and the preservation of natural resources. This data provides an overview of the level of students' knowledge regarding the importance and methods of



paper waste recycling. Data analysis shows that the majority of students have a good understanding of paper waste recycling. A total of 39 students, or 4.9% of the surveyed student population, fall into the category of very clear understanding. This group likely possesses in-depth knowledge about the process of paper waste recycling, its environmental benefits, and the necessary steps involved. The positive contribution of this group can help educate other students about the importance of this practice in waste reduction and resource conservation. The majority of students, 454 students, or 57.2%, fall into the category of understanding. They have a good understanding of paper waste recycling. Although at a broader level, this understanding can help students comprehend the importance of paper recycling and the basic steps required in the recycling process. This group has the potential to become agents of change by spreading awareness about the importance of recycling practices. However, there is a group of students who fall into the category of having limited understanding. A total of 263 students, or 33.1% of the surveyed student population, admitted to having an inadequate understanding of paper waste recycling. This group requires further information about the specific steps involved in paper waste recycling and its positive environmental impact. More specific educational efforts can help this group understand the significant benefits of this practice. The minority group that does not understand (38 students, or 4.8%) acknowledges their lack of understanding about paper waste recycling. This group needs more attention in the form of explanations and education about the importance of paper waste recycling practices and how students can contribute to reducing paper waste. Improving the understanding of this group will assist in shaping their awareness and responsibility for environmental preservation. Overall, the data results show that the majority of students have a good understanding of paper waste recycling. While some students still require more information, appropriate educational measures and consistent practices can help enhance students' understanding of the importance of paper waste recycling and practical ways to implement it in daily life. By strengthening students' understanding, paper waste recycling practices can be well integrated into students' mindsets and sustainable actions related to environmental protection.

### **3.20. Students understand the waste management system at school.**

The majority of students have a good understanding of the waste management system at school. The waste management system in school is crucial for maintaining cleanliness and environmental health, as well as teaching students responsible waste management practices. This data provides an overview of the extent to which students understand the waste management system at school. Data analysis results indicate that the majority of students have a good understanding of the waste management system at school. A total of 51 students, or 6.4% of the surveyed student population, fall into the category of very clear understanding. This group likely possesses in-depth knowledge about various aspects of waste management, including responsible practices of collection, sorting, recycling, and disposal. The positive contribution of this group can help maintain the effectiveness of the waste management system at school. The majority of students, 408 students, or 51.4%, fall into the category of understanding. They have a good understanding of the waste management system at school. Although at a broader level, this understanding can help students comprehend the waste



management practices carried out at school and understand the importance of their role in maintaining the cleanliness of the school environment. This group has the potential to support and integrate waste management practices more effectively into the daily routines at school. However, there is a group of students who fall into the category of having limited understanding. A total of 291 students, or 36.6% of the surveyed student population, admitted to having an inadequate understanding of the waste management system at school. This group requires further information about the components of the waste management system, its benefits, and the necessary practices to maintain system efficiency. More specific and clear educational efforts can help this group understand the importance of the waste management system at school. The minority group that does not understand (44 students, or 5.5%) acknowledges their lack of understanding about the waste management system at school. This group needs more attention in the form of explanations and education about the importance of the waste management system at school and how they can contribute to maintaining the cleanliness and sustainability of the system. Improving the understanding of this group will assist in shaping their awareness and responsibility for maintaining the cleanliness of the school environment. Overall, the data results show that the majority of students have a good understanding of the waste management system at school. However, a sustainable educational approach and active student participation in waste management practices at school remain important to ensure the proper functioning of the system and provide positive benefits to the school environment. By strengthening student understanding and involving them in waste management practices, the system can continue to evolve towards better efficiency and sustainability.

### 3.21. Analysis of Students' Initial Knowledge about Waste Management

Furthermore, to gain an understanding of the tendencies of each variable in this study, the steps taken involved categorizing the mean observation values of each variable based on a five-point scale guideline. The process of constructing the five-point scale guideline was carried out systematically and structurally, following the established procedures.

$\bar{x} > (Mi + 1.5SDi) = \text{very high}$

$(Mi + 0.5SDi) < \bar{x} \leq (Mi + 1.5SDi) = \text{high}$

$(Mi - 0.5SDi) < \bar{x} \leq (Mi + 0.5SDi) = \text{moderate}$

$(Mi - 1.5SDi) < \bar{x} \leq (Mi - 0.5SDi) = \text{low}$

$\bar{x} \leq (Mi + 1.5 SDi) = \text{very low}$

Explanation:

$\bar{x}$  = mean observation

$M_i$  (ideal mean) =  $1/2$  (maximum score + minimum score)

$SD_i$  (ideal standard deviation) =  $1/6$  (maximum score - minimum score)

Subsequently, the results of the mean observation were compared with these norms.

$\bar{x} > 65.25$  = very high

$55.42 < \bar{x} \leq 65.25$  = high

$45.58 < \bar{x} \leq 55.42$  = moderate

$35.75 < \bar{x} \leq 45.58$  = low

$\bar{x} \leq 35.75$  = very low

The overall observation results indicate an average of 51.33. This suggests that students' understanding of waste management falls into the moderate category. This average score reflects a level of understanding that can be considered adequate, but there is room for further improvement in enhancing students' understanding of waste management.

#### 4. RECOMMENDATIONS

Based on the data results indicating that the average observation score of students' understanding of waste management falls under the moderate category (score 51.33), the following are some recommendations that can be proposed to stakeholders in the curriculum in Indonesia:

**Enhanced Focus on Sustainable Lifestyle and Environmental Education:** The importance of education on sustainable lifestyles and a healthy environment is increasing. Therefore, curriculum stakeholders should consider enhancing the focus on environmental education, including waste management, as an integral part of the curriculum at all education levels. This can be achieved through the development of deeper and more relevant teaching materials.

**Integration of Concepts across Various Subjects:** Besides dedicated environmental education, students' understanding of waste management can also be enhanced by integrating related concepts across various subjects. For instance, in subjects like natural sciences, Indonesian language, or the arts, waste management concepts can be applied to enrich students' understanding.

**Interactive and Practical Approaches:** The curriculum should design interactive and practical teaching methods that directly involve students in waste management. Real practices, such as waste management within the school environment, recycling projects, or visits to waste management facilities, can help students experience the actual processes and deepen their understanding.

**Utilization of Technology and Modern Media:** Curriculum stakeholders can leverage technology and modern media, such as educational videos, e-learning platforms, or interactive simulations, to present waste management concepts in an engaging and more comprehensible manner for students.

**Collaboration with External Entities:** Curriculum stakeholders can collaborate with environmental institutions, local governments, and non-governmental organizations related to the environment. Such collaborations can bring broader knowledge and real-world experiences to student learning.

**Continuous Monitoring and Evaluation:** It is essential to continually monitor and evaluate the effectiveness of curriculum changes related to students' understanding of waste management. This way, stakeholders can identify successes and areas in need of improvement.

**In-depth Teacher Education:** Apart from reinforcing what is taught to students, curriculum stakeholders must also ensure that teachers have a strong understanding of waste management. Training and professional development for teachers in this regard are crucial.

By implementing these recommendations, curriculum stakeholders in Indonesia can contribute to enhancing students' understanding of waste management, which, in turn, will contribute to broader efforts in maintaining environmental cleanliness and promoting sustainable behavior within society.

## 5. CONCLUSION

The observation results from the questionnaire responses to the 20 items in the questionnaire instrument reveal a pattern of students' understanding of various aspects of waste management within the school environment. Specifically, students can be categorized as having a good understanding of items such as identifying the types of waste present in the school environment, understanding organic and inorganic waste, and comprehending the dangers posed by organic waste. Furthermore, students also demonstrate an understanding of the importance of proper waste management within the school environment, including concepts like reuse, recycle, and reduce. However, it is important to note that in some questionnaire items, there are categories of students with less understanding. For instance, in items like the method of making takakura compost, creating high-protein animal feed, and making ecobricks, students exhibit inadequate levels of understanding. Similarly, the understanding of the benefits of ecobricks also tends to be less clear. In this context, further attention is needed to enhance students' understanding of specific aspects that still show low levels of comprehension. Overall, the questionnaire observation results provide an overview of students' understanding of waste management within the school environment. These findings can serve as a basis for designing more focused and effective educational programs aimed at enhancing students' understanding of waste management aspects that still need improvement. In total, the overall average score of students' understanding of waste management is 51.33. Consequently, it can be concluded that students' understanding of waste management falls into the moderate category. Although this

score reflects a level of understanding that is not low, there is room for further improvement to enhance students' comprehension.

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