

Cognizance and Practices of Junior High School Students at Zamboanga National High School West on Solid Waste Management

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ABSTRACT: This study aimed to evaluate the awareness and practices of Junior High School students at Zamboanga National High School West concerning Solid Waste Management (SWM). It employed a cross-sectional approach using descriptive and correlational analysis. A total of 364 respondents were selected from a population of 5,943 using a G-power sample size calculator. A stratified sampling technique was applied to choose 91 students across four curriculum levels. A questionnaire checklist was developed, incorporating demographic details, an Awareness of Solid Waste Management (ASWM) tool, and a Practices on Solid Waste Management (PSWM) tool, adapted from the study "Solid Waste Management Awareness and Practices Among Senior High School Students in a State College in Zamboanga City, Philippines" (Catan and Molina, 2021, 24). Statistical analyses included mean score and standard deviation, t-test, ANOVA, and correlation analysis. The findings revealed that while students understood SWM concepts, their waste management practices—such as reducing, reusing, and proper disposal—needed improvement. Segregation and recycling were found to be the least practiced aspects. Additionally, age significantly influenced awareness levels, with 13-year-old students demonstrating lower awareness than older students. Female students showed a higher level of awareness than their male counterparts. However, there were no significant differences in waste management practices across different age groups. A significant correlation was observed between students' awareness levels and their SWM practices. Based on these findings, the researchers recommend that school administrators implement a comprehensive solid waste management policy, including structured guidelines and a student handbook, to effectively address challenges related to waste management.

KEYWORDS: Awareness; Cognizance; Management; Practices; Solid Waste

INTRODUCTION

The World Bank projected that the Philippine economy would expand by 5.6% in 2023 and slightly rise to 5.8% in 2024, as stated in its semi-annual Philippines Economic Update (Huaxia 2023, 1). This economic growth has been driven by an expanding middle class, increasing consumer demand, and a strong overall economic performance (World Bank 2020, 1). However, despite these positive developments, this progress has inadvertently worsened the plastic pollution crisis (Balota et al. 2023, 2). As reported by the World Bank (2019, p. 1), the Philippines produces around 2.7 million tons of plastic waste each year, with about 20% of it estimated to enter the ocean. Like many fast-growing nations, the country faces challenges with excessive plastic production and consumption, alongside inadequate solid waste management infrastructure. Addressing this issue requires public awareness, effective legislation, and well-structured government programs (Reyes and Madrigal 2020, 10).

Cognizance of solid waste management refers to the understanding individuals or communities have regarding proper waste management practices. Solid Waste Management (SWM) is a structured system that involves the controlled generation, collection, transportation, processing, segregation, reduction, reuse, recycling, storage and disposal of solid waste in a way that minimizes environmental impact and reduces waste (Dela Cruz and Nabor 2022, 1).

Schools generate various types of waste, including paper, metal, plastic, glass, and organic materials. These waste materials can be categorized as hazardous, non-hazardous, toxic, or non-toxic, depending on their source, whether from commercial, agricultural, or institutional activities. The most commonly discarded items in schools include paper, plastic food containers, and packaging materials. Additionally, waste is produced through school operations, such as discarded boxes, papers, and teaching materials like tapes and visual aids, which are often considered unusable or non-recyclable (Mishra et al., 2014, 396).

The issue of solid waste requires urgent action from both the government and the public (Coracero et al. 2021, 10). If ineffective waste management persists, it could lead to severe repercussions, including health risks for communities and

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environmental concerns such as air pollution (Abu Qdais, 2007,1; Sharholy et al., 2008,1; Madrigal and Oracion, 2017,1), cited by (Reyes and Madrigal 2020, 2; Molina and Catan 2021, 5). The Philippine Constitution states, "The state will defend and promote citizens' rights to a healthy, balanced ecosystem that adheres to the natural harmony and rhythm" (Sec. 16, Art. II). Additionally, it ensures that the "State should defend and advance peoples' rights to their health and among them in still health consciousness" (Sec. 15, Art. II). These clauses passed what is also known as the Republic Act (R.A) No. 9003, Act of 2000 for the Management of Ecological Solid Waste (Official Gazette of the Philippines., 2001). Mandated some major government organizations like DepEd, TESDA, CHED, DILG, and PIA to run education and communication campaigns on solid waste management. To enhance the incorporation of environmental concerns across all educational levels, particularly emphasizing theories and practices such as segregation, reduction, reuse, recycling, and proper solid waste management.

Practice in solid waste management has always been a challenge for the different institutions of learning. Several studies link awareness and solid waste practices mostly done in the community (Zulkipli et al. 2022,1; Alfaras 2023, 1; Urmila et al. 2022, 5481; Sanchez 2023,1 and household practices (Elamin et al. 2021, 13), the higher education institution (Paghasian 2017, 1; Syed et al. 2023, 1;)

As an educational institution, Zamboanga National High School strives to foster a child-friendly and environmentally sustainable learning environment. However, waste management remains a significant challenge within the school. With student enrollment increasing each year, the volume of waste also rises. While the school has a dedicated workforce to maintain cleanliness, additional support is still required. To effectively address this issue, the school must establish comprehensive programs and guidelines that provide a long-term solution to waste management.

Despite extensive research on solid waste management (SWM), several critical gaps remain, particularly in understanding how awareness translates into actual waste disposal practices. While existing studies highlight the importance of environmental education in shaping waste management behaviors (Debrah et al., 2021, 1), they often reveal a disconnect between awareness and practice. For example, Molina and Catan (2021, 1) found that while senior high school students possessed a solid understanding of SWM concepts, this awareness did not strongly influence their disposal behaviors. This indicates a need to explore further the factors that hinder students from applying their knowledge in practical settings.

To the best of the researchers' knowledge, no studies have been conducted on solid waste management at Zamboanga National High School West. Therefore, there is a need for research that explores SWM practices at the secondary school level while also examining the relationship between awareness and actual waste management behaviors. Additionally, this study aims to develop SWM policies that effectively address the needs of junior high school students. Specifically, it evaluates their level of awareness and waste management practices within the school.

LITERATURE REVIEW

Solid waste management. The concept of waste management covers a wide range of activities, from waste collection to processing. It involves the generation, collection, transportation, and processing of waste, as well as efforts to reduce waste production, repurpose waste as an economic resource, engage communities, and protect both human health and the environment (Akliyah et al. 2018, 3). Highly developed countries such as Japan and Germany have established effective solid waste management systems (Matsumoto 2011, 1; Gabriel et al. 2021, 1 as cited in Rabei et al. 2023, 5). However, many developing nations continue to face challenges in implementing efficient waste management practices and disseminating essential information.

The Philippines, as a fast-growing nation, faces challenges from excessive plastic production and usage, worsened by insufficient solid waste management systems. A World Bank report (2019, p. 1) reveals that the country produces around 2.7 million tons of plastic waste each year, with roughly 20% of it entering the ocean. To combat the growing solid waste crisis, a comprehensive waste management approach is necessary to reduce the increasing risks to communities, human health, and the environment (Madrigal and Oracion 2017, 1, as cited in Reyes and Madrigal 2020, 10).

If this worsening waste issue remains unaddressed, it could have severe environmental and health consequences. In response, the Philippine government has enacted laws, policies, and guidelines to prevent waste-related disasters. One of the key legislations is Republic Act No. 9003, or the Ecological Solid Waste Management Act of 2000, which was passed by Congress to uphold the constitutional mandate of protecting and promoting "the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature" (Phil. Const. art. II, sec. 16). Furthermore, the act reinforces the State's commitment to safeguarding public health and fostering health consciousness among its citizens (Phil. Const. art. II, sec. 15).

Ecological Solid Waste Management Act. Enacted on January 26, 2000, the Ecological Solid Waste Management Act of 2000 established a comprehensive framework for managing solid waste in an environmentally responsible manner (Republic Act

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No. 9003, sec. 1). The Act outlines fundamental policies aimed at safeguarding public health and the environment, emphasizing key actions such as: (a) Implementing environmentally sustainable methods that optimize resource use while promoting conservation and waste recovery.

(b) Establishing guidelines to reduce solid waste volume through source reduction and minimization waste techniques, such as composting, recycling, reusing, and recovery (Republic Act No. 9003, sec. 1(c)).

Furthermore, the Act supports the development of national research and development initiatives to strengthen institutional frameworks, promote resource conservation, and enhance locally designed waste reduction, collection, separation, and recovery systems. It also mandates the proper handling of solid waste, including its separation, collection, transport, storage, treatment, and disposal, by adopting best environmental practices while prohibiting incineration (Republic Act No. 9003, sec. 1(d)). Additionally, the Act advocates for the integration of solid waste management principles into both formal and informal education to raise public awareness and encourage participation in environmental conservation efforts (Republic Act No. 9003, sec. 1(h)).

Awareness of Solid Waste Management. In Sections 55-56 of the Ecological Solid Waste Management Act of 2000 mandate that the national government, in partnership with the Educational Institutions such as Technical Education and Skills Development Authority (TESDA), the Commission on Higher Education (CHED), the Department of Education (DepEd), and the Philippine Information Agency (PIA), implement a solid waste management campaign. This initiative focuses on continuous education and awareness programs, integrating environmental concerns into all levels of the school curriculum while emphasizing both the theoretical and practical aspects of waste management (Republic Act No. 9003, sec. 55-56).

Moreover, collaborative efforts among policymakers, waste management authorities, and stakeholders play a crucial role in promoting education and support, enhancing waste management infrastructure and systems, and fostering an environment that encourages behavioral change (Treyes et al. 2023, 16). This ongoing awareness campaign has gradually improved students' understanding and engagement in solid waste management.

Molina and Catan (2021, 1) investigated the level of awareness and the solid waste management (SWM) practices of senior high school students in the Philippines. Their study examined how SWM concepts are integrated into the curriculum at a state college in Zamboanga City. Recognizing solid waste management as a critical issue for both the environment and public health, the researchers emphasized the importance of educating young people to promote responsible waste disposal. The findings showed that although students had a sufficient grasp of SWM concepts, such as the consequences of improper waste disposal and efforts initiated by the school, their knowledge did not significantly translate into environmentally responsible disposal behaviors. Consequently, Molina and Catan (2021, 1) recommended further research to identify the underlying factors influencing student behavior and to track changes in awareness and practices over time.

Education in Solid Waste Management. Debrah et al. (2021, 1) conducted a study entitled "Raising Awareness on Solid Waste Management through Formal Education for Sustainability: A Developing Countries Evidence Review," which examines the urgent issue of solid waste management (SWM) in developing nations, specifically in rapidly urbanizing areas. The study emphasizes the crucial role of environmental education in tackling SWM challenges, specifically addressing the knowledge gap between younger and older generations. While both secondary and tertiary education students exhibited positive attitudes and a general awareness of environmental concerns, the study highlights the need for further education to enhance sustainable waste management practices. The study found that students lacked practical knowledge of SWM due to insufficient teacher guidance and a lack of hands-on experience. The research also pointed out that education level and age influence individuals' awareness, attitudes, and practices regarding SWM (Debrah et al. 2021, 5). Weak environmental curricula and the absence of practical content on modern environmental issues limit the effectiveness of SWM education, highlighting the need for teacher training and practical experience to bridge the knowledge-practice gap.

In another study, Paghasian (2017, 1) explored SWM awareness and practices among college students at a university level in the southern part of the nation. The findings revealed that students had high levels of awareness regarding SWM theories and practices, with promising behaviors related to waste segregation, reduction, and reuse. However, waste disposal practices were rated as only "fair," indicating room for improvement. Paghasian (2017, 1) concluded that while awareness positively impacts behaviors such as segregation, reduction, and recycling, it has a limited effect on actual disposal habits. The study recommends further research to explore factors influencing specific disposal behaviors and to track changes in both awareness and practices over time.

Protection of Public Health and the Environment. A conducive learning environment extends beyond the physical classroom space. Students are encouraged to pursue knowledge in a safe and supportive environment, and their surroundings

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greatly impact their learning processes and future career inclinations. A positive learning environment is essential for academic success and the effective implementation of an efficient curriculum (Shrestha et al. 2019, 1).

Practice in Solid Waste Management. Garbage, waste, or trash, regardless of the term used, the volume of waste produced by modern society is overwhelming. From food scraps to plastics, electronics, and hazardous materials, the waste generated poses significant challenges. Solutions proposed to address this issue include segregation, reduction, reuse, recycling, and proper disposal of waste materials (Oco 2023, 198; Elamin and Bahri 2022, 14; Alfara 2023, 2332; Paghasian 2017, 6; Kilaton 2023, 238; Catan and Molina 2020, 39; Sanchez 2023,1).

The segregation of solid waste involves separating materials based on their characteristics to facilitate recycling, reuse, and waste reduction (Republic Act No. 9003, art. 2). Reuse is the process of using an item or material more than once, either for its original intended purpose or for a new function, without altering its physical or chemical properties. This practice helps reduce waste, conserve resources, and minimize environmental impact by extending the lifespan of products before they are discarded or recycled. Recycling involves treating waste materials to convert them into new products (Republic Act No. 9003, art. 2). Proper waste disposal refers to the safe and secure discharge of solid waste in an environmentally sound manner (Republic Act No. 9003, art. 2).

Conceptual framework. Figure 1 illustrates the connection between junior high school students' awareness and understanding (cognizance) and their solid waste management (SWM) practices, while also considering the impact of demographic factors such as age, gender, and grade level. The framework is composed of three primary variables: the independent variable (cognizance of solid waste management), the dependent variable (solid waste management practices), and the intervening variable (demographic profile).

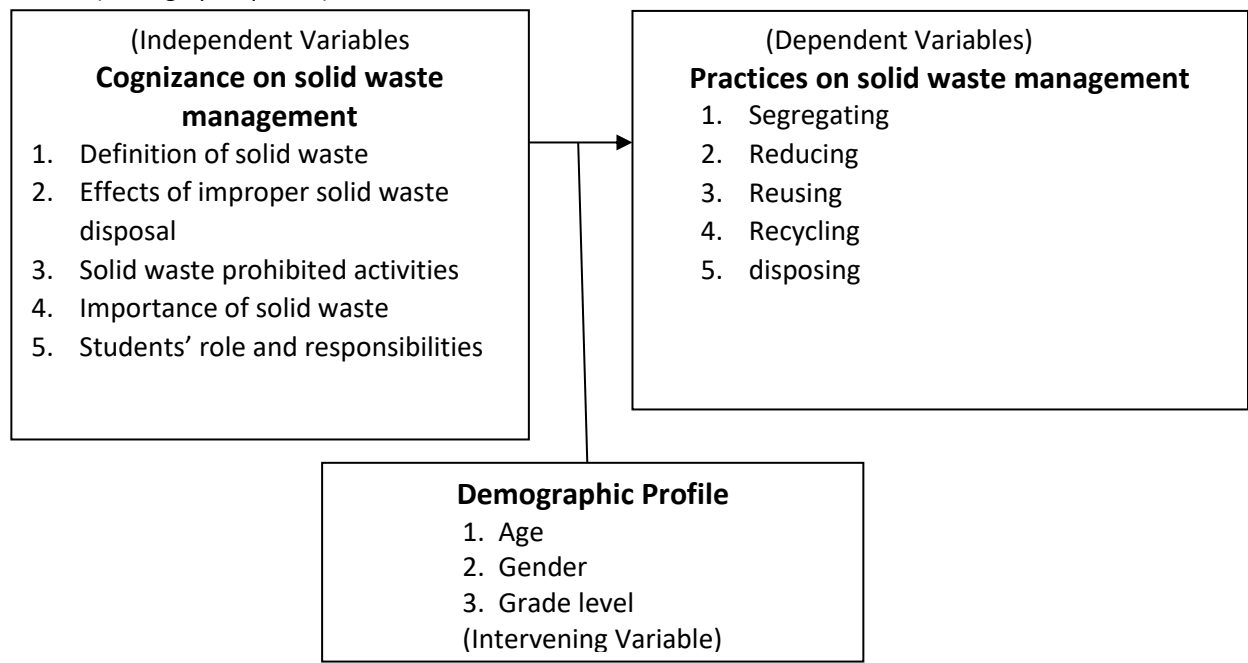


Figure 1. Conceptual Framework of the Study

This conceptual framework outlines how awareness influences behavior, with demographic factors serving as a moderating element. It suggests that students' understanding of solid waste management plays a crucial role in shaping their waste management practices. A higher level of awareness regarding proper waste disposal, its environmental impact, and students' responsibility is expected to foster more responsible actions, such as waste segregation, minimizing waste production, reusing materials, recycling, and proper disposal.

However, the relationship between cognizance and practices is not direct. The students' demographic profiles (age, gender, and grade level) act as intervening variables, potentially affecting how students translate awareness into action. For instance, younger students may have limited understanding or engagement compared to older students, and gender differences might reflect varying levels of commitment to environmental practices.

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Research Questions

This study assessed the cognizance and practices of junior high school students at Zamboanga National High School on solid waste management.

Specifically, the study aimed to answer the following questions:

1. What is the level of awareness on solid waste management of the junior high school students at Zamboanga National High School in terms of the following:
 - 1.1 definition of solid waste management
 - 1.2 effects of improper solid waste disposal
 - 1.3 solid waste prohibited activities
 - 1.4 importance of solid waste management
 - 1.5 student's role and responsibilities?
2. What is the level of practice on solid waste management in terms of the following:
 - 2.1 segregating
 - 2.2 reducing
 - 2.3 reusing
 - 2.4 recycling
 - 2.5 disposing?
3. Does a significant difference exist between the level of awareness and practices of junior high school students at Zamboanga National High School West regarding solid waste management when categorized by profile (age, gender, and grade level)?
4. Is there a significant relationship between cognizance and practices of junior high school students toward solid waste management?
5. Based on the findings, what solid waste management policy can be designed?

Scope and Limitation

This study focused on the assessment of the awareness) and practices of junior high school students at Zamboanga National High School West regarding solid waste management. The scope includes examining students' knowledge about proper waste disposal, waste reduction, and recycling practices, as well as how frequently they engage in such activities. The respondents of the study are limited to junior high school students from grades 7 to 10 at Zamboanga National High School West during the school year 2024–2025.

The study was delimited to the following: It is restricted to junior high school students (grades 7 - 10), excluding teachers and administrative personnel. The research focuses solely on Zamboanga National High School West, and the findings may not be generalizable to students from other schools or regions. The study did not cover external factors influencing waste management behavior, such as household practices or community-based initiatives. Data collection will rely on self-reported surveys and questionnaires, which may be subject to biases such as social desirability or recall bias.

METHOD

Research Design

The researcher employed a cross-sectional design that integrated both descriptive and correlational analyses. Descriptive analysis was conducted to evaluate and compare students' levels of awareness and their solid waste management practices. Meanwhile, correlational analysis was utilized to determine the existence of a relationship between students' awareness of solid waste management and their actual waste-handling behaviors.

Research Participants

The study participants are junior high school students at Zamboanga National High School West.

Table 1: Population and Sample

Zamboanga National High School West (ZNHS WEST)	No. of Students (N=Population)	No. of Students (n=samples)
Grade 7	1498 (25.11%)	91
Grade 8	1414 (23.70%)	91
Grade 9	1570 (26.32%)	91

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Grade 10	1512 (25.35%)	91
Total	5964 (100%)	364

Three hundred sixty-four (364) respondents were extracted from a 5943-population using a G-power sample generator. A stratified sampling technique was used in selecting the 91 samples from four curriculum levels

Research Instrument

To achieve the study's objectives, a questionnaire checklist was used as the main instrument for data collection. It was divided into three parts: the demographic profile, the Awareness on Solid Waste Management (ASWM) tool, and the Practices on Solid Waste Management (PSWM) tool.

The demographic section, created by the researchers, gathered information on respondents' age, gender, and grade level.

The ASWM and PSWM tools were adapted from the study "Solid Waste Management Awareness and Practices among Senior High School Students in a State College in Zamboanga City, Philippines" (Catan and Molina 2021, 24). The questionnaire demonstrated reliability, with a reported Cronbach's $\alpha = .776$, indicating strong internal consistency. The ASWM tool was divided into five categories: (1) the definition of solid waste, (2) the effects of improper solid waste disposal, (3) prohibited activities related to solid waste, (4) the importance of solid waste management, and (5) students' roles and responsibilities. Each category contained four items rated on a four-point Likert scale: 1 = Not aware, 2 = Slightly aware, 3 = Aware, 4 = Fully aware. This tool was designed to assess junior high school students' awareness of solid waste management.

Table 2: Indices of Awareness on Solid Waste Management (ASWM) tool

Mean Range	Awareness of Solid Waste Management
3.25 – 4.00	Very High (VH)
2.50 – 3.24	H (High)
1.75 – 2.49	Low (H)
1.00 – 1.74	Very Low (VL)

Table B provides a framework for interpreting the results of the Solid Waste Management Awareness. The table categorizes students' responses to different levels of awareness and frequencies based on the mean scores derived from the questionnaire. The interpretation for awareness was divided into four distinct ranges, each associated with a corresponding level of awareness.

Mean Range: (3.25 – 4.00) Solid Waste Management Awareness: Very High (VH). If the mean score for awareness falls within this range, it indicates that the students have an exceptional understanding of solid waste management. They are likely well-informed about key concepts such as waste segregation, recycling, and the environmental impacts of improper disposal.

Mean Range: (2.50 – 3.24) Solid Waste Management Awareness: High (H)

A mean score in this range suggests that students possess a good level of awareness but may lack full comprehension of some aspects of solid waste management. They are knowledgeable and aware of the importance of waste reduction and management, but there might be areas for improvement in their understanding

Mean Range: (1.75 – 2.49) Solid Waste Management Awareness: Low (L)

A mean score in this range reflects a limited understanding of solid waste management. Students in this category may have only basic knowledge or misconceptions about waste management, which can hinder their ability to adopt responsible environmental behaviors.

Mean Range: (1.00 – 1.74) Solid Waste Management Awareness: Very Low (VL) Scores in this range reflect a very limited or almost complete lack of awareness of solid waste management. Students may not understand the importance of proper waste handling, the environmental impact of improper disposal, or their role in waste management practices.

PSWM tool was subdivided into five categories, namely, segregation, reduction, reuse, recycling, and disposal of solid waste, with 4 items in each category answerable by equivalent codes, 1 = never practice; 2 = seldom practice; 3 = often practice; 4 = always practice. PSWM was used to measure the level of practices of high school students towards solid waste management.

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Table 3: Indices of Practices on Solid Waste Management (PSWM) tool

Mean Range	Practice Solid Waste Management
3.25 – 4.00	Very High (VH)
2.50 – 3.24	High (H)
1.75 – 2.49	Low (H)
1.00 – 1.74	Very Low (VL)

Table 3 provides a framework for interpreting the results of the Solid Waste Management practices. The table categorizes students' responses into different levels of awareness and frequencies based on the mean scores derived from the questionnaire. The interpretation for practices is divided into four distinct ranges, each associated with a corresponding frequency of practices.

Mean Range: (3.25 – 4.00) Solid Waste Management Practices: Very High (VH). For practices, this range means students consistently engage in solid waste management activities, such as segregating waste, recycling, and proper disposal. "VERY HIGH" suggests that these practices are habitual and firmly integrated into their daily routines.

Mean Range: (2.50 – 3.24) Solid Waste Management Practices: HIGH (H) "High" indicates that students regularly engage in solid waste management practices, though not as consistently as those in the "VH" category. They likely take action most of the time but may occasionally neglect certain practices, like recycling or proper waste disposal.

Mean Range: (1.75 – 2.49) Solid Waste Management Practices: LOW (L) "Low" indicates infrequent engagement in solid waste management activities. Students may occasionally practice waste segregation, recycling, or proper disposal, but these actions are inconsistent and not part of their regular behavior.

Mean Range: (1.00 – 1.74) Solid Waste Management Practices: VERY LOW (VL) indicates a complete absence of waste management practices. Students in this category do not engage in waste segregation, recycling, or proper

Data Gathering Procedure

The researchers submitted the research proposal along with the letter of intent to the school principal of Zamboanga National High School-West for approval. Upon approval, the proposal was then forwarded to the District Research Evaluator for evaluation in terms of technicalities and content to ensure alignment with DEPED's research agenda and to address the pressing issues of the school, district, and division. The research proposal was sent back to the researchers for enhancement and improvement. Once the proposal was enhanced and improved, the district evaluator forwarded the paper to the district office for endorsement. The district office endorsed the paper to the division office for approval (Division Memo 854, s 2021).

Upon receiving approval from the division office through the Planning and Research Office, the researchers personally approached the School Principal with the intent letter, research proposal, informed consent form, and approval letter from the division office to request permission to conduct the survey. After the principal's approval, the researchers visited the faculty rooms of eight different departments and distributed the approval letter signed by the principal, along with the informed consent form, assent form, and parent's consent.

The researchers then met with the participants to explain the study's procedures, objectives, and benefits to ensure their understanding of the study's purpose before distributing the different forms. Immediately afterward, the students were asked to sign the informed consent and assent forms, while parental consent forms were sent to their parents for signature. On the next day, only students who signed the informed consent and assent forms and provided parental consent were included as participants and received the research questionnaire. Participants were given 30 minutes to complete the questionnaire, and the questionnaires were collected immediately upon completion. The data gathered was used for analysis and to generate results. The entire data collection process took approximately one to two weeks to cover all respondents. Once the required data were collected, the questionnaire forms were shredded, and digital copies were deleted to ensure confidentiality. Participation in the study was voluntary, and participants were informed that they could opt out by refusing to sign the consent form, which would automatically exclude them from the study (Paghasian 2017, 6; Shrestha et al. 2019, 2).

Data Analysis

The mean and standard deviation were utilized to address the first and second research questions. The mean, which represents the average value in a dataset, is calculated by summing all values and dividing by the total number of data points, thereby assigning equal importance to each value (Frost 2024, 1).

For the third research question, a t-test for independent samples was conducted to examine differences based on gender, while a one-way ANOVA was employed to analyze variations across age and grade level.

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To address the fourth research question, the Pearson R Correlation was used to determine the relationship between students' awareness and their solid waste management practices (Catan and Molina 2020, 42; Oco 2023, 198; Clef 2013, 1). Additionally, the Kolmogorov-Smirnov (K-S) test was applied to evaluate the normality of the dataset (Zhang and Wu 2021, 1; Dimitrova et al. 2020, 1).

For the fifth research question, based on the study's findings and conclusions, the researcher formulated and recommended a solid waste management policy and guidelines for Zamboanga National High School West, ensuring a school environment that supports effective teaching and learning. The collected data were processed using IBM SPSS Statistics V.20 to enhance accuracy and efficiency in data analysis (Bryman and Cramer 2011, 1).

RESULTS AND DISCUSSION

Cognizance in Solid Waste Management. Table 4 presents Solid Waste Management Awareness among Junior High School students in terms of definition, effects of improper waste disposal, solid waste prohibited activities, importance, and role of students in solid waste disposal.

Table 4: Solid Waste Management Awareness among Junior High School Students.

Statement	SD	Mean	Description
1.1 Definition of Solid Waste Management			
1. Agricultural waste	0.9	2.70	Highly aware
2. Commercial waste	0.8	2.50	Highly aware
3. household waste	0.8	3.00	Highly aware
4. school waste/institution waste	0.8	3.10	Highly aware
Weighted Mean	0.6	2.81	Highly aware
1.2 Effects of Improper Solid Waste Disposal			
5. Clogging the drainage canal can lead to floods during the rainy season.	0.9	3.00	Highly aware
6. human illness	0.9	3.10	Highly aware
7. air pollution	0.9	3.10	Highly aware
8. Breeding or sheltering of pests such as flies, rats, and mosquitoes	1.0	2.90	Highly aware
Weighted Mean	0.7	3.00	Highly aware
1.3 Awareness of Solid Waste Prohibited Activities			
9. Littering, throwing, or dumping of waste in public places such as school grounds, hallways, or inside the classroom	1.0	3.00	Highly aware
10. Open dumping of leaves and plastics	1.0	2.80	Highly aware
11. Open burning of plastics	0.9	2.80	Highly aware
12. Mixing of solid waste in any waste box	1.0	2.70	Highly aware
Weighted Mean	0.7	2.83	Highly aware
1.4 Importance of solid waste			
13. Key to achieving a clean and green environment	0.8	3.30	Highly aware
14. Reduce the reproduction of pests	0.9	2.90	Highly aware
15. Protect public health	0.7	3.40	Highly aware
16. Prevent diseases such as skin allergies and respiratory diseases	0.9	3.10	Highly aware
Weighted Mean	0.6	3.20	Highly aware
1.5 Student's role and responsibilities			
17. Reduce the waste generated	0.9	3.00	Highly aware
18. Clean as you go or CLAYGO	0.8	3.30	Highly aware
19. Segregate waste when disposing based on trashcan labels	0.9	3.00	Highly aware
20. Recycle waste and reuse items	0.8	3.10	Highly aware
Weighted Mean	0.6	3.10	Highly aware
General Weighted Mean	0.5	2.99	Highly aware

Legend: 1.00 – 1.74 = Very Low (VL); 1.75 – 2.49 = Low (H); 2.50 – 3.24 = High (H); 3.25 – 4.00 = Very High (VH)

Table 4 shows the Awareness of Solid Waste Management among high school students, revealing that they exhibit a high level of awareness across all areas evaluated, with a general weighted mean of 2.99, indicating that students are highly informed about solid waste management concepts.

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In terms of the Definition of Solid Waste Management, the students demonstrated high awareness, particularly of household waste (mean = 3.00) and school waste (mean = 3.10). Their awareness of agricultural waste and commercial waste was slightly lower, with mean scores of 2.70 and 2.50, respectively. The overall weighted mean for this section was 2.81, reflecting high awareness overall. Similar findings are reported by Catan and Molina (Catan and Molina 2020, 34), who noted that the students demonstrated high levels of awareness in terms of the definition of solid waste management.

When it comes to the Effects of Improper Solid Waste Disposal, students were highly aware of the various negative impacts, such as floods caused by clogged drainage canals (mean = 3.00), human illness, and air pollution (both mean = 3.10). They were also aware of the risk of breeding pests (mean = 2.90), resulting in a section-weighted mean of 3.00. This aligns with research conducted by Catan and Molina (Catan and Molina 2020, 35), which found that the students demonstrated high levels of awareness in terms of the effects of improper solid waste disposal.

For Awareness of Prohibited Activities, such as littering (mean = 3.00) and open dumping (mean = 2.80), the students showed high awareness. However, awareness of mixing waste in trash bins was slightly lower (mean = 2.70). The weighted mean for this section was 2.83, indicating students were well-informed about improper waste practices. This is consistent with findings by Catan and Molina (Catan and Molina 2020, 35), who observed that the students demonstrated high levels of awareness in terms of the Prohibited Activities of solid waste disposal.

Regarding the Importance of Solid Waste Management, the students scored highly in understanding its role in achieving a clean environment (mean = 3.30) and protecting public health (mean = 3.40). Awareness of its role in reducing pests was slightly lower (mean = 2.90), resulting in a weighted mean of 3.20 for this section. These results are supported by Catan and Molina (Catan and Molina 2020, 37), who observed that the students demonstrated high levels of awareness in terms of the importance of solid waste management.

Finally, in terms of their Roles and Responsibilities, students showed strong awareness of actions such as reducing waste (mean = 3.00), recycling (mean = 3.10), and the Clean as You Go (CLAYGO) initiative (mean = 3.30). The weighted mean for this section was 3.10, suggesting that students are highly conscious of their role in waste management. This finding echoes the results by Catan and Molina (Catan and Molina 2020, 35), who observed that the students demonstrated high levels of awareness in terms of the roles and responsibilities of students in solid waste disposal.

In summary, the students exhibit a solid understanding of solid waste management concepts, the effects of improper disposal, prohibited activities, and their responsibilities in maintaining a clean environment. The statement 'importance of solid waste management got the highest mean score (3.20), while the lowest awareness was in the definition of solid waste with a mean score of 2.81. Meanwhile, their awareness remains consistently high across all measured areas, indicating effective education and understanding of solid waste management practices. This aligns with research conducted by Paghasian (2017, 7), who reported that the respondents have a high level of awareness of solid waste management. Zulkipli et al. (2020, 659) found that all respondents had a high level of awareness. However, despite the similarity of its results, the recent study may differ from the literature cited in terms of respondents and sampling technique. A recent study was conducted on junior high school students whose ages range from 12 to 18 years old. The previous research was conducted on university students whose ages range from 19 years to above 30 years old.

Catan and Molina (2020, 35) observed that the students demonstrated high levels of awareness of solid waste management. Which consistent with the findings of the recent study that students are knowledgeable about their responsibilities for the success of the solid waste management program.

Reyes and Madrigal (2020, 13) conducted a study assessing students' awareness, attitudes, and practices regarding solid waste management in a Philippine Catholic school. Their findings align with the present study, indicating that students exhibit a high level of awareness and a positive attitude toward their high school's solid waste management program.

Similarly, Kilton et al. (2023, 239) examined the awareness and practices of solid waste management among Grade 11 senior high school students in Jasaan South District, Philippines. Their study supports the findings of the current research, as students demonstrated a strong understanding of various waste management practices.

Practice in solid waste management. Table 5 presents the Solid waste management Practices among Junior High school students in terms of segregating, reducing, reusing, recycling, and disposing of solid waste.

Table 2 shows that Solid Waste Management Practices in junior high school students are generally practiced solid waste management "often" across most categories, with a general weighted mean of 2.63. However, there are specific areas where students' practices are less frequent.

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In the category of Segregating Solid Waste, students reported practicing waste segregation "seldom", with a weighted mean of 2.30. While segregating reusable from non-reusable items like bottles was done "often" (mean = 2.50), the segregation of biodegradable from non-biodegradable waste (mean = 2.20) and recyclables (mean = 2.10) was practiced less frequently. Similarly, the separation of non-harmful from toxic waste was seldom practiced (mean = 2.40). Opposite findings are reported by Catan and Molina (2020, 39), who noted that waste segregation practices are often practiced. The result differs slightly in terms of the frequency with which the students segregate their waste materials in school.

For Reducing Solid Waste, students showed stronger practices, with a weighted mean of 2.78, indicating they "often" reduced waste. Practices like bringing lunch in reusable containers (mean = 3.10), converting food waste into animal feed (mean = 2.90), and saying no to plastic (mean = 2.80) were commonly observed. However, using eco-bags (mean = 2.30) was less frequently practiced. Similar findings are reported by Catan and Molina (2020, 40), who noted that waste reduction practices are often practiced. These practices for the reduction of solid waste include reusable containers, Eco bags, and buying only important items.

Table 5: Solid waste management Practices among Junior High school students.

Statement	SD	Mean	Description
2.1 Segregation of solid waste			
1. Biodegradable (e.g., papers, leaves, vegetables) from non-biodegradable (e.g., Plastics, wires, cans).	0.8	2.20	Low
2. Recyclable (e.g., plastics, wires, cans).	0.8	2.10	Low
3. Non-harmful waste from toxic wastes (e.g., battery, ink, pentel pen).	0.9	2.40	Low
4. Reusable from non-reusable (e.g. bottles)	0.9	2.50	High
Weighted Mean	0.7	2.30	Low
2.2 Reducing Solid Waste			
5. Taking lunch in school using a reusable container	1.0	3.10	Very High
6. Using an eco-bag	0.9	2.30	Low
7. Converting food waste into animal feed	0.9	2.90	High
8. Saying no to plastic if only a few items are bought.	0.9	2.80	High
Weighted Mean	0.6	2.78	High
2.3 Reusing of Solid Waste			
9. use scratch paper for solving	0.8	3.30	Very High
10. washable food and water containers	0.8	3.30	Very High
11. unused clothes and toys are given to the less fortunate people.	0.9	3.10	High
12. grocery bags	0.8	3.10	High
Weighted Mean	0.6	3.10	High
2.4 Recycling of Solid Waste			
13. converting old items into new products	0.9	2.43	Low
14. generating funds out from plastic bottles, metals, or cans	0.9	2.30	Low
15. creating art craft	0.9	2.42	Low
16. repurpose old materials by combining them with new ones.	0.9	2.44	Low
Weighted Mean	0.7	2.39	Low
2.5 Disposing of Solid Waste			
17. biodegradable items in compost pit	0.9	2.30	Low
18. items in proper trash bins	0.8	2.22	Low
19. non-biodegradable items by selling them in junkshops.	0.9	2.61	High
20. threw garbage on the trash bins	0.9	3.24	High
Weighted Mean	0.6	2.59	High
General Weighted Mean	0.5	2.63	High

Legend: 1.00 – 1.74 = Very Low (VL); 1.75 – 2.49 = Low (L); 2.50 – 3.24 = High (H); 3.25 – 4.00 = Very High (VH)

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In terms of segregating solid waste, students demonstrated low awareness, with a weighted mean of 2.30. Most items, including the segregation of biodegradable, recyclable, and toxic waste, were rated low, except for distinguishing reusable from non-reusable waste (2.50, High). This indicates a gap in students' knowledge regarding proper waste classification. Supported by the study of Nabor and Ortega-Dela Cruz (2022, 1) that students exhibited low levels of waste management practices. Moreover, Rabei et al. (2023, 1) conducted a cross-sectional study on knowledge, practices, and solid waste segregation management at Qassim University (QU) in Saudi Arabia. Their study found that respondents exhibited poor waste segregation and management practices, which mirrors the present study's findings, were students infrequently practiced waste segregation.

For reducing solid waste, students exhibited high engagement (2.78). Notably, taking lunch in a reusable container had the highest mean score (3.10, Very High), followed by converting food waste into animal feed (2.90, High) and saying no to plastic (2.80, High). However, the use of eco-bags (2.30, Low) suggests room for improvement in promoting sustainable carrying alternatives. Aligns with the study conducted by Morales and Oco (2023, 1) that students had a strong understanding of SWM and effectively practiced waste reduction.

Reusing solid waste received the highest weighted mean (3.10, High), reflecting a strong student practice in this area. The most notable behaviors included using scratch paper for solving (3.30, Very High) and using washable food and water containers (3.30, Very High). Additionally, donating unused clothes and toys (3.10, High) and reusing grocery bags (3.10, High) highlight a positive inclination toward sustainability. This is consistent with findings by Catan and Molina (2020, 40) who observed that reusing behaviors are often practiced by the students and are influenced more by personal habits and environmental awareness.

Conversely, recycling solid waste was rated low (2.39). Students showed limited engagement in converting old items into new products (2.43, Low), generating funds from recyclables (2.30, Low), and creating art and crafts (2.42, Low). This suggests that despite the awareness of reusing materials, the practical application of recycling remains a challenge. These results are slightly different from studies like those of Catan and Molina (2020, 40) which found that recycling is often practiced by senior high school students.

For disposing of solid waste, students demonstrated high engagement (2.59). Proper garbage disposal, such as throwing waste in trash bins (3.24, High) and selling non-biodegradable waste to junkshops (2.61, High), showed positive results. However, biodegradable waste disposal (2.30, Low) and placing items in the correct bins (2.22, Low) indicate areas for reinforcement. This is consistent with findings by Catan and Molina (2020, 40,) who observed that disposing of solid waste is often practiced by the students.

Overall, the general weighted mean of 2.63 (High) suggests that while Junior High School students engage in solid waste management practices, challenges persist in waste segregation and recycling. Efforts should be focused on strengthening awareness campaigns and hands-on initiatives to enhance these areas. Reyes and Madrigal (2020, 18) conducted a descriptive-correlational study on high school students' awareness, attitudes, and practices related to SWM in a diocesan Catholic school. The study found that students exhibited high awareness, very positive attitudes, and strong SWM practices, which are consistent with the findings of the present study. Kilaton et al. (2023, 235) found that individuals who are aware of proper waste management are more likely to implement it in practice. Their study revealed that students strongly agreed on the importance of segregation, reduction, recycling, reuse, and proper disposal, aligning with the present study's results.

Additionally, Studies on higher education institutions, such as Paghasian (2017, 5), showed that students had good practices in segregation, reduction, and recycling, which are consistent with the present study. However, recycling and disposal practices were rated as fair, which highlights the real problem of the community. Solid waste disposal is difficult to achieve most especially if there is no existing system.

Thus, solid waste management is a global concern that demands immediate attention. In the Philippines, the full implementation of Republic Act No. 9003, also known as the Ecological Solid Waste Management Act of 2000, is vital. This legislation emphasizes the importance of waste segregation, proper disposal, recycling, and reuse. Public participation and community mobilization through education and training are essential for the effective implementation of solid waste management programs (Coracero et al., 2021, 216). Active involvement from the community, including students, teachers, and the school as a whole, is crucial to achieving sustainable outcomes.

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Table 6: One-way ANOVA on significant differences in Awareness of Solid Waste Management when data are grouped according to age

Solid Waste Management	Age	Mean	F	p-value	Description
Definition of solid waste	12 years old	2.69	1.914	.091	Not sig.
	13 years old	2.75			
	14 years old	2.88			
	15 years old	2.92			
	16 years old	2.68			
	17 years old	2.71			
Effects of improper solid waste disposal	12 years old	2.73	2.088	.067	Not sig.
	13 years old	2.91			
	14 years old	3.13			
	15 years old	3.09			
	16 years old	2.88			
	17 years old	2.90			
Solid waste prohibited activities	12 years old	3.03	2.656	.023	Sig.
	13 years old	2.61			
	14 years old	2.93			
	15 years old	2.94			
	16 years old	2.77			
	17 years old	2.78			
Importance of solid waste	12 years old	2.88	2.775	.018	Sig.
	13 years old	3.01			
	14 years old	3.30			
	15 years old	3.22			
	16 years old	3.12			
	17 years old	3.17			
Students' role and responsibilities	12 years old	3.03	2.223	.052	Not Sig.
	13 years old	2.96			
	14 years old	3.19			
	15 years old	3.22			
	16 years old	2.99			
	17 years old	3.02			

Table 6 presents the analysis of whether there are significant differences in solid waste management awareness when data are categorized by age across various awareness areas. Regarding the definition of solid waste, the results show an F-value of 1.914 and a p-value of .091, indicating no significant difference in awareness among different age groups. Similarly, for the effects of improper solid waste disposal, an F-value of 2.085 and a p-value of .067 suggest that students' awareness of the consequences of improper disposal does not significantly differ based on age.

However, when examining prohibited solid waste activities, the analysis yielded an F-value of 2.656 and a p-value of .023, indicating a significant difference in awareness across age groups. This suggests that students of different ages have varying levels of understanding regarding prohibited activities related to solid waste management. Furthermore, the post hoc test (see table 7) indicated that in the awareness of solid waste management prohibited activities, there were significant differences between age groups 13- and 14-year-olds with a p-value of .042 and age groups 13 and 15 years old with a p-value of .034. This implies that the awareness level of the 13-year-old students is less than their 14- and 15-year-old counterparts. Similarly, Debrah et al. (2021, 1) examined environmental knowledge among youth and older individuals in developing countries, revealing that differences in awareness, attitudes, and solid waste management (SWM) practices are strongly influenced by age. This conclusion aligns with the findings of the current study.

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Likewise, in terms of the importance of solid waste management, an F-value of 2.775 and a p-value of .018 further indicate a significant difference in awareness, showing that students' recognition of solid waste management's significance varies by age. Furthermore, the post hoc test (see table 8) tested significant differences between age groups 13- and 14-year-olds with a p-value of .019. This suggests that the students' level of awareness in terms of how important solid waste management is statistically significant among the 13 and 14-year-old age groups. The awareness of 13 year 13-year-old students is much lower than their 14-year-old counterparts.

For students' roles and responsibilities, the analysis produced an F-value of 2.223 and a p-value of .052, suggesting no statistically significant difference based on age, though the result is close to the threshold for significance. These findings imply that while students' awareness of prohibited solid waste activities and the importance of solid waste management varies by age, their understanding of the definition, effects of improper disposal, and roles and responsibilities remains relatively consistent across age groups.

Madrigal and Oracion (2018, 1) investigated awareness, attitudes, and practices regarding solid waste management among employees and students at a Catholic higher education institution in the Philippines. Their study found that awareness, attitudes, and practices were significantly related to age, supporting the findings of the present study. Conversely, Magdayo et al. (2022, 1) examined solid waste awareness, characterization, and management among members of the Mindanao State University-Buug Campus. Their results indicated that while students displayed high awareness of solid waste management, no significant relationship existed between awareness and age, contradicting the findings of the current study.

Table 7: Independent t-test on significant differences in Awareness on Solid waste Management when data are grouped according to gender.

Awareness of Solid waste Management	Gender	Mean	Df	t	p-value	Description
A. Definition of solid waste	Male	2.72	359	-1.767	.078	Not sig.
	Female	2.84				
B. Effects of improper solid waste disposal	Male	2.87	359	-2.283	.023	Sig.
	Female	3.05				
C. Solid waste prohibited activities	Male	2.72	359	-1.990	.047	Sig.
	Female	2.88				
D. Importance of solid waste	Male	3.03	359	-2.736	.007	Sig.
	Female	3.22				
E. Students' roles and responsibilities	Male	2.96	359	-2.677	.008	Sig.
	Female	3.15				

The independent t-test results reveal notable gender differences in awareness of solid waste management among junior high school students. In terms of the definition of solid waste, no significant difference is found between male and female students ($p = .078$), although females have a slightly higher mean score (2.84) compared to males (2.72). In contrast, significant differences are observed in four other categories. For the effects of improper solid waste disposal, females exhibit significantly higher awareness (3.05) than males (2.87), with a p-value of .023, indicating that females are more cognizant of the negative impacts of improper waste disposal. Regarding solid waste prohibited activities, females also show greater awareness (2.88) than males (2.72), and this difference is statistically significant ($p = .047$). Additionally, in the category of importance of solid waste, females have a significantly higher awareness (3.22) compared to males (3.03), with a p-value of .007.

For students' roles and responsibilities in solid waste management, female students exhibit a significantly higher level of awareness (3.15) compared to males (2.96), with a p-value of .008. Overall, the findings indicate that female students are generally more aware of solid waste management than their male counterparts, with significant differences observed in categories such as the effects of improper disposal, prohibited activities, the importance of solid waste, and students' roles and responsibilities. A similar study by Ali et al. (2022, 1) examined awareness, attitudes, concerns, and practices regarding solid waste management (SWM) among university students. The results revealed that female students demonstrated better awareness and engagement in SWM-related issues than males, aligning with the findings of the present study. Conversely, a study by Ifegbesan (2010, 209) in Nigeria assessed secondary school awareness, knowledge, and practices concerning waste management. The results indicated that male students were more aware of solid waste management than females, contradicting the findings of the present study.

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Similarly, Abdul-Wahab et al. (2010, 1) conducted research in the Sultanate of Oman to evaluate environmental awareness and the public's willingness to protect the environment. Their survey revealed that males exhibited higher environmental knowledge, greater concern, and more proactive environmental behaviors than females, which contrasts with the present study's findings.

Madrigal and Oracion (2017, 1) conducted a survey assessing the solid waste management awareness, attitudes, and practices of employees and students at a Catholic higher education institution in the Philippines. Their findings indicated that gender had no significant influence on attitudes and practices, suggesting that male and female respondents had similar levels of awareness, which contradicts the present study.

Dung et al. (2017, 1) assessed college students' knowledge and attitudes toward solid waste management in Nigeria's North-Central zone. Their findings indicated that gender did not significantly influence students' knowledge or attitudes regarding SWM.

However, Magdayo et al. (2022, 1) studied solid waste awareness, characterization, and management among Mindanao State University-Buug Campus students. Their findings showed a high level of awareness regarding SWM and a significant relationship between awareness and gender, aligning with the findings of the present study.

Table 8: One-way ANOVA on significant differences in Awareness of Solid Waste Management when data are grouped according to Grade Level.

Awareness of Solid Waste Management	Grade level	Mean	F	p-value	Description
Definitions of solid waste	Grade 7	2.68	8.500	.000	Sig.
	Grade 8	2.79			
	Grade 9	3.03			
	Grade 10	2.65			
Effects of Improper Solid Waste Disposal	Grade 7	2.76	8.739	.000	Sig.
	Grade 8	3.01			
	Grade 9	3.24			
	Grade 10	2.89			
Solid waste prohibited activities	Grade 7	2.63	3.577	.014	Sig.
	Grade 8	2.81			
	Grade 9	2.96			
	Grade 10	2.85			
Importance of solid waste	Grade 7	2.98	6.812	.000	Sig.
	Grade 8	3.10			
	Grade 9	3.36			
	Grade 10	3.16			
Students' role and responsibilities	Grade 7	2.84	10.99	.000	Sig.
	Grade 8	3.08			
	Grade 9	3.33			
	Grade 10	3.04			

Table 8 reveals significant differences in junior high school students' awareness of solid waste management when grouped according to grade level across multiple categories. For the definition of solid waste, the analysis shows a significant difference in awareness among students at different grade levels, with a p-value of .000 and an F-value of 8.850. This indicates that the understanding of solid waste definitions varies notably depending on the students' grade levels. It further revealed that these differences (see table 11) are evident in grade 7 and grade 9 ($p=.000$), grade 8 and grade 9 ($p=.029$), and grade 9 and grade 10 ($p=.000$). This implies that grade 9 students have much higher mean score than grade 7, 8 and 10 students. Grade 9 students have a much better grasp of what solid waste is than the rest of the grade level.

In terms of the effects of improper solid waste disposal, a significant difference was also found ($p = .000$, $F = 8.739$), highlighting that students' awareness of the harmful consequences of improper disposal, such as environmental damage and health risks, differs across grade levels.

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The post hoc test confirmed differences (see Table 12) between grade 7 and grade 9 students. Grade 7 students show a significantly lower awareness compared to Grade 9 students, with a mean difference of $-.47780$ and a p-value of $.000$. This indicates that Grade 9 students have a significantly better understanding of the negative effects of improper waste disposal compared to Grade 7 students. Additionally, Grade 9 students have significantly higher awareness compared to Grade 10 students, with a mean difference of $.35744$ and a p-value of $.002$. This suggests that awareness of the effects of improper solid waste disposal is higher in Grade 9 compared to Grade 10 students.

Regarding solid waste prohibited activities, there is a statistically significant difference in awareness ($p = .014$, $F = 3.577$), indicating that students' understanding of activities that should be avoided, like littering and open burning, varies depending on their grade.

The post hoc test revealed a notable difference (see Table 13) between Grade 7 and Grade 9, with a mean difference of -0.33354 and a p-value of 0.007 , indicating that Grade 9 students have significantly higher awareness than their Grade 7 counterparts. These suggest that awareness of prohibited solid waste activities is significantly higher in Grade 9 students compared to those in Grade 7, while no substantial differences exist among other grade levels.

For the importance of solid waste, the ANOVA results show another significant difference ($p = .000$, $F = 6.812$), demonstrating that students in different grade levels have varying levels of awareness of the significance of proper waste management practices for environmental and public health.

The post hoc test (see Table 14) revealed that Grade 9 students demonstrate significantly higher awareness of the importance of solid waste compared to those in Grades 7 and 8. However, awareness does not significantly differ between Grade 9 and Grade 10.

Finally, for students' roles and responsibilities in solid waste management, the results again show a highly significant difference ($p = .000$, $F = 10.997$). This suggests that the awareness of personal responsibility in managing waste, such as reducing, recycling, and proper disposal, increases or decreases depending on the students' grade levels.

The post hoc test revealed that students' awareness of their roles and responsibilities in solid waste management increases with grade level, with Grade 9 students exhibiting the highest awareness and Grade 7 students the lowest. These differences highlight the importance of reinforcing waste management education as students advance through their academic journey.

The results indicate that grade level plays a significant role in shaping students' awareness across all aspects of solid waste management. The most prominent differences are observed in their understanding of solid waste definitions, the consequences of improper disposal, and their roles and responsibilities. Conversely, Magdayo et al. (2022, 1) on solid waste awareness, characterization, and management among students at Mindanao State University-Buug Campus. Their findings revealed that although students demonstrated a high level of awareness regarding solid waste management, no significant correlation was found between awareness and factors such as age, course, or year level.

Table 9: One-way ANOVA on significant differences in Practices of Solid waste Management when data are grouped according to age.

Practice on Solid Waste Management	age	Mean	f	p-value	Description
Segregating	12 years old	2.96	1.828	.107	Not sig.
	13 years old	2.79			
	14 years old	3.03			
	15 years old	2.97			
	16 years old	3.07			
	17 years old	3.05			
Reducing	12 years old	2.98	1.066	.379	Not sig.
	13 years old	2.79			
	14 years old	2.92			
	15 years old	3.00			
	16 years old	2.92			
	17 years old	2.97			
Reusing	12 years old	2.90	1.132	.343	Not sig.

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	13 years old	3.16			
	14 years old	3.27			
	15 years old	3.15			
	16 years old	3.22			
	17 years old	3.19			
Recycling	12 years old	2.57	.909	.475	Not sig.
	13 years old	2.88			
	14 years old	2.88			
	15 years old	2.83			
	16 years old	2.97			
	17 years old	2.84			
Disposing	12 years old	2.78	.949	.449	Not Sig.
	13 years old	2.93			
	14 years old	2.96			
	15 years old	2.94			
	16 years old	2.90			
	17 years old	2.74			

Table 9 presents the results of a one-way ANOVA analysis investigating the impact of age on various solid waste management practices, including segregating, reducing, reusing, recycling, and disposing of waste. The analysis revealed no significant differences in practices based on age across these categories.

For segregating solid waste, ANOVA showed an F-value of 1.828 with a significance level of 0.107, indicating that age does not significantly affect the ability to separate waste into categories like biodegradable and non-biodegradable. Similarly, in the reducing category, the F-value was 1.066 and the significance was 0.379, suggesting that different age groups do not differ significantly in their waste reduction practices.

In terms of reusing waste, the F-value was 1.132 with a significance of 0.343, reflecting no significant variation in how different age groups engage in practices such as using scrap paper or reusable containers. The analysis for recycling showed an F-value of 0.909 and a significance level of 0.475, indicating that age does not impact recycling behaviors, such as converting old items into new products.

Finally, regarding disposing of waste, the F-value was 0.949 with a significance of 0.449, showing no significant differences among age groups in their disposal practices, including the use of proper trash bins and composting biodegradable items. Overall, the results suggest that age does not significantly influence solid waste management practices, indicating a consistent approach to waste management across different age groups.

Conversely, Ifegbesan (2010, 1) examined the awareness, knowledge, and practices of secondary school students in Nigeria regarding waste management. The findings revealed a significant difference in awareness levels based on age. Similarly, Magdayo et al. (2022, 1) researched solid waste awareness, characterization, and management among Mindanao State University-Buug Campus constituents. Their study found that while students exhibited a high level of awareness regarding solid waste management, there was no significant relationship between awareness and age, further contradicting the findings of the current study.

Table 10: Independent t-test on significant differences in practices on Solid waste Management when data are grouped according to sex.

Practice on Solid Waste Management	Gender	Std. Deviation	Mean	t	Sig.	Description
A. Segregating	Male	.731	2.35	.560	.576	Not sig.
	Female	.763	2.30			
B. Reducing	Male	.631	2.79	-1.105	.270	Not sig.
	Female	.620	2.77			
C. Reusing	Male	.659	3.12	-1.552	.122	Not sig.
	Female	.543	3.20			

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D. Recycling	Male	.736	2.16	-2.678	.008	Sig.
	Female	.594	2.73			
E. Disposing	Male	.607	2.59	.026	.979	Not sig.
	Female	.574	2.59			

Table 10 presents the results of an independent t-test examining significant differences in solid waste management practices between males and females. The practices analyzed include segregating, reducing, reusing, recycling, and disposing of solid waste. For segregating waste, the t-test results show no significant difference between males and females, with a t-value of 0.560 and a significance level of 0.576. Both genders exhibit similar behaviors in separating waste, with mean scores of 2.35 for males and 2.30 for females (Table 8). This suggests that gender does not play a significant role in waste segregation practices, which is consistent with research by (madrigal and Oracion 2018, 1) who found that awareness and environmental knowledge, rather than gender, primarily influence waste segregation behaviors.

In the case of reducing waste, the t-test results also indicate no significant gender differences, with a t-value of -1.105 and a significance level of 0.270. The mean scores for males and females are 2.79 and 2.77, respectively (Table 8). This suggests that both genders are similarly involved in waste reduction practices, aligning with studies like those by madrigal and Oracion (2018, 1), who concluded that individual attitudes and environmental concerns, rather than gender, are more influential in shaping waste reduction behaviors. For reusing waste, the t-value was -1.552, with a significance level of 0.122, indicating no statistically significant difference between males and females. The mean score for males is 3.12, while for females, it is 3.20 (Table 8). This lack of significant difference in reusing behaviors is supported by research from madrigal and Oracion 2018, 1, which suggested that personal habits and environmental motivations are more impactful than gender in driving reusing behaviors. However, when it comes to recycling, there is a significant difference between males and females, with a t-value of -2.678 and a significance level of 0.008. The mean score for females is 2.73, compared to 2.16 for males, indicating that females are more likely to engage in recycling activities (Table 8). This is consistent with prior research, such as that by Madrigal and Oracion (2018, 1), which found that females tend to exhibit more pro-environmental behaviors, including recycling, compared to males. Finally, for disposing of waste, there is no significant gender difference, with a t-value of 0.026 and a significance level of 0.979 (Table 8). Both males and females have identical mean scores of 2.59, suggesting similar practices in waste disposal. This is in line with findings from past studies, such as Madrigal and Oracion (2018, 1), which reported that disposal behaviors tend to be uniform across genders, as they are often influenced by external factors like infrastructure and accessibility. Overall, the findings suggest that there are no significant differences between males and females in the practices of waste segregation, reduction, reuse, and disposal. However, females tend to be more actively involved in recycling compared to males.

A similar study by Madrigal and Reyes (2020, 1) assessed high school students' awareness, attitudes, and practices regarding solid waste management in a Diocesan Catholic School. Their findings revealed a significant relationship between practice and sex, indicating that gender influences solid waste management practices, which contradicts the present study's results. Likewise, Badonio et al. (2023, 1) examined junior high school students' awareness and practices related to solid waste management at Northwestern Mindanao State College of Science and Technology (NMSCST). Their study found significant associations between students' gender and their waste management practices, suggesting that sex plays a role in influencing waste management behaviors, a finding that contradicts the current study. Conversely, Dung et al. (2017, 1) assessed the knowledge and attitudes of college education students in Nigeria regarding solid waste management. Their results indicated that gender had no significant impact on student's knowledge and attitudes toward waste management, aligning with the findings of the present study.

Table 11: One-way ANOVA on significant differences in Practices of Solid waste Management when data are grouped according to grade level.

Awareness of Solid Waste Management	Grade level	Mean	F	p-value	Description
A. Segregating	Grade 7	2.77	6.866	.000	Sig.
	Grade 8	2.86			
	Grade 9	3.15			
	Grade 10	2.96			
	Grade 7	2.82	2.907	.035	Sig.

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B. Reducing	Grade 8	2.81			
	Grade 9	3.03			
	Grade 10	2.97			
C.Reusing	Grade 7	3.08	2.514	.058	Not Sig.
	Grade 8	3.15			
	Grade 9	3.30			
	Grade 10	3.21			
D.Recycling	Grade 7	2.83	.217	.885	Not Sig.
	Grade 8	2.86			
	Grade 9	2.87			
	Grade 10	2.91			
E.Disposing	Grade 7	2.86	3.143	.025	Sig.
	Grade 8	2.85			
	Grade 9	3.06			
	Grade 10	2.85			

The results of the one-way ANOVA analysis on the significant differences in Practices on Solid Waste Management across different grade levels reveal varying levels of awareness and engagement in solid waste management practices.

The findings indicate that Segregating ($F = 6.866$, $p = .000$) implies a statistically significant difference between grade levels. The post hoc test (see Table 19) revealed that Grade 9 students exhibit significantly better practices compared to both Grade 7 and Grade 8. A significant mean difference of -0.37952 ($p = 0.000$) between Grade 7 and Grade 9 indicates that Grade 9 students are more engaged in solid waste segregation. Similarly, the comparison between Grade 8 and Grade 9 shows a significant mean difference of -0.29063 ($p = 0.010$), further supporting the heightened participation of Grade 9 students in this practice, and is significantly different between Grade 7 and Grade 10 students.

In addition, reducing solid waste ($F = 2.907$, $p = .035$) suggests a statistically significant difference between the mean scores in terms of reducing solid waste among students. The post hoc test (see Table 20) revealed that there is a significant mean difference of -0.21138 ($p = 0.036$) between Grade 7 and Grade 9, indicating that Grade 9 students are more actively involved in reducing solid waste. Similarly, between Grade 8 and Grade 9, a significant mean difference of -0.21614 ($p = 0.031$) further suggests that Grade 9 students outperform those in Grade 8 in their efforts to reduce waste.

Moreover, disposing ($F = 3.143$, $p = .025$) shows statistically significant differences among grade levels, suggesting that students' practices in this area vary depending on their grade level. Specifically, Grade 9 students demonstrated the highest mean scores in these aspects, indicating greater engagement in segregation, reduction, and disposal of waste. Post hoc test revealed that there is a significant difference between Grade 8 and Grade 9, with a mean difference of -0.20476 ($p = 0.045$), suggesting that Grade 9 students are more proactive in disposing of solid waste compared to Grade 8 students. Additionally, the comparison between Grade 9 and Grade 10 also shows a significant mean difference of 0.20958 ($p = 0.047$), further indicating that Grade 9 students exhibit better waste disposal practices than Grade 10 students.

On the other hand, the results for Reusing ($F = 2.514$, $p = .058$) and Recycling ($F = .217$, $p = .885$) show no significant differences, implying that students across all grade levels have relatively similar practices in these areas. This suggests that while efforts in reusing and recycling are present, they do not significantly vary across different grades. Overall, the findings highlight the need for targeted interventions to strengthen solid waste management practices, particularly in areas where significant differences exist, to ensure consistency in sustainable waste management behaviors among students.

Madrigal and Reyes (2020, 1) conducted a descriptive-correlational study examining the awareness, attitudes, and practices of high school students regarding solid waste management (SWM) in a Diocesan Catholic School. Their findings revealed a significant relationship between awareness, practice, sex, and academic level, suggesting that grade level plays a crucial role in shaping students' awareness and waste management practices. This aligns with the current study, which found significant differences in SWM practices, indicating that as students' progress in grade level, their awareness and engagement in waste management also increase.

Similarly, Badonio et al. (2023, 1) investigated the awareness and practices of junior high school students regarding SWM at Northwestern Mindanao State College of Science and Technology (NMSCST). Their study reported significant associations between students' academic level and their waste management practices, reinforcing the idea that grade level influences SWM

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behaviors. These findings support the results of the present study, highlighting the role of academic progression in shaping students' waste management practices.

Testing the significant relationship between cognizance and practices of junior high school students toward solid waste management.

Table 12: Pearson Correlation on the relationship between awareness and practices of junior high school students toward solid waste management.

Awareness of Solid Waste Management (x)		Practice on Solid Waste Management (y)		R Value	p-value	Decision
Mean	Standard deviation	Mean	Standard deviation	.646	.000	Significant
2.99	.56	2.63	.56			

Table 12 summarizes the results of the Pearson correlation analysis examining the relationship between junior high school students' awareness and their solid waste management practices. The analysis reveals a significant positive correlation, with a Pearson correlation coefficient of $r = .646$ ($p < .001$), indicating a strong association between students' level of awareness and their engagement in solid waste management practices.

The mean awareness score among students is 2.99, with a standard deviation of 0.56, suggesting a moderate to high level of understanding of solid waste management concepts. Likewise, their mean practice score is 2.63, with the same standard deviation, reflecting a moderate level of participation in proper waste management activities. The correlation value of 0.646 further implies that students with greater awareness of solid waste management principles are significantly more likely to adopt responsible waste management behaviors. The highly significant p-value (.000) confirms that this relationship is not coincidental, reinforcing the importance of educational initiatives and awareness programs in enhancing students' waste management practices.

Reyes and Madrigal (2020, 1) conducted a descriptive-correlational study on high school students' awareness, attitudes, and practices concerning solid waste management in a Diocesan Catholic School. Utilizing a researcher-developed instrument, their study employed mean, standard deviation, and Pearson correlation analyses. The findings demonstrated that students exhibited high awareness, a very positive attitude, and strong engagement in solid waste management practices. A significant correlation was observed between awareness and practice, with awareness and attitude identified as key predictors of students' waste management behaviors, aligning with the present study's findings.

In a similar vein, Debrah et al. (2020) emphasized that solid waste management (SWM) is a complex issue shaped by political, socioeconomic, institutional, and environmental factors, especially within urban settings of developing nations. Their study revealed that although secondary and tertiary students tend to demonstrate considerable environmental awareness and favorable attitudes, a lack of practical instruction persists due to many teachers' insufficient experience in effectively guiding students in applying SWM strategies. Likewise, Paghasian (2017) explored the correlation between awareness and SWM practices among college students at Mindanao State University – Maigo School of Arts and Trades. Employing a descriptive-correlational method, the study surveyed 253 randomly selected students using a questionnaire focused on their awareness and engagement in SWM activities. Findings showed that students were highly aware of SWM, exhibiting strong practices in waste segregation, reduction, and recycling, while reuse and disposal were only moderately practiced. Importantly, the study concluded that awareness significantly influenced behaviors such as segregation, reduction, reuse, and recycling, but did not directly affect disposal practices.

CONCLUSION AND RECOMMENDATIONS

From the findings drawn, the following conclusions were generated:

Firstly, the findings of this study indicate that junior high school students at Zamboanga National High School West possess a solid understanding of solid waste management concepts, including their effects and the responsibilities associated with proper waste disposal. Their commitment to reusing, reducing, and disposing of waste reflects a foundational awareness of sustainable practices. However, the need for improvement in waste segregation and recycling practices is evident, suggesting that while awareness is present, further emphasis on these specific areas is necessary to enhance overall waste management efforts.

Secondly, the study also highlights the significant influence of age on students' awareness of solid waste management, with younger students, particularly those aged 13, demonstrating lower awareness levels. This underscores the necessity for targeted educational interventions tailored to this age group. Additionally, the findings reveal gender differences in awareness,

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with female students exhibiting greater knowledge of solid waste issues than their male counterparts. As students progress through grade levels, awareness increases, peaking in Grade 9, reinforcing the need for educational initiatives that adapt to the developmental stages of students.

Thirdly, the analyses indicate that while solid waste management practices are generally consistent across age groups, notable differences are observed based on gender and grade level, particularly in recycling behaviors. Grade 9 students are identified as more proactive in segregating, reducing, and disposing of waste, highlighting the importance of targeted environmental education programs to build upon this momentum. Lastly, the statistically significant relationship between awareness and engagement in solid waste management practices emphasizes the critical role of education in promoting sustainable behaviors. By fostering higher awareness levels through comprehensive educational initiatives, Zamboanga National High School West can encourage more effective waste management practices among its students, ultimately contributing to a healthier and more sustainable environment.

Based on the findings and conclusions, the following recommendations were offered: To enhance solid waste management practices among junior high school students at Zamboanga National High School West, several key recommendations are proposed.

To DepEd Curriculum planners, recognizing the need for targeted educational interventions for younger students, it is recommended to develop an age-specific curriculum addressing the knowledge gaps identified in 13-year-olds regarding prohibited activities and the importance of waste management. Engaging these students through age-appropriate activities, such as games or contests, can further enhance their understanding. Moreover, promoting gender-inclusive awareness campaigns can help address disparities in solid waste management awareness between male and female students. This includes organizing gender-sensitive workshops that emphasize the role of male students in recycling while empowering female students to lead initiatives.

To Parents and Guardians, increasing parental involvement through informational sessions about solid waste management can encourage families to reinforce these principles at home. Forming partnerships with local organizations dedicated to environmental sustainability can provide additional resources and expertise for school initiatives.

To student leaders/environmental advocates, utilizing technology and social media to promote awareness among students can create engaging content that highlights the importance of responsible waste management practices. By implementing these recommendations, Zamboanga National High School West can foster a stronger sense of responsibility among students and contribute to a more sustainable environment.

The Future Researchers conduct extensive research on the external factors affecting the segregation and disposal of solid waste materials and extend the number of participants to capture a wider scope and increase generality of the results. Finally, to the school heads/administrators, create a Solid waste management policy, guidelines, and student handbook for efficiently managing the problems with solid waste.

To School DRRM/SWM focal Person, Integrating solid waste management guidelines and student handbook to continuously monitor and evaluate waste management practices, establishing a feedback mechanism for regular student input is essential, along with conducting annual assessments to track progress and adjust educational strategies accordingly.

A. Proposed Intervention: Policy Guidelines for Zamboanga National High School West

Solid Waste Management Policy Guidelines for
Zamboanga National High School West

I. Introduction

Zamboanga National High School West is committed to fostering a clean, healthy, and sustainable learning environment by implementing a comprehensive Solid Waste Management Policy. This initiative aligns with the provisions of Republic Act No. 9003 (Ecological Solid Waste Management Act of 2000) and aims to cultivate a sense of environmental responsibility among students, faculty, and staff.

II. Objectives

1. Waste Reduction: Minimize the amount of waste generated in school.
2. Segregation at Source: Ensure proper segregation of waste at the point of generation.
3. Recycling and Reuse: Promote recycling and the reuse of materials whenever possible.
4. Environmental Education: Foster awareness and behavioral change towards responsible waste management.
5. Compliance with National Laws: Ensure adherence to local and national waste management regulations.

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III. Scope

This policy applies to all individuals within the school premises, including students, faculty, staff, visitors, and vendors operating within Zamboanga National High School West.

IV. Waste Classification

1. Biodegradable Waste: Includes food scraps, garden waste, and other organic materials that can decompose naturally.
2. Non-biodegradable Waste: Comprises plastics, metals, and other materials that do not decompose.
3. Recyclable Waste: Paper, cardboard, bottles, and materials that can be processed and reused.
4. Hazardous Waste: Includes batteries, light bulbs, chemicals, and electronic waste (e-waste).

V. Waste Management Procedures

1. Segregation and Collection:
 - Designate waste bins for biodegradable, non-biodegradable, recyclable, and hazardous waste throughout the school premises.
 - All members of the school community are responsible for properly segregating their waste before disposal.
 - Establish a collection schedule in coordination with local waste management authorities.
2. Recycling Program:
 - Encourage the reuse of paper and other materials in school activities.
 - Set up a materials recovery facility (MRF) within the school to process recyclables.
 - Partner with local recyclers to facilitate the proper disposal of recyclable materials.
3. Composting:
 - Implement a school composting program to process biodegradable waste for use in the school's gardens.
 - Establish compost pits or bins in designated areas, ensuring proper maintenance.
4. Hazardous Waste Disposal:
 - Ensure the safe disposal of hazardous materials in compliance with local and national regulations.
 - Coordinate with specialized agencies for the safe collection and processing of hazardous waste.

VI. Roles and Responsibilities

1. School Administration:
 - Develop and enforce the Solid Waste Management Policy.
 - Ensure that all necessary resources for waste management (bins, signage, composting areas) are available.
 - Monitor compliance and take corrective actions when necessary.
2. Faculty and Staff:
 - Lead by example in practicing proper waste segregation and management.
 - Integrate environmental education and waste management practices into the curriculum.
 - Supervise students in adhering to waste disposal protocols.
3. Students:
 - Actively participate in waste segregation, recycling, and composting programs.
 - Take part in environmental clubs or activities that promote sustainability.
4. Parent-Teacher Association (PTA):
 - Support waste management initiatives by organizing school-community waste reduction campaigns.
 - Participate in fund-raising activities for waste management infrastructure.
5. Local Government and Environmental Agencies:
 - Provide technical assistance, training, and support for the school's waste management programs.
 - Coordinate with the school in the safe disposal of collected waste.

VII. Monitoring and Evaluation

1. Conduct regular audits of the waste management system to identify areas for improvement.
2. Involve students in waste monitoring activities, such as waste audits and awareness campaigns.
3. Evaluate the effectiveness of the policy annually and update as necessary to reflect changing needs and regulations.

VIII. Penalties and Incentives

1. Penalties:
 - Students or staff who fail to comply with the waste management protocols may be subject to disciplinary actions as outlined in the school's code of conduct.

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- Fines may be imposed for vendors or visitors who violate the waste segregation rules.
- 2. Incentives:
 - Recognize and reward students, classes, or departments that demonstrate exemplary waste management practices.
 - Provide incentives such as certificates, awards, or environmental leadership opportunities for outstanding contributions.

IX. Awareness and Training

1. Conduct regular workshops and seminars for students, faculty, and staff on proper waste management practices.
2. Integrate solid waste management topics into the school's curriculum, focusing on environmental sustainability.
3. Install clear signage on waste bins and designated areas to guide proper waste segregation.

X. Implementation Timeline

1. Phase 1 (Months 1-3):
 - Conduct waste assessment and baseline study.
 - Set up waste segregation infrastructure and assign designated waste collectors.
2. Phase 2 (Months 4-6):
 - Launch the recycling and composting programs.
 - Begin environmental education and awareness campaigns.
3. Phase 3 (Ongoing):
 - Continuous monitoring and evaluation of the system.
 - Expansion of programs based on feedback and observed needs.

This Solid Waste Management Policy for Zamboanga National High School West aims to cultivate a culture of environmental responsibility, helping to reduce the school's ecological footprint while educating future generations on the importance of sustainability.

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