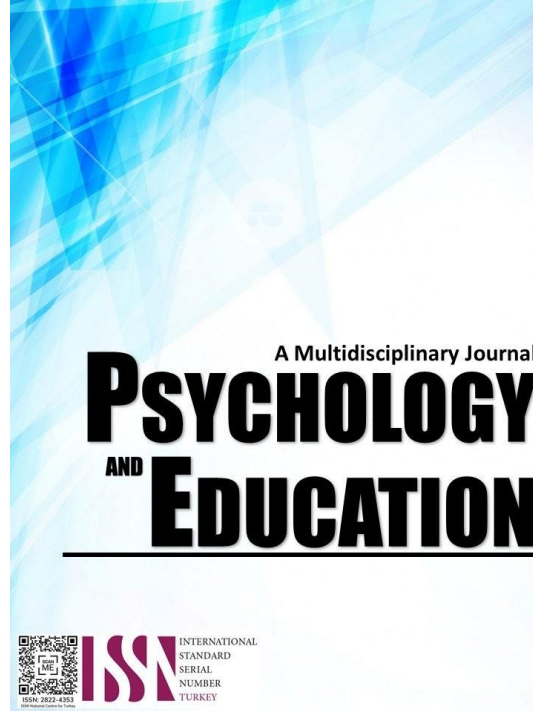


AWARENESS AND PRACTICES IN THE IMPLEMENTATION OF SOLID WASTE MANAGEMENT



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Awareness and Practices in the Implementation of Solid Waste Management

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Abstract

The study examined the extent of implementation of solid waste management awareness and practices. It focused on the 114 teaching and non-teaching personnel from 11 different Primary and Elementary Schools in the School Year 2024-2025 of Poonapiagapo District, Division of Lanao del Norte. It employed descriptive - correlational method of design. The study aimed to identify the extent of awareness and implementation practices in terms of segregation, reduction, reuse, recycling, and disposal of teaching and non-teaching personnel. The findings revealed that respondents demonstrated a thorough understanding of Solid Waste Management Practices in terms of segregation, reduction, reuse, recycling, and disposal of waste. However, there was a significant gap in terms of its implementation practices. The findings revealed a predominantly early-to-mid-career female teaching population with strong waste segregation understanding, although improvements were needed in reuse, recycling, and advanced disposal. Awareness, significantly influenced by demographic factors like age and tenure, was key to successful waste management practice implementation. While certain demographics impact implementation, a high level of institutional commitment to waste management was evident. An action plan was designed as the output of the study.

Keywords: *solid waste management, segregation, reduction, reuse, recycling, disposal*

Introduction

Fast growth of the human population coupled with rapid industrialization and urbanization has triggered enormous waste production. The situation is devastating in rural areas where there is a dearth of scientific waste management strategies, mostly in the context of underdeveloped and developing countries. Solid Waste Management (SWM) is a critical environmental problem with direct effects on both environments. It can be in the air, water, and soil, and public health. The increase in waste generation across the world greatly complicates proper waste management activities. Any non-liquid waste created by individuals, households, small businesses, or institutions outside of the waste generated within cities is referred to as Solid Waste (SW) and the uncontrolled disposal of SW may affect public health and the environment as well (Derilo, 2021).

Solid waste generation is an unavoidable consequence of human activity, and its management has a negative influence on both human and environmental health. Incessant increase of solid waste is causing serious global concern to manage the waste in a sustainable manner and hence several solid waste management (SWM) options have been explored till date (Khan et al., 2022).

The rapid growth in urban populations, economies, and power consumption in developing countries, combined with the failure of institutional authorities responsible for city planning, road works, SWM, and the environment to execute their core functional duties, has led to rampant SW generation. SWM plays a vital role in minimizing the impacts faced by municipal and rural areas due to increasing urbanization. It has become a major environmental challenge in developing countries due to the economic growth and the acceleration of consumption, which caused an expansion in SW generation. SWM systems in most cities of lower-middle income countries are underachieving their goals, underperforming, and originating adverse sustainability effects in urban growth and development (Derilo, 2021).

As defined by RA No. 9003 “Ecological Solid Waste Management Act of 2000” Waste identified or listed as hazardous waste (either solid, liquid, gaseous or in semisolid form) which may cause or contribute to death, serious or incapacitating illness, or acute/chronic effect on the health of persons and other organisms. The law also defined Solid waste as refers to all discarded household waste, commercial waste, nonhazardous institutional and industrial waste, street sweepings, construction debris, agricultural waste, and other non- hazardous/non-toxic solid waste.

Furthermore, the major issue that needs to be addressed right away is the lack of solid waste management in schools. For everyone to study in a healthier, safer, and more sustainable environment, comprehensive waste management strategies that emphasize segregation, reduction, reuse, recycle, and appropriate disposal must be put into place. To maintain the environment and the school community over the long term, cooperation between local authorities, educators, parents, students, and administrators is necessary.

In addition, the absence of a sustainable waste management system in a school sets off a chain reaction of unfavorable events that affects the community, educators, and students' well-being. For everyone's learning environment to be healthier, safer, and more sustainable, a complete waste management policy that emphasizes segregation, reduction, recycling, reuse, and appropriate disposal must be put into place.

Moreover, this study is anchored on and Republic Act No. 9512, the National Environmental Awareness and Education Act of 2008. This law underscored the importance of promoting environmental awareness and responsible waste management practices, particularly within educational institutions.

Subsequently, it took place in the School Year 2024–2025, and concentrated on the teachers in the District of Poonapiago area, Lanao del Norte division. This period of time permitted a thorough analysis of the population's knowledge of and use of solid waste management techniques. The study intended to offer important insights into the difficulties and possibilities for promoting sustainable waste management practices in a localized context. It also focused on the teachers in this particular district. In order to improve environmental sustainability within the school context in Poonapiago, Lanao del Norte, future interventions and policy decisions would be informed by the data collected during this period. This would provide an overview of the current status of waste management awareness and practices.

Research Questions

The goal of the study was to identify the awareness and practices of the implementation of solid waste management in the Poonapiago District. Specifically, the study sought to answer the following questions:

1. What is the demographic profile of the respondents in terms of:
 - 1.1. age;
 - 1.2. sex;
 - 1.3. highest educational attainment;
 - 1.4. plantilla position; and
 - 1.5. length of service?
2. What is the level of respondents' awareness in terms of:
 - 2.1. segregation;
 - 2.2. reduction;
 - 2.3. reuse;
 - 2.4. recycle; and
 - 2.5. disposal?
3. What is the extent of implementation of solid waste management practices in terms of:
 - 3.1. segregation;
 - 3.2. reduction;
 - 3.3. reuse;
 - 3.4. recycle; and
 - 3.5. disposal?
4. Is there a significant difference between the level of awareness and implementation of solid waste management practices among respondents based on their demographic profile?
5. Is there a significant relationship between the demographic and awareness of solid waste management practices?
6. Which of the respondents' demographic profiles and levels of awareness significantly predict the waste management practices of the respondents?
7. What action plan can be designed based from the results of the study?

Methodology

Research Design

This study used descriptive - correlational method of research to analyze the relationship of the variables. It utilized surveys or questionnaires to gather the needed data essential for the study. Quantitative descriptive - cumulative research was used to observe the relationship between the variables with the principal objective to analyze the level of awareness and extent of implementation of solid waste management through the use of statistical treatment analysis.

Respondents

The respondents of this study were the teaching and non-teaching personnel of Poonapiago District, Division of Lanao del Norte for the school year 2024-2025. The researcher employed random sampling to determine the extent of implementation of solid waste management practices in various sets of respondents by dividing the respondents into subgroups based on their specific characteristics such as age, sex, highest educational attainment, teaching designation, and number of years in service.

The researcher chose Poonapiago District where she is currently teaching as her key respondents due to her deep concern regarding the practices of the individuals within this setting who have not been adhering to appropriate solid waste management practices. The respondents in question failed to reflect on the fundamental principles of waste management, including segregation, reduction, reuse, recycling, and proper disposal within the school premises. This choice stemmed from a desire to address and improve the current shortcomings in waste management practices within the school community, aiming to foster a more sustainable and environmentally conscious approach towards waste management.

To ensure that every member of the population has an equal chance of being included in the sample, the study used stratified random sampling to create a sample that accurately reflects the characteristics of the population being studied. It involves dividing the

population into subgroups, or strata, based on shared characteristics, and then randomly selecting samples from each stratum.

Instrument

The researcher used structured questionnaire adapted from Lalamonan (2019). New five questions were included by the researcher to address specific research objectives not covered by the original questionnaire and the questionnaire underwent pilot testing with the teachers at Poonapiagapo National High School. The adapted questionnaire was likely relevant to the local context of the school, the teachers' roles, and the research objectives. The questionnaire was based on Likert scale questions to measure the respondents' awareness, implementation, and attitudes related to solid waste management. The respondents were selected regardless of the teachers' age, and sex, highest educational attainment, teaching designation, and their number of years in service.

Procedure

Upon the approval of the research instrument, the researcher formally wrote the letter of permission signed by the adviser and the Dean of Graduate Studies of St. Peters College to conduct this study to the Schools Division Superintendent of Lanao del Norte through the school heads of Poonapiagapo District to seek its permission to allow the study to take place.

As the request permission was granted, the researcher personally visited the schools to gather the data needed for the study. This determined their willingness to participate in the study. After the approval from the concern individuals, the researcher continued the data gathering procedure wherein she personally administered the distribution and retrieval of the survey questionnaire.

The research instrument with complete instructions was provided for the respondents. Emphasis was placed on the rule that there is no right or wrong answer to each questionnaire. Retrieval of the questionnaires was tabulated by the researcher and the results were endorsed to statistician for statistical treatment.

Data Analysis

The data was tabulated and interpreted to acquire the actual information needed. The following statistical tools were employed to answer the different problems presented.

For Problem 1, Frequency and Percentage Distribution were used in analyzing and determining the demographic profile of the respondents age, sex, highest educational attainment, teaching designation and number of years in service.

For Problem 2, Mean and Standard deviation were used to measure the level of respondents' awareness in terms of segregation, reduction, reuse, recycle, and disposal.

For Problem 3, Frequency and percentage Distribution were used to measure extent of implementation of solid waste management practices in terms of segregation, reduction, reuse, recycle, and disposal.

For Problem 4, t- test was used to assess the significant difference between the level of awareness and implementation of solid waste management practices among respondents based on their demographic profile.

For Problem 5, Pearson's r Correlation coefficient was used in determining the significant relationship between the socio-demographic and awareness of solid waste management practices at Poonapiagapo District.

For Problem 6, Regression Analysis was used to test the relationship between the respondents' socio-demographic profile, level of awareness and the waste management practices of the respondents.

Results and Discussion

This section comprises the analysis, presentation, and interpretation of the finding resulting from this study. The analysis and interpretation of data is carried out based on the results of a modified questionnaire based on the problems presented.

Problem 1: What is the demographic profile of the respondents in terms of age, sex, highest educational attainment, teaching designation, and number of years in service?

Table 1. *Age of the Respondents*

<i>Age (in years)</i>	<i>Frequency</i>	<i>Percentage (%)</i>
21-30	27	27.0
31-40	36	36.0
41-50	25	25.0
51-above	12	12.0
Total	100	100.0

Based on Table 2, which summarizes the age distribution of the respondents, the majority of individuals fell within the 31-40 age group, accounting for 36% of the total respondents. This was followed by the 21-30 age group, comprising 27% of the respondents. The 41-50 age group represented 25% of the participants, while the 51-and-above category accounted for the smallest proportion at 12%. The data suggested that the sample was predominantly composed of individuals in their early to mid-career stages, with a noticeable

declined in representation among older age groups.

According to Esman and Bual (2023) a study perceived that the younger the teachers and the shorter teaching experience were more collaborative than those older and longer in teaching. The older and longer the teachers were in teaching, the more they were resistant to changes and collaborative activities.

Table 2. *Sex of the Respondents*

<i>Sex</i>	<i>Frequency</i>	<i>Percentage (%)</i>
Male	1	1.00
Female	99	99.0
Total	100	100.0

Table 2 reveals the sex distribution of the respondents. The vast majority of the respondents were female, representing 99% of the total sample, while only 1% was male. This indicated a significant gender imbalance in the sample, suggesting that the data predominantly reflected the perspectives or characteristics of female participants.

The dominance of the female teachers could be ascribed or accounted to the noted dedication and commitment of women in the teaching profession. The shifting of the male sector to engage in skilled manpower and preference to work abroad were attributed to the decrease in the number of males engaged in the teaching profession.

According to Brade as cited by Abdon and Farin (2022) on the research capabilities of teachers where females dominated in the study. Similarly, the same author stressed that more women excelled in the teaching profession because of the premise of their ability to show more care, patience, and understanding among children compared to men.

Table 3. *Highest Educational Attainment of the Respondent*

<i>Highest Educational Attainment</i>	<i>Frequency</i>	<i>Percentage (%)</i>
Bachelor's Degree	50	50.0
With MA/MS units	10	10.0
MA/MS CAR	4	4.0
Full-fledged Master	31	31.0
With PhD/EdD units	2	2.0
Full-fledged PhD/EdD	3	3.0
Total	100	100.0

Table 3 provides an overview of the highest educational attainment among the respondents. The majority of respondents held a Bachelor's Degree, accounting for 50% of the sample. This was followed by those with a full-fledged Master's degree, representing 31%. A smaller proportion had completed coursework toward a Master's degree (10%) or held a Master's degree with a Candidate for Advancement to Research (CAR) status (4%). Respondents with PhD/EdD qualifications were relatively few, with only 3% holding a full-fledged doctorate and 2% having completed some doctoral coursework. These figures indicated that most respondents had at least an undergraduate education, with a significant portion having pursued or completed advanced degrees, reflecting a generally well-educated population.

These findings aligned with the observation of Abdon and Farin (2022) stated that the importance of taking graduate studies not only for professional competence and advancement but for promotion in the future. This held on to the desire not to remain Teacher I for the rest of their lives but was motivated by their desire to be promoted as Head Teacher or School Administrator someday. Similarly to the study of Catacutan (2022), who in her study found that the teachers' respondents had pursued their graduate studies as a basis for professional and career development.

Table 4. *Plantilla Position of the Respondents*

<i>Plantilla Position</i>	<i>Frequency</i>	<i>Percentage (%)</i>
Principal I	2	2.0
Master Teacher I	4	4.0
Master Teacher II	1	1.0
Head Teacher III	1	1.0
Head Teacher I	1	1.0
Teacher III	15	15.0
Teacher II	9	9.0
Teacher I	62	62.0
Administrator Officer II	4	4.0
ADAS I	1	1.0
Total	100	100.0

Table 4 details the plantilla positions of the respondents, showing that the majority, 62%, were designated as Teacher I. This was followed by 15% who held the Teacher III position and 9% as Teacher II. Administrative and supervisory positions made up a smaller portion of the sample, with 4% serving as Master Teacher I and another 4% as Administrative Officers. Other roles such as Principal I



(2%) and Master Teacher II (1%) were represented minimally, while positions like Head Teacher II and Principal II had no respondent. The data highlighted that most of the respondents were in entry-level or junior teaching positions, with relatively fewer occupying leadership or specialized teaching roles.

According to Mclean (2019), the most successful teachers I gaining promotion developed a career strategy, and career time table. Also, teachers developed a career anchorage perspective which influenced the level of promotion that satisfied their career needs. This perspective being reassessed and re-adjusted by the individual at different stages in their career.

Table 5. Length of Service of the Respondents

<i>Length of Service</i>	<i>Frequency</i>	<i>Percentage (%)</i>
Below-4	18	18.0
5 – 9	41	41.0
10 - 14	12	12.0
15 - 19	7	7.0
20 - 24	13	13.0
25 - 30	9	9.0
Total	100	100.0

Table 5 provides the distribution of respondents based on their length of service. The largest group, 41%, had 5-9 years of experience, followed by 18% with less than 4 years of service. Those with 20-24 years and 10-14 years of service accounted for 13% and 12%, respectively. Smaller proportions of respondents had served for 25-30 years (9%) and 15-19 years (7%). The data suggested that the majority of the respondents were relatively early to mid-career professionals, with fewer individuals in longer-tenured roles.

According to Janardhanan and Raghavan (2018), found that employees’ tenure was positively related to their performance. The longer their tenure at their respective organizations, the higher was their job performance. Employees who have worked for a much longer period were more familiar with the job and therefore, were able to perform much better than newer staff. They were also more committed and loyal to their organizations and held more responsible positions that made them perform better.

A teacher’s years of teaching experience had been described as important predictors of a teacher’s ability to effectively alter his or her teaching actions. Many studies had suggested that teachers do change in terms of their approach to classroom situations across the span of their careers (McMillan, 2019). Expert teachers had been described by Leinhardt and Greeno (2016) as displaying well-practiced routines that contain more effective methods for obtaining desired responses from students.

Problem 2: What is the Level of Respondents’ Awareness in terms segregation, reduction, reuse, recycle, and disposal?

Table 6. Level of Respondents’ Awareness on Solid Waste Management Practices in terms of Segregation

<i>Indicators</i>	<i>Mean</i>	<i>SD</i>	<i>Description</i>
1. Segregation of biodegradable (paper, banana peels, cardboard, food wastes, leaves, twigs, and vegetables) and non-biodegradable (plastic toys, glass, steel, rubber) wastes at school.	1.00	0.00	Very High
2. Segregation of recyclable wastes (paper, cardboard, plastic bottles) from non-recyclable or residuals which have no potential for reuse and recycling (sando bags, napkins, diapers, ball pens, etc.)	1.00	0.00	Very High
3. Segregation of non-harmful wastes from toxic and hazardous wastes such as pentel pens, laboratory chemicals, ink, cell batteries and others.	1.00	0.00	Very High
4. Segregation of medical waste (used syringes, bandages, etc.) for safe disposal and preventing the spread of infections.	1.00	0.00	Very High
5. Segregation of metal waste (cans, foil, etc.) for recycling or reuse.	1.00	0.00	Very High
6. Segregation of plastic waste (bottles, bags, containers, etc.) based on their type and recyclability.	1.00	0.00	Very High
7. Segregation of e-waste (old mobile phones, chargers, etc.) from other waste.	1.00	0.00	Very High
8. Segregation of textile waste (clothes, shoes, etc.) for recycling, donation, or proper disposal.	1.00	0.00	Very High
9. Segregation of bulky waste (furniture, appliances, etc.) for proper disposal.	1.00	0.00	Very High
10. Segregation of food waste for composting or anaerobic digestion to create valuable soil amendments.	1.00	0.00	Very High
Total Measure	1.00	0.00	Very High

Note: 1.00–1.49 – Very High; 1.50–2.49 – High; 2.50–3.49 – Low; 3.50–4.00 – Very Low.

Table 6 presents the level of respondents' awareness regarding solid waste management practices, specifically in terms of segregation. Across all ten indicators, the respondents achieved a mean score of 1.00 with a standard deviation of 0.00, indicating uniformly "Very High" awareness. The data revealed that respondents demonstrated a thorough understanding of critical segregation practices, including the differentiation of biodegradable and non-biodegradable wastes, recyclable versus non-recyclable materials, and the separation of hazardous, medical, and e-wastes. Furthermore, they exhibited comprehensive awareness of specific practices such as segregating bulky, plastic, textile, and metal wastes, as well as composting food waste.

These findings suggested a strong adherence to proper waste segregation protocols, reflecting effective education or training initiatives on solid waste management within the respondents' environment. The implications were significant, as high awareness was a fundamental precursor to successful implementation of waste management practices. This level of awareness enhanced the potential for reducing environmental pollution, promoting recycling, and improving public health by minimizing exposure to hazardous and medical wastes. The results also underscored the readiness of the respondents to actively participate in sustainable waste management systems, which can be further leveraged through policy enforcement and resource allocation.

Kihila et al. (2021) reported that waste segregation is a crucial element in the waste management chain for effective implementation of the 3Rs. Segregation at the source simplifies handling and processing, thereby facilitating resource recovery, promoting reuse and recycling, and reducing operational costs. In contrast, few researchers argued that the waste segregation practice was more influenced by knowledge, attitude, awareness, facilities, and incentives rather than the enforcement of the law (Rangga et al., 2022).

Therefore, waste segregation at source, particularly at the household level, is an integral component of sustainable solid waste management, which is a critical public health issue. Although multiple interventions have been published, often with contradictory findings, few authors have conducted a comprehensive systematic synthesis of the published literature. A systematic review to synthesize all published interventions conducted in any country in the world which targeted household-level waste segregation with or without additional focus on recycling or composting (Trushna et al., (2024).

Waste segregation is the process of separating different types of waste at the source to facilitate efficient processing and management. Effective segregation is essential for improving recycling rates, reducing contamination, and ensuring the quality of recyclable materials. According to recent studies, source segregation can significantly enhance resource recovery and reduce the environmental impact of waste disposal (Mishra, 2024). However, challenges such as lack of awareness and inadequate infrastructure often hinder the implementation of effective segregation practices, particularly in developing regions (Zhang et al., 2024).

Table 7 evaluates the respondents' level of awareness regarding solid waste management practices in terms of reducing waste. Across all ten indicators, the respondents achieved a "Very High" level of awareness, with a total mean of 1.00 and a standard deviation of 0.10. This consistent high score underscored the respondents' strong understanding and commitment to waste reduction practices.

The specific practices with "Very High" awareness included borrowing, sharing, or renting items for occasional use, mindful purchasing to prevent food waste, and using reusable containers for lunches, beverages, and snacks. Respondents also displayed awareness of avoiding single-use plastics, such as disposable straws, cutlery, plastic bags, and paper towels, and demonstrated knowledge of sustainable purchasing habits, such as choosing products with minimal packaging and buying in bulk.

Table 7. Level of Respondents' Awareness on Solid Waste Management Practices in terms of Reduce

Indicators	Mean	SD	Description
1. Borrowing, sharing, and/or renting things that are needed occasionally.	1.00	0.00	Very High
2. Buying only what is needed so that one will not end up throwing away extra food.	1.00	0.00	Very High
3. Packing lunch in reusable lunchbox so that one cannot buy wrapped/packed food at school.	1.00	0.00	Very High
4. Bring water in reusable water bottles than buying water in one used plastic bottles at the school.	1.00	0.00	Very High
5. Bring snacks and beverages in reusable containers.	1.00	0.00	Very High
6. Use of reusable cutlery and straws in the canteen.	1.00	0.00	Very High
7. Say no to single-use plastic bags.	1.00	0.00	Very High
8. Avoid using disposable paper towels.	1.00	0.00	Very High
9. Choose products with less packaging.	1.00	0.00	Very High
10. Buy in bulk to reduce packaging waste.	1.01	0.10	Very High
Total Measure	1.00	0.10	Very High

Note: 1.00–1.49 – Very High; 1.50–2.49 – High; 2.50–3.49 – Low; 3.50–4.00 – Very Low.

The high level of awareness reflected the success of educational and advocacy efforts aimed at promoting waste reduction. This understanding can significantly contribute to minimizing waste generation and environmental pollution. The data implied that respondents were well-prepared to adopt sustainable consumption practices in their daily routines. Moving forward, these findings suggested opportunities to further reinforce reduction behaviors through institutional policies, incentives, and campaigns that encouraged sustainable lifestyles, particularly within school and community settings.

Reduction was the most preferred ways in solid waste management. Doing reduction saved natural resources, reduced toxicity of waste and reduced costs (Molina & Catan, 2019). Waste reduction refers to strategies aimed at minimizing the generation of waste at its source. This can be achieved through practices such as using fewer materials, buying in bulk, and avoiding single-use items. Research indicates that waste reduction not only protects the environment but also reduces costs associated with waste disposal (Zakhilwal et al., 2024).

Additionally, the integration of circular economy principles, which prioritize waste prevention and material recovery, has been shown

to significantly reduce waste generation and promote resource efficiency (Aiguobarueghian et al., 2024) (Sondh et al., 2024).

Table 8 presents the level of respondents' awareness regarding solid waste management practices in terms of reuse. The overall total measure yielded a mean of 1.01 with a standard deviation of 0.06, indicating a consistently "Very High" level of awareness across all indicators. Respondents exhibited strong knowledge of various reuse practices, such as reusing old materials instead of purchasing new ones, utilizing unfilled papers for scratch, and repurposing grocery bags, food containers, and plastic bottles.

Additionally, there was significant awareness of creative reuse practices, such as converting scrap paper into memo pads, using old clothes as cleaning rags, and repurposing old jars, newspapers, and cardboard boxes for storage or packing purposes. Slight variations in the mean for some practices (e.g., 1.02 for reusing papers, jars, and cardboard boxes) reflected high awareness with minimal differences in adherence.

The data suggested that respondents were not only aware but also likely to incorporate reuse strategies into their daily lives. This high awareness highlighted the positive impact of sustainability education, particularly in promoting practical and accessible methods of reducing waste through reuse. These practices reduced reliance on disposable products and extended the lifecycle of materials, contributing to waste minimization and resource conservation. The findings implied that fostering a culture of reuse can further strengthen waste management initiatives, especially when complemented by programs that encourage innovation and creativity in reusing materials.

Reuse involves the use of items again for their original purpose or for a different function, thereby extending their lifecycle and reducing the need for new products. Reuse not only conserves resources but also reduces the amount of waste generated. Research has shown that reuse can be an effective strategy for reducing waste, particularly in urban areas where waste generation rates are high (Aiguobarueghian et al., 2024). Additionally, community-based initiatives, such as waste banks and exchange programs, have been successful in encouraging the reuse of materials and fostering a culture of sustainability (Sondh et al., 2024).

Table 8. Level of Respondents' Awareness on Solid Waste Management Practices in terms of Reuse

<i>Indicators</i>	<i>Mean</i>	<i>SD</i>	<i>Description</i>
1. Reusing old materials than buying a new one.	1.00	0.00	Very High
2. Keeping those unfilled papers and using it as scratch.	1.02	0.20	Very High
3. Reusing grocery bags.	1.01	0.10	Very High
4. Reusing washable food containers.	1.00	0.00	Very High
5. Reusing scrap paper into memo pads.	1.02	0.14	Very High
6. Reusing old clothes as cleaning rags.	1.00	0.00	Very High
7. Reusing old jars as storage containers for small items.	1.02	0.14	Very High
8. Reusing old newspapers as packing material.	1.00	0.00	Very High
9. Reusing old plastic bottles as water bottles.	1.00	0.00	Very High
10. Reusing old cardboard boxes for storage.	1.02	0.14	Very High
Total Measure	1.01	0.06	Very High

Note: 1.00–1.49 – Very High; 1.50–2.49 – High; 2.50–3.49 – Low; 3.50–4.00 – Very Low.

Table 9 evaluates the level of respondents' awareness regarding solid waste management practices in terms of recycling. The total measure showed a mean of 1.02 and a standard deviation of 0.14, reflecting a "Very High" level of awareness across all indicators. Respondents demonstrated strong familiarity with various recycling practices, such as redesigning waste materials into new products, creating decorative items from plastic wrappers and other waste, and using recycled paper for crafts and projects.

Furthermore, respondents showed awareness of advanced recycling strategies, including initiating income-generating activities from waste materials and sorting waste into categories for effective recycling. Composting food scraps and yard waste, as well as recycling common materials like paper, plastic, glass, and metal, also received very high ratings. The importance of promoting recycling and participating in community recycling programs was equally recognized.

Table 9. Level of Respondents' Awareness on Solid Waste Management Practices in terms of Recycle

<i>Indicators</i>	<i>Mean</i>	<i>SD</i>	<i>Description</i>
1. Redesigning waste materials into a new product.	1.02	0.14	Very High
2. Making decors out of plastic wrappers and other colorful waste materials.	1.02	0.14	Very High
3. Using recycled paper for crafts and projects.	1.02	0.14	Very High
4. Initiating income-generating activities out of waste materials.	1.04	0.24	Very High
5. Using recycled products out of redesigned waste materials.	1.04	0.24	Very High
6. Sorting waste materials into different categories.	1.03	0.22	Very High
7. Composting food scraps and yard waste.	1.03	0.17	Very High
8. Recycling paper, plastic, glass, and metal.	1.00	0.00	Very High
9. Promoting the importance of recycling.	1.00	0.00	Very High
10. Participating in community recycling programs.	1.02	0.14	Very High
Total Measure	1.02	0.14	Very High

Note: 1.00–1.49 – Very High; 1.50–2.49 – High; 2.50–3.49 – Low; 3.50–4.00 – Very Low.

The findings indicated that respondents were well-informed about the diverse applications and benefits of recycling, from artistic and practical uses to entrepreneurial initiatives. This high level of awareness reflected successful advocacy for recycling practices and highlighted the respondents' readiness to actively participate in sustainable waste management efforts. The implications were far-reaching, as enhanced recycling practices contributed to reducing landfill waste, conserving resources, and generating economic opportunities. To build on this awareness, schools and communities can implement structured programs and partnerships that encouraged innovative recycling initiatives and broader participation in organized recycling efforts.

According to David et al. (2019), the materials/components/items/parts that can be recycled were plastics, papers, glasses, electronics, batteries, textiles, and other waste. By using recycled components, they can reduce virgin products. The recovered items financially save cost, as well as, environmentally avoid unwanted pollution. Recycling is a process that converted the used material into usable after processing. Waste recycling can help to solve the problem of scarcity of raw materials. Recycling rare earth metals played a significant role in reverse logistics. There is a very subtle difference between 'Recycling' and 'Reuse'. Through recycling, initially, raw materials are extracted from used products that may be used to make the same or new product. 'Reuse' is meant for using an object without any reprocessing or treatment; it only elongates the life of an object (David et al., 2019).

Recycling is the process of converting waste materials into new products to prevent the depletion of natural resources and reduce energy consumption. Recycling plays a crucial role in mitigating the environmental impacts of waste disposal, such as greenhouse gas emissions and soil contamination. Studies have demonstrated that recycling can significantly lower the volume of waste sent to landfills and contribute to the conservation of natural resources (Mishra, 2024) (Zakhilwal et al., 2024). For instance, a comprehensive review of engineering strategies for environmental sustainability highlights the potential of recycling to reduce the environmental impact of solid waste management (Zakhilwal et al., 2024). Furthermore, advancements in recycling technologies, such as automated sorting systems and chemical recycling, have enhanced the efficiency and effectiveness of recycling processes (Rathoure, 2024).

Table 10 highlights the level of respondents' awareness regarding solid waste management practices in terms of disposal. The results showed that respondents exhibited a "Very High" level of awareness, with a mean score of 1.00 and a standard deviation of 0.00 across all items. This consistent high score indicated a thorough understanding of proper disposal practices.

Respondents were fully aware of the importance of waste management behaviors such as not throwing garbage indiscriminately, avoiding the burning of waste materials, and refraining from dumping waste in open spaces. They also recognized the significance of more structured waste disposal methods, including composting biodegradable waste, separating materials at the source, and using designated bins for different types of waste. Additionally, the respondents understood the necessity of properly disposing of medical and hazardous waste in appropriate containers.

Table 10. *Level of Respondents' Awareness on Solid Waste Management Practices in terms of Disposal*

<i>Indicators</i>	<i>Mean</i>	<i>SD</i>	<i>Description</i>
1. Throwing and leaving of garbage anywhere.	1.00	0.00	Very High
2. Burning of waste materials.	1.00	0.00	Very High
3. Throwing of waste materials in common open dumps.	1.00	0.00	Very High
4. Disposal of biodegradable wastes into a compost pit.	1.00	0.00	Very High
5. Separating waste materials at source.	1.00	0.00	Very High
6. Avoiding littering in public places.	1.00	0.00	Very High
7. Separating waste materials at source.	1.00	0.00	Very High
8. Using designated bins for different types of waste.	1.00	0.00	Very High
9. Properly disposing of medical waste in designated containers.	1.00	0.00	Very High
10. Disposal of hazardous/ toxic/special wastes such as laboratory leftover (chemicals) or electronic waste in any garbage container.	1.00	0.00	Very High
Total Measure	1.00	0.00	Very High

Note: 1.00–1.49 – Very High; 1.50–2.49 – High; 2.50–3.49 – Low; 3.50–4.00 – Very Low.

The uniformity in the responses suggested that there was a strong culture of awareness regarding proper disposal practices, which was critical for minimizing environmental contamination and protecting public health. These findings implied that the respondents were well-prepared to adopt environmentally responsible waste disposal behaviors.

Madrigal and Oracion (2018), indicated that educating people to waste management will help them understand the indiscriminate disposal of waste to the environment and human health and empower them to act accordingly. Teaching students about the importance of recycling is the first step to developing lasting sustainable practices. Recycling education for schools offered students an understanding of the impact of waste on the environment, the process of recycling, and the benefits of waste reduction. Beyond the obvious environmental advantages, engaging students to recycle also builds responsibility, teamwork, and a greater awareness of their role in the broader world (David et al., 2019).

Disposal is the final step in the waste management hierarchy and involves the safe and environmentally responsible disposal of waste that cannot be reused or recycled. Landfills and incineration are the most common disposal methods, each with its own set of challenges and environmental implications. Landfills, if not properly managed, can lead to soil and groundwater contamination, while incineration can result in air pollution and the release of toxic substances (Samreen et al., 2024). However, advancements in disposal technologies,



such as engineered landfills and waste-to-energy systems, have improved the safety and efficiency of waste disposal (Mishra, 2024).

Table 11 presents the consolidated findings on the level of respondents' awareness regarding solid waste management (SWM) practices. The overall results showed that the respondents possessed a "Very High" level of awareness across all categories, with the total measure yielding a mean of 1.01 and a standard deviation of 0.04. This indicated consistent and exceptional awareness of solid waste management practices, with minimal variability in responses.

Table 11. Consolidated Findings of the Level of Respondents' Awareness on Solid Waste Management Practices

Awareness on SWM	Mean	SD	Description
Segregation	1.00	0.00	Very High
Reduction	1.00	0.01	Very High
Reuse	1.01	0.06	Very High
Recycle	1.02	0.14	Very High
Disposal	1.00	0.00	Very High
Total Measure	1.01	0.04	Very High

Note: 1.00–1.49 – Very High; 1.50–2.49 – High; 2.50–3.49 – Low; 3.50–4.00 – Very Low.

In terms of specific practices, respondents displayed very high awareness of all five key components: segregation (mean = 1.00, SD = 0.00), reduction (mean = 1.00, SD = 0.01), reuse (mean = 1.01, SD = 0.06), recycling (mean = 1.02, SD = 0.14), and disposal (mean = 1.00, SD = 0.00). Each category received a "Very High" rating, signifying that the respondents were well-informed about the full spectrum of waste management strategies, from minimizing waste generation (reduction) to proper disposal methods.

These findings suggested a well-established understanding of sustainable waste management practices, which was critical for fostering responsible behaviors and promoting environmental sustainability. The implications were clear: with such a high level of awareness, respondents were better positioned to implement and advocate for effective waste management solutions within their communities or workplaces. This strong foundation can serve as a springboard for more targeted interventions, such as hands-on workshops, campaigns, or policy initiatives, to further support and encourage these practices on a larger scale. This affirmed the study of Villanueva as cited by Lalamonan (2019) that education was an important component of solid waste management that should be presented to establish a good program in the community. Furthermore, this was supported by Madrigal and Oracion (2018) that the introduction or integration of waste management concepts will improve the understanding on waste management behaviors and practices.

Problem 3: What is the extent of implementation of solid waste management practices in terms segregation, reduction, reuse, recycle, and disposal?

Table 12 provides an overview of the respondents' extent of implementation of solid waste management practices in terms of segregation. The results showed that the implementation of segregation practices was consistently "Always" in place, with a total measure mean of 1.00 and a standard deviation of 0.01. This reflected that all respondents consistently applied segregation practices across various aspects of waste management.

Specific practices such as segregating waste in classrooms, offices, and canteens, using color-coded bins, and ensuring the availability of proper receptacles for special waste types were fully implemented. There was also clear evidence of active educational efforts, as respondents reported regularly educating students and staff about waste segregation. Furthermore, monitoring and enforcement of segregation practices, along with designated areas for waste collection and sorting, were implemented thoroughly. The presence of Material Recovery Facilities (MRF), while slightly higher in mean (1.01), still fell within the "Always" category, indicating high but marginally more variable adherence.

Table 12. Level of Respondents' Extent of Implementation on Solid Waste Management Practices in terms of Segregation

Indicators	Mean	SD	Description
1. Segregation Implementation is evident in classrooms, offices and canteen.	1.00	0.00	Always
2. Waste is segregated into at least two types.	1.00	0.00	Always
3. Receptacle for special waste is necessary wherever applicable.	1.00	0.00	Always
4. No unmanaged waste receptacles outside the classrooms.	1.00	0.00	Always
5. Providing clear labeling for each waste bin.	1.00	0.00	Always
6. Using color-coded bins for different waste types.	1.00	0.00	Always
7. Educating students and staff on proper waste segregation.	1.00	0.00	Always
8. Regularly monitoring and enforcing segregation practices.	1.00	0.00	Always
9. Having designated areas for waste collection and sorting.	1.00	0.00	Always
10. Availability of MRF.	1.01	0.10	Always
Total Measure	1.00	0.01	Always

Note: 1.00–1.49 – Always; 1.50–2.49 – Sometimes; 2.50–3.49 – Rarely; 3.50–4.00 – Never.

These findings suggested that segregation practices were strongly embedded in the respondents' environments, indicating a high level of institutional commitment to waste management. This comprehensive implementation of segregation practices was crucial for the effectiveness of waste management systems, as it ensured that waste was sorted correctly for recycling, reuse, or safe disposal.

Segregation as defined in Article 2, Sec. 3 of R.A. No. 9003, pertained to the process of separating materials from the origin in order to facilitate recycling, reuse of materials, and reduce waste generation.

Table 13. *Level of Respondents' Extent of Implementation on Solid Waste Management Practices in terms of Reduce*

Indicators	Mean	SD	Description
1. Avoidance of use of plastics in canteen.	1.05	0.22	Always
2. No more plastics used as secondary packaging material.	2.02	0.77	Sometimes
3. Most foods are packed using biodegradable materials.	2.31	0.88	Sometimes
4. Orient school canteen vendors on plastic avoidance policy.	2.06	0.85	Sometimes
5. Implement DepEd-Lanao del Norte policy on plastic avoidance in canteens.	1.13	0.34	Always
6. Encourage the use of reusable water bottles.	1.19	0.39	Always
7. Promote the use of reusable lunchboxes.	1.21	0.41	Always
8. Reduce the consumption of disposable paper cups.	1.12	0.33	Always
9. Minimize the use of disposable cutlery and straws.	1.03	0.17	Always
10. Encourage the use of cloth bags instead of plastic bags.	1.20	0.40	Always
Total Measure	1.43	0.28	Always

Note: 1.00–1.49 – Always; 1.50–2.49 – Sometimes; 2.50–3.49 – Rarely; 3.50–4.00 – Never.

Table 13 examines the respondents' extent of implementation of solid waste management practices in terms of waste reduction. The results showed a mix of consistent and occasional implementation, with the total measure mean of 1.43 and a standard deviation of 0.28. Overall, the respondents demonstrated a strong commitment to reducing waste, but there were some areas where implementation could be further improved.

The practices with "Always" implementation included the avoidance of plastics in the canteen, promoting reusable water bottles and lunchboxes, reducing the consumption of disposable paper cups, minimizing the use of disposable cutlery and straws, and encouraging the use of cloth bags instead of plastic bags. These practices aligned with a proactive approach to waste reduction, suggesting that respondents were generally adhering to policies aimed at minimizing single-use plastics and disposable items. However, several practices, such as reducing the use of plastics as secondary packaging, ensuring that most foods were packed with biodegradable materials, and orienting school canteen vendors on plastic avoidance, received a "Sometimes" rating. These areas showed potential for improvement, indicating that while there were some efforts to implement reduction measures, they may not be as consistently applied or fully integrated into daily operations.

Hence, while a solid foundation for reducing waste was in place, the findings highlighted the need for stronger enforcement and more consistent application of reduction practices in certain areas, particularly in relation to packaging and vendor education. Focused efforts on these aspects could further enhance waste reduction and contribute to more sustainable practices in the school and community environment. Reduction was the most preferred ways in solid waste management. Doing reduction saved natural resources, reduced toxicity of waste and reduced costs as stressed by the Asia Foundation as cited by Molina and Catan (2021).

According to Zhu et al., as cited by David et al. (2019), they can actually reduce the use of natural resources like water, oil, energy, fuel, metals, gas etc. Significantly, the most effective way to reduce environmental negativity was to better design a product for the prevention of waste. There were a lot of advantages in reducing the usage of new resources and reusing recovered items.

Table 14 provides an overview of the respondents' extent of implementation of solid waste management practices in terms of reuse. The total measure has a mean of 2.57 and a standard deviation of 0.17, indicating that respondents, on average, engage in reuse practices "Rarely." This suggested that while there were some efforts to incorporate reuse practices, they were not yet consistently or frequently applied across all areas. Certain practices, such as reusing old clothes as cleaning rags and reusing old plastic bottles as containers for small items, received an "Always" rating, indicating that these actions were regularly carried out. These were practical and common reuse strategies that are easy to implement in everyday activities. Additionally, the practice of reusing items like jars for storage also received a "Sometimes" rating, suggesting that it was somewhat common but not universally applied.

Table 14. *Level of Respondents' Extent of Implementation on Solid Waste Management Practices in terms of Reuse*

Indicators	Mean	SD	Description
1. Composting of biodegradable waste.	2.43	0.50	Sometimes
2. Actual application of compost in gardening.	3.03	0.59	Rarely
3. Reuse used tires as decorative flower pots.	3.63	0.66	Never
4. Use of compost products or soil from the compost pit were used in the garden.	3.68	0.66	Never
5. Re-use practices are evident.	1.12	0.33	Always
6. Reusing old plastic bottles as containers for storing small items.	1.99	0.52	Sometimes
7. Repurposing old newspapers as packing material.	3.66	0.48	Never
8. Using old clothes as cleaning rags.	1.00	0.00	Always
9. Reusing old jars as storage containers for small items.	2.25	0.44	Sometimes
10. Turning old cardboard boxes into craft projects.	2.89	0.75	Rarely
Total Measure	2.57	0.17	Rarely

Note: 1.00–1.49 – Always; 1.50–2.49 – Sometimes; 2.50–3.49 – Rarely; 3.50–4.00 – Never.

On the other hand, practices like composting biodegradable waste, applying compost to gardening, and repurposing materials such as tires, newspapers, and cardboard boxes received much lower ratings, indicating that they were rarely or never implemented. These lower scores suggested that while there was awareness of these practices, their application may be hindered by factors such as lack of resources, knowledge, or infrastructure to support such activities.

Then, while there were some successful implementations of basic reuse practices, there was significant room for improvement, particularly in more resource-intensive activities such as composting and repurposing materials. Efforts to increase awareness and provide the necessary tools or guidance could enhance the frequency and effectiveness of reuse practices, ultimately contributing to a more sustainable waste management system. Reuse as defined in Article 2, Sec. 3 of R.A. No. 9003 was pertained to the recovering of materials that had the same or different usage without changing its physical and chemical characteristics.

Table 15. Level of Respondents' Extent of Implementation on Solid Waste Management Practices in terms of Recycle

Indicators	Mean	SD	Description
1. Recover and recycle papers (pots, charcoal, etc).	2.05	0.61	Sometimes
2. Plastic waste turned into pillows as one of the examples.	2.91	0.81	Rarely
3. Drinking straws and popsicle sticks made into tiny houses among others.	3.72	0.57	Never
4. Products out of recyclable materials show promise (profit, utility, etc).	2.06	0.55	Sometimes
5. Utilization of MRF.	1.79	0.54	Sometimes
6. Recycling glass bottles and jars.	2.02	0.55	Sometimes
7. Turning plastic bottles into useful items like planters or pencil holders.	3.45	0.73	Rarely
8. Composting food scraps and yard waste.	3.37	0.80	Rarely
9. Using recycled paper for crafts and projects.	3.32	0.76	Rarely
10. Participating in community recycling programs.	2.51	0.54	Rarely
Total Measure	2.72	0.19	Rarely

Note: 1.00–1.49 – Always; 1.50–2.49 – Sometimes; 2.50–3.49 – Rarely; 3.50–4.00 – Never.

Table 15 provides an overview of the respondents' extent of implementation of solid waste management practices in terms of recycling. With a total measure mean of 2.72 and a standard deviation of 0.19, the results suggested that respondents, on average, engage in recycling practices "Rarely." This indicated that while there were some efforts to implement recycling practices, they were not yet a widespread or consistent feature of daily routines.

Specific practices such as utilizing a Material Recovery Facility (MRF) and recycling paper received "Sometimes" ratings, meaning, these actions were occasionally practiced but not systematically observed.

Similarly, recycling glass bottles, jars, and utilizing materials for crafting received "Sometimes" ratings, suggesting that these practices occurred intermittently. The fact that these practices showed promise in terms of their environmental and economic benefits implied potential for greater adoption, but they had not yet reached high implementation levels.

Other recycling practices, such as turning plastic waste into pillows, using drinking straws for crafts, and utilizing recyclable materials for new products, received "Rarely" or "Never" ratings, indicating that these activities were not frequently carried out. These findings pointed to a need for greater emphasis on recycling education, infrastructure, and incentives to make these practices more accessible and applicable on a daily basis.

In conclusion, while there were some engagements in recycling, the implementation was still relatively limited and inconsistent. To improve recycling efforts, additional support, resources, and encouragement could be provided, especially in areas where recycling had clear environmental or economic benefits.

By focusing on increasing awareness and providing practical tools for recycling, the frequency and effectiveness of these practices could be enhanced.

Recycling as defined in Article 2, Sec. 3 of R.A. No. 9003 pertaining to the treating of waste material by converting them into a new product. According to David et al. (2019), the materials/components/items/parts that can be recycled were plastics, papers, glasses, electronics, batteries, textiles, and other waste. By using recycled components, they can reduce virgin products. The recovered items financially saved cost, as well as, environmentally avoided unwanted pollution.

Table 17 outlines the extent of implementation of solid waste management practices related to disposal. The total measure had a mean of 1.52 and a standard deviation of 0.15, suggesting that, on average, respondents implemented disposal practices "Sometimes." This indicated that while certain disposal practices were followed regularly, others were less consistently applied.

Several practices related to proper disposal, such as the timely collection of segregated solid wastes, the use of sacks for residual waste, and the establishment of designated waste collection areas, were rated as "Always."

These results reflected strong adherence to essential disposal protocols, ensuring that waste was properly handled and disposed of in accordance with regulations. The consistent implementation of such practices was a positive sign of waste management systems working effectively in areas where they were implemented.



Table 16. *Level of Respondents' Extent of Implementation on Solid Waste Management Practices in terms of Disposal*

Indicators	Mean	SD	Description
1. Proper disposal of special wastes.	2.40	0.49	Sometimes
2. On site establishment of composting facilities for biodegradable wastes (any of these: compost pit, vermicompost, etc.)	3.27	0.80	Rarely
3. Proper observance of collection schedules for specific category of segregated solid wastes.	1.40	0.49	Always
4. Designate drop-off center/MRF (ideal, sturdy, labeled, actual sales on recyclable waste).	1.46	0.50	Always
5. Residual waste due for collection is inside sacks to facilitate collection by the LGU.	1.13	0.34	Always
6. Ensuring proper disposal of hazardous waste, such as batteries and electronic waste.	1.19	0.39	Always
7. Having designated areas for waste collection and sorting.	1.20	0.40	Always
8. Maintaining cleanliness and hygiene around waste bins.	1.00	0.00	Always
9. Educating students and staff on proper waste disposal practices.	1.00	0.00	Always
10. Following local regulations for waste disposal.	1.14	0.35	Always
Total Measure	1.52	0.15	Sometimes

Note: 1.00–1.49 – Always; 1.50–2.49 – Sometimes; 2.50–3.49 – Rarely; 3.50–4.00 – Never.

In contrast, practices such as the on-site establishment of composting facilities and the proper disposal of special wastes were rated as “Rarely” or “Sometimes.” The fact that composting facilities and hazardous waste disposal were not consistently in place. These suggested that there may be limitations in terms of resources or infrastructure, which hindered their broader adoption. These practices, while important for sustainable waste management required additional attention to be fully integrated into daily routines.

Overall, the results suggested that while basic waste disposal practices were frequently followed, more advanced practices—such as composting and managing special waste—are still not fully integrated. To enhance the overall waste management system, efforts should focus on improving the infrastructure, resources, and education necessary to encourage more widespread implementation of these essential practices. Disposal as defined in Article 2, Sec. 3 of R.A. No. 9003 pertained to the discharge of solid waste.

Table 17. *Consolidated Findings of the Level of Respondents' Extent of Implementation on Solid Waste Management Practices*

Extent of Implementation of SWM	Mean	SD	Description
Segregation	1.00	0.01	Always
Reduction	1.43	0.28	Always
Reuse	2.57	0.17	Rarely
Recycle	2.72	0.19	Rarely
Disposal	1.52	0.15	Sometimes
Total Measure	1.85	0.09	Sometimes

Note: 1.00–1.49 – Always; 1.50–2.49 – Sometimes; 2.50–3.49 – Rarely; 3.50–4.00 – Never.

Table 17 provides a consolidated overview of the extent of implementation of solid waste management (SWM) practices among the respondents. The overall mean score of 1.85, with a standard deviation of 0.09, indicated that, on average, respondents implemented SWM practices “Sometimes.” This suggested a moderate level of implementation, where certain practices were more consistently followed, while others were less frequent or irregular.

The practice of waste segregation had the highest implementation rating, with a mean of 1.00 and a standard deviation of 0.01, categorized as “Always.” This implied that respondents consistently engaged in segregating waste, indicating strong adherence to segregation practices. Similarly, reduction practices also showed a high level of implementation (“Always”), with a mean of 1.43 and a standard deviation of 0.28, reflecting a strong commitment to minimizing waste generation, particularly in the school setting.

However, reuse and recycling practices received lower implementation ratings, with means of 2.57 and 2.72, respectively, both categorized as “Rarely.” These findings suggested that while there were some efforts to reuse materials or engage in recycling, such practices were not widely or consistently implemented. There may be barriers, such as lack of resources, awareness, or infrastructure, that limited the regular application of these practices.

Finally, disposal practices were implemented “Sometimes” with a mean of 1.52. This indicated that while some essential disposal practices (e.g., proper segregation, timely collection) were regularly followed, more advanced practices, like composting or managing special wastes, were less frequently carried out.

In conclusion, the consolidated findings highlighted that while waste segregation and reduction were prioritized and well-implemented, there was a room for improvement in the areas of reuse, recycling, and advanced disposal practices. To enhance the overall effectiveness of SWM, the focused should be on addressing the barriers to implementing these practices and promoting greater involvement from all stakeholders in the waste management process.



Problem 4: Is there a significant difference between the level of awareness and implementation of solid waste management practices among the respondents based on their demographic profile?

Table 18. Differences between the Level of Awareness and Implementation of Solid Waste Management Practices among the Respondents based on their Demographic Profile

Demographic Profile	Level of Awareness		Level of Implementation	
	F-value (p-value)	Remarks	F-value (p-value)	Remarks
Age	6.971 (<.001**)	Significant	4.253 (.007**)	Significant
Sex	0.025 (.876)	Not significant	6.201 (.014*)	Significant
Highest Educational Attainment	.465 (.801)	Not significant	1.176 (.327)	Not significant
School Size	1.751 (.179)	Not significant	2.592 (.080)	Not significant
Plantilla Position	.156 (.998)	Not significant	1.815 (.076)	Not significant
Years in Service	4.297 (.001**)	Significant	3.225 (.010**)	Significant

Note: **p<.01 *p<.05

The results presented in Table 18 showed significant differences between the level of awareness and the extent of implementation of Solid Waste Management (SWM) practices based on certain demographic profiles, with some key observations for different groups.

Firstly, age emerged as a significant factor for both awareness and implementation of SWM practices, with F-values of 6.971 ($p < .001$) for awareness and 4.253 ($p = .007$) for implementation. This indicated that age played a crucial role in shaping both the awareness of and the practices related to SWM. Older respondents may possess more experience, which can translate into higher levels of awareness and more effective implementation of SWM strategies. The significant F-values suggested that age-related factors, such as accumulated knowledge and experience, may influence both the understanding and application of SWM practices.

In terms of gender, the study revealed a significant difference in the level of SWM implementation (F-value = 6.201, $p = .014$), but no significant difference in awareness (F-value = 0.025, $p = .876$). This implied that while male and female respondents had similar awareness levels, there was a notable difference in how they implemented SWM practices, with one gender possibly engaging more in tangible actions related to waste management.

This result suggested that gender-based factors, such as social roles or responsibilities, may affect how SWM practices are carried out, even if both genders are equally aware of them.

Highest educational attainment did not show any significant effect on either awareness or implementation (F-values of 0.465, $p = .801$ for awareness and 1.176, $p = .327$ for implementation). This suggested that regardless of the respondents' academic qualifications, there were no notable differences in their understanding or application of SWM practices. This could indicate that educational programs related to SWM may need to be more tailored or effective in engaging people at all educational levels to drive better outcomes.

For school size, no significant differences were found in the level of awareness (F-value = 1.751, $p = .179$) or implementation (F-value = 2.592, $p = .080$), suggesting that the scale of the school did not have a major impact on either awareness or SWM practices. This could imply that, regardless of the size of the institution, the level of commitment to and effectiveness in SWM could be more influenced by other factors, such as policies, resources, or administrative support.

Regarding years in service, both awareness and implementation showed significant differences (F-values of 4.297, $p < .001$ for awareness and 3.225, $p = .010$ for implementation). This suggested that respondents with longer years of service had significantly higher levels of both awareness and implementation of SWM practices. This could be due to their accumulated knowledge, experience in handling waste management tasks, and possibly stronger engagement in school policies or initiatives related to SWM.

In conclusion, the results indicated that demographic factors such as age, gender, and years in service significantly influence both awareness and implementation of SWM practices. These findings suggested that interventions aimed at improving SWM practices should consider these demographic variations, tailoring strategies to enhance engagement across different age groups, genders, and levels of experience. For instance, older employees and those with more years in service may benefit from leadership or mentoring roles in SWM initiatives, while strategies to boost SWM implementation in gender-specific ways may address the gap in male respondents' practical engagement.

Problem 5: Is there a significant relationship between the demographic and awareness of solid waste management practices?

Table 19. Relationship between the Demographic and Awareness of Solid Waste Management Practices

Demographic Profile	Awareness		Remarks
	Point-Biserial r-value	p-value	
Age	0.287**	.004	Significant
Highest Educational Attainment	-0.140	0.166	Not significant
Plantilla Position	-0.091	0.372	Not significant
Length of Service	0.302**	0.002	Significant

Note: **p<.01



The results presented in Table 19 indicate the relationships between various demographic factors and the level of awareness of Solid Waste Management (SWM) practices among the respondents. Notably, age and length of service were found to have significant relationships with awareness, while other factors, such as highest educational attainment, school size, and teaching designation, did not show significant relationships.

The point-biserial r-value for age was 0.287 ($p = .004$), which was statistically significant ($p < .01$). This suggested that age was positively correlated with the level of awareness about SWM practices. As age increased, respondents were likely to have a higher awareness of SWM. This could be attributed to the accumulation of life experiences and possibly longer exposure to environmental education or practices over time. Older individuals might have also witnessed changes in societal norms and practices, leading to heightened awareness of issues such as waste management.

Similarly, length of service was found to have a significant relationship with awareness, with a point-biserial r-value of 0.302 ($p = .002$), indicating a positive correlation between the number of years respondents have worked in their positions and their awareness of SWM. This suggested that individuals with longer tenure in their roles were more likely to be aware of SWM practices, possibly due to greater involvement in organizational initiatives, policies, or training related to waste management. Experience gained over time can provide employees with the knowledge and responsibility to implement effective waste management practices.

On the other hand, highest educational attainment had a negative correlation ($r = -0.140$), but this was not statistically significant ($p = .166$). This indicated that the level of education may not have a strong impact on the respondents' awareness of SWM practices. It suggested that other factors, such as work experience or specific training on waste management, might be more influential than formal education in shaping awareness.

Thus, the results of this table highlighted the importance of age and length of service as key factors influencing awareness of SWM practices. Age and tenure may offer valuable insights into the effectiveness of awareness programs, suggesting that individuals with more experience were more likely to be knowledgeable about SWM. Therefore, targeting interventions based on these demographic characteristics could help improve overall awareness of SWM practices across various groups.

Educational programs and awareness campaigns could be designed to engage younger or less experienced respondents, ensuring that all demographic groups have the necessary information to participate in sustainable waste management practices. Tang and Ledesma (2023), indicated a need for increased awareness campaigns on the specific waste management regulations, incentives, and penalties.

Problem 6: Which of the respondents' demographic profile and level of awareness significantly predict the extent of the implementation of the waste management practices of the respondents?

Table 20. Regression Analysis of Predicting the Extent of the Implementation of the SWM Practices by Demographic Profile and Awareness

Predictors	Beta	t-value	p-value	Remarks
Age=21-30	-0.012	-.263	.793	Not significant
Age=31-40	.004	.100	.921	Not significant
Age=41-50	.044	1.176	.243	Not significant
Age=>51 (ref)	--	--	--	--
Sex=Female	.163*	2.091	.040	Significant
Education=Bachelor Degree	-.029	-.571	.569	Not significant
Education=With MA/MS units	.011	.202	.841	Not significant
Education=MA/MS CAR	-.052	-.881	.381	Not significant
Education=Full-fledged Master	.015	.347	.729	Not significant
Education=With at least PhD/EdD units (ref)	--	--	--	--
Position=Administrator Officer	-.032	-.561	.577	Not significant
Position=Teacher I	.016	.366	.715	Not significant
Position=Teacher II	.033	.696	.488	Not significant
Position=Teacher III	-.019	-.465	.643	Not significant
Position=Master Teacher I	-0.031	-.611	.543	Not significant
Position=Others (ref)	--	--	--	--
Service=<4	-.003	-.066	.947	Not significant
Service=5-9	.020	.432	.667	Not significant
Service=10-14	.025	.525	.601	Not significant
Service=15-19	.078	1.565	.122	Not significant
Service=20-24	-.013	-.299	.766	Not significant
Service=25-30 (ref)	--	--	--	--
Awareness	.685**	3.215	.002	Significant

Note: ** $p < .01$ * $p < .05$

The regression analysis reveals that various demographic factors, including age, sex, education, plantilla position, and years of service, have varying impacts on the extent of implementation of Solid Waste Management (SWM) practices. Sex was a significant predictor of SWM implementation, while factors such as age, education, position, and years of service did not show a strong correlation with

implementation levels.

The analysis indicated that female respondents were more likely to implement SWM practices compared to their male counterparts, with a significant positive relationship between being female and the extent of implementation (Beta = 0.163, $p = 0.040$). This could reflect gender differences in environmental responsibility or may indicate that women are generally more engaged in sustainability efforts, particularly at the community or household level.

The demographic factors related to education, position, and years of service did not significantly predict the extent of SWM implementation. This finding suggested that formal education or job title may not directly influence the practical application of waste management practices. The number of years a person had been in service also did not correlate strongly with implementation, implying that experience alone was not a significant determinant of SWM adoption.

Most notably, awareness of SWM practices emerged as the most significant predictor of implementation (Beta = 0.685, $p = 0.002$). This emphasized that respondents who were more aware of the importance and methods of solid waste management were more likely to adopt and implement these practices. This underscored the crucial role of awareness programs in bridging the gap between knowledge and action. Enhancing awareness can encourage participants to not only learn about waste management but also take concrete steps to apply sustainable practices in their daily lives.

In conclusion, the results suggested that while certain demographic factors, such as sex influence the implementation of SWM practices, the key driver for successful implementation is awareness. Therefore, educational initiatives and awareness programs should be prioritized, especially to reach male respondents. These efforts can help ensure that more individuals translate their knowledge into meaningful action, ultimately improving the effectiveness of SWM practices across different school settings.

Conclusions

Based on the indicated findings, the following conclusions were drawn: The study's findings revealed a sample largely comprised of early -to-mid career individuals with under representation of older participants and a significant gender imbalance favoring females. Most respondents held at least an undergraduate degree but primarily occupied entry level of junior teaching positions, rather than leadership or specialized roles. The findings suggested a well-established understanding of sustainable waste management practices, which was critical for fostering responsible behaviors and promoting environmental sustainability.

The data showed respondents have a thorough understanding of critical segregation practices, including the differentiation of biodegradable and non-biodegradable wastes, recyclable versus non-recyclable materials, and the separation of hazardous, medical, and e-wastes. This suggested that segregation practices were strongly ingrained. These findings suggested that segregation practices were strongly embedded in the respondents' environments, indicating a high level of institutional commitment to waste management. The study also showed that while waste segregation and reduction were prioritized and well-implemented, there was room for improvement in the areas of reuse, recycling, and advanced disposal practices. The results indicated that demographic factors such as age, gender, and years in service significantly influenced both awareness and implementation of SWM practices. The results highlighted the importance of age and length of service as key factors influencing awareness of SWM practices. Age and tenure may offer valuable insights into the effectiveness of awareness programs, suggesting that individuals with more experience were more likely to be knowledgeable about SWM. The results suggested that while certain demographic factors, such as sex influenced the implementation of SWM practices, the key driver for successful implementation was awareness. The action plan was rooted in the findings of the study, which revealed significant relationships between demographic factors such as age and length of service, and the level of awareness of Solid Waste Management (SWM) practices.

Based on the results and conclusions of the study, the following recommendations are offered. The DepEd officials may develop and conduct training programs such as curriculum development, teacher training, community engagement, resource provision, and monitoring and evaluation to strengthen the awareness and implementation of solid waste management practices among teachers, students, and other stakeholders. The local government unit and barangay officials may be encouraged to formulate an ordinance on Solid Waste Management (SWM) and adopt Republic Act (RA) 9003, ensuring its strict implementation. A similar comprehensive study must be conducted on a broader scope to determine if the same findings will be established.

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