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Assessment of solid waste management awareness and practices among junior high school students in Northwestern Mindanao state college of science and technology (NMSCST)

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Abstract

The study was conducted to investigate the level of awareness and practices on solid waste management among junior high school students in Northwestern Mindanao State College of Science and Technology (NMSCST). The descriptive-correlational research design was employed to examine the association between students' profile (age, sex, and year-level) and their level of awareness and practices. The study also sought to determine the relationship between awareness and practices on solid waste management. A total of 120 junior high school students were randomly selected as respondents. Data were collected through interview using a questionnaire with sections on profiling, awareness, and practices. The data were analyzed quantitatively using descriptive and inferential statistics. The findings revealed that students primarily obtained information on solid waste management from the school. The students showed a fair level of awareness regarding solid waste management but had limited knowledge of specific laws governing waste management. The students demonstrated positive attitudes towards waste segregation, reduce, reuse, with a tendency to engage in these practices often. However, their participation in creative activities involving recycling waste materials, and proper waste disposal were occasional. The inferential statistics revealed significant associations between students' profile (sex, age, and year level) and their level of awareness, as well as between students' profile (age and year level) and their practices. Notably, students' level of awareness was significantly associated with their practices on solid waste management, particularly in the areas of segregation, reduction, reuse, recycling, and disposal.

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Introduction

The escalating generation of solid waste due to rapid population growth has emerged as one of the most critical global issues, leading to environmental deterioration and severe consequences (Atienza, 2008). Solid waste encompasses various forms of discarded materials, including garbage, refuse, sludge, and other waste products resulting from diverse industrial, commercial, mining, agricultural operations, and institutions (US EPA, 2023). The management of solid waste, regardless of its form, presents a significant challenge that necessitates proper handling and mitigation measures. Inadequate management practices contribute to environmental pollution and give rise to a multitude of diseases (WHO, 2023). As the world deals with these critical environmental problems, educational systems must foster environmentally aware citizens with a strong commitment to the environment and extensive knowledge of environmental issues, empowering them to take responsible action (Tuncer *et al.*, 2009).

Recognizing the urgency of addressing solid waste concerns, Republic Act 9003, also known as “The Ecological Solid Waste Management Act of 2000”, mandates the national government, in collaboration with key institutions such as the Department of Education (DepEd), Technical Education and Skills Development Authority (TESDA), Commission on Higher Education (CHED), and Philippine Information Agency (PIA), to conduct continuous education and information campaigns on solid waste management. This legislative framework emphasizes the integration of environmental concerns into school curricula at all levels, with particular emphasis on waste management principles such as segregation at source, reduction, recycling, re-use, and composting. These measures aim to promote environmental awareness and mobilize citizen action. Additionally, R.A. No. 9512, the Environmental Awareness and Education Act of 2008, mandates the integration of environmental education into school curricula at all levels, including public and private schools. Moreover, it encourages tertiary education institutions through the National Service Training

Program to engage in activities related to tree planting, waste minimization, segregation, recycling and composting, freshwater and marine conservation, forest management and conservation, relevant livelihood opportunities, economic benefits, and other programs that support the implementation of environmental protection laws.

Given the growing relevance of educating individuals about managing solid waste, research has been conducted to assess the impact of solid waste management education on students' awareness and behavior levels (Marello & Helwege, 2014; Molina & Catan, 2021). Establishing a strong awareness of solid waste management (SWM) is crucial within academic institutions (Bautista, 2019). Education plays a pivotal role in equipping individuals with the necessary knowledge to understand environmental issues and effectively contribute to proper waste management practices (Gakungu, 2012).

While several studies have focused on assessing the level of awareness and practices among college students in the Philippines, limited research has been conducted on Junior High School students. Notably, no study has investigated the level of awareness and practices specifically among junior high school students at Northwestern Mindanao State College of Science and Technology. Therefore, this study aims to assess the awareness and practices of junior high school students concerning solid waste management. The specific objectives of this study are to: (1) assess the level of awareness among the students, (2) determine their practices related to solid waste management, (3) investigate the significant relationship between students' profiles (age, sex, and year-level) and their level of awareness and practices regarding solid waste management, and (4) examine the significant relationship between the awareness of Junior High School students and their practices concerning solid waste management. The findings from this study will provide valuable insights into the level of awareness and practices related to solid waste management among junior high school students. Moreover, the study will facilitate the development

and implementation of RA 9003 also known as Ecological Solid Waste Management Act of 2000 in the institutional level.

Materials and methods

Research Design

The study employed descriptive-correlational research design to investigate the association between students' profile (age, sex, and year-level) and the level of awareness and practices on solid waste management, also, to ascertain the relationship between the level of awareness and the practices of the junior high school students on solid waste management. The correlational research design was used to relate the identified variables in the study.

Respondents of the study

The respondents of the study were the junior high school students at the Northwestern Mindanao State College of Science and Technology enrolled in the academic year 2022-2023. Out of 173 junior high school students, only 120 respondents were randomly selected in the study. A stratified random sampling approach was employed to select the respondents that represent the whole group of population. There were a total of 28, 31, 30, 31 respondents for Grade 7, Grade 8, Grade 9, and Grade 10, respectively. The selection of sample size was based on Yamane (1967). It is explained further with the following equation.

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

n = Sample size

N = Total population

e = Margin of error (0.05)

Proportional allocation formula was utilized for sample size determination, considering that the number of students in each year-level was uneven. This approach ensured that an appropriate number of respondents were selected from each specific year-level.

$$n_i = \frac{N_i}{N} \times n$$

n_i = sample size for a stratum

N_i = Population size for a stratum

N = Total population size

n = Desired total sample size

Data Collection

The interview was conducted in the study with the respondents using a guided questionnaire. The questionnaire was adapted from the study of Molina and Catan (2021) and Paghasian (2017), with minor modifications. It consisted of three parts: the first part focused on gathering the respondents' profiles, the second part assessed their level of awareness regarding solid waste management, and the last part examined their practices on waste management, specifically in terms of segregation, reduction, reuse, recycling, and disposal. The study adhered to ethical protocols by obtaining consent through consent letters before collecting essential data.

Data Analysis

All recorded data were analyzed quantitatively using descriptive statistics such as mean and percentage. Inferential statistics such as Chi-square test for independence was used to determine the relationship between variables. The level of awareness and to interpret the practices of the respondents pertaining to solid waste management were measured using a five-point Likert scale with its numerical scale and verbal interpretation as shown in the table below.

Table 1. Interval scale to determine level of awareness on solid waste management of the students.

Scale	Interpretation
4.21 - 5.00	Strongly Aware
3.41 - 4.20	Aware
2.61 - 3.40	Uncertain
1.81 - 2.60	Not Aware
1.00 - 1.80	Strongly Not Aware

Table 2. Interval scale to interpret the solid waste management practices of the students.

Scale	Interpretation
4.21 - 5.00	Always
3.41 - 4.20	Often
2.61 - 3.40	Sometimes
1.81 - 2.60	Rarely
1.00 - 1.80	Never

Results and discussion

A. Respondents profile

The survey results indicate that the majority (66%) of the total respondents were female, while 34% were male (Fig. 1).

The respondents were further categorized based on their year-level, revealing that 23% of the total respondents were in Grade 7, 26% were in Grade 8, 25% were in Grade 9, and the remaining 26% were in Grade 10 (Fig. 2). These findings suggest an uneven distribution of students across the different year-levels. Regarding age, the majority (63%) of the respondents were between 14 and 16 years old, 35% belonged to the age group of 11-13 years old, and only 2% of the respondents were in the age range of 17-19 years old the 34% for male in the figure below.

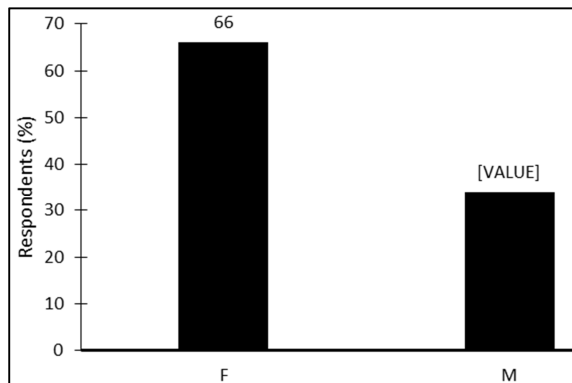


Fig. 1. Sex profile of the respondents.

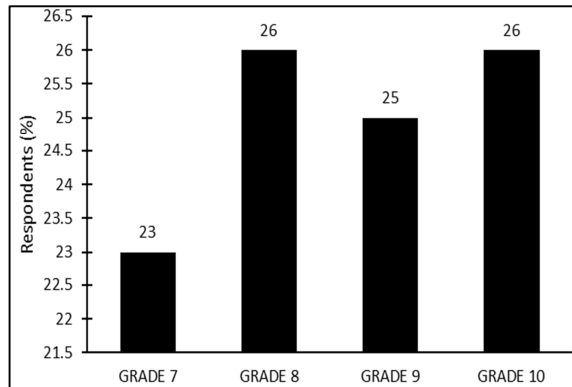


Fig. 2. Year-level of the respondents.

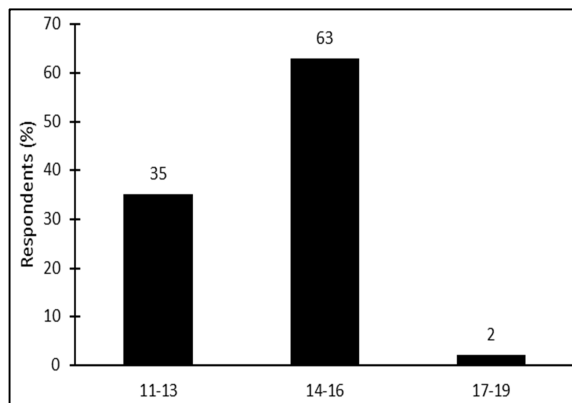


Fig. 3. Age profile of the respondents.

Level of awareness on SWM of the Junior High School students

The efficient dissemination of information plays a crucial role in the successful implementation of solid waste management practices. Fig. 4 illustrates the various sources of information regarding solid waste management of the respondents. It is noteworthy that the school emerged as the primary source of information, accounting for the highest percentage (17%). This finding emphasizes the significant role played by educational institutions in disseminating knowledge and increasing the level of awareness among students. Schools serve as important platforms for providing education and cultivating students' understanding, enabling them to acquire the necessary information (Al-shuaibi, 2014).

The internet ranked as the second main source of information, with 16 percent of the students citing it. This can be attributed to the widespread accessibility of the internet and social media platforms, even among younger age groups (11-13 years old). The internet's efficiency in connecting people and facilitating the dissemination of information explains its high percentage. Additionally, the internet serves as a valuable resource for personal, social, and economic development (AF, 2023).

Television obtained the third highest percentage (15%), highlighting its significance in disseminating information related to solid waste management awareness and practices. Television, not limited to entertainment, serves as a medium for education, mass communication, and gathering information (GF, 2018).

On the other hand, both newspapers and radio obtained the lowest percentage of 5%. These findings indicate that these traditional mediums of information are less impactful compared to other sources. Newspapers have become less commonly used due to the continuous advancement of technology, such as the internet and social media, which provide more convenient and efficient means of information dissemination.

Similarly, radio, while a technological medium, is less frequently utilized by younger generations, as they do not engage with it to the same extent as older generations the unnamed portion in figure 4 is for the friends/colleagues with 8%.

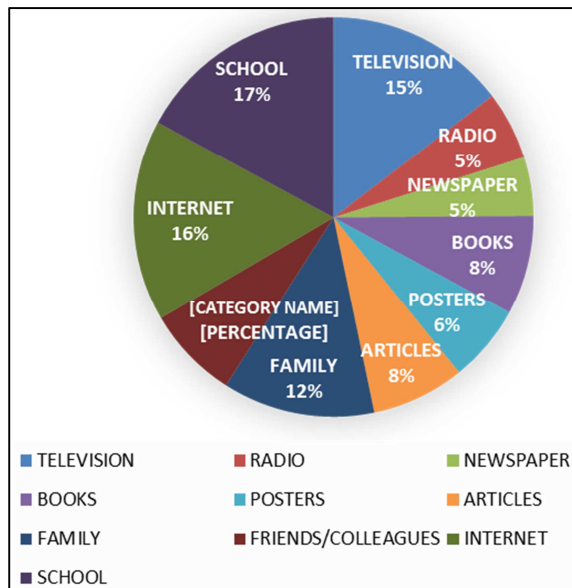


Fig. 4. The unnamed portion in figure 4 is for the friends/colleagues with 8%.

According to Table 3, the results for the level of awareness of the students concerning solid waste managements, the highest mean value the highest mean value of 4.13 was observed for item 19, which pertains to the "Importance of recycling." This indicates that students are aware of the significance of recycling in solid waste management. They recognize the value of reusing and recycling items for future use, possibly due to their economic awareness and the need to support their academic requirements (Comighud & Arevalo, 2021).

On the other hand, the lowest mean value of 2.81 was recorded for item 1, which concerns the "Republic Act 9003" or the Ecological Solid Waste Management Act of 2000. This indicates that students are uncertain about their knowledge of this particular law governing solid waste management. This finding is consistent with the research conducted by Molina and

Catan (2021) and Paghasian (2017), which also revealed a relatively low level of awareness among students regarding different laws related to solid waste management, particularly RA 9003. It is important to note that Article 3 of the Philippine Civil Code emphasizes that ignorance of the law does not excuse individuals from complying with it. Therefore, it is crucial for students to be familiar with the various laws pertaining to solid waste management. This implies the need for teachers to integrate relevant laws on solid waste management into their lessons.

Additionally, the findings indicate uncertainty among students regarding the school's orientation on the SWM program. The policies associated with the program, the corresponding sanctions for violations, the purpose of implementing the SWM program, the identification of hazardous and non-hazardous wastes, and the prohibited actions stated by the law. This suggests that students lack sufficient knowledge in these areas.

Overall, the grand mean of 3.63 indicates that students possess a fair level of awareness regarding solid waste management. They have a general understanding of the concept of solid waste management as a means of ecological protection and preservation, which aligns with the findings of Bautista (2019) and Paghasian (2017) that Filipino students generally have favorable knowledge of SWM. However, there are areas of uncertainty and room for improvement, particularly in understanding specific policies, sanctions, and the purpose behind implementing the SWM program. These findings highlight the importance of further education and awareness initiatives to enhance the respondents' knowledge and understanding of SWM practices. this discussion intends on Table 5 and should not be mixed with table 3 discussion, it should be in proper order of sequence. More so, it should be discussed according to table. Kindly move this discussion after the table 4 discussion.

Table 3. Level of awareness of Junior High School Students on SWM.

Statements	Mean	Interpretation
1. Republic Act 9003	2.81	Uncertain
2. Solid Waste Management (SWM) Program of the school	3.42	Aware
3. School's Orientation on SWM program	3.18	Uncertain
4. Policies of SWM program	3.20	Uncertain
5. Corresponding sanctions of any violation of the SWM program	3.07	Uncertain
6. Solid waste management committee of the school	3.41	Aware
7. Purpose of the management on implementing the SWM program	3.35	Uncertain
8. School's SWM program is a big help on achieving clean and green environment	3.81	Aware
9. Importance of the SWM	3.57	Aware
10. Practicing SWM saves money and energy	3.68	Aware
11. Student's role and responsibilities towards school's SWM program	3.54	Aware
12. Unity is very significant in making up and internalizing the SWM	3.41	Aware
13. Implementation will be successful and effective if concerned people will participate	3.61	Aware
14. Discipline on SWM matters a lot	3.72	Aware
15. Proper waste disposal	3.91	Aware
16. Possible illnesses that you can get whenever trashes are not properly disposed	3.85	Aware
17. Negative effects of having poor SWM to the environment	3.64	Aware
18. Before throwing garbage, it is a must to read those trash-can labels for segregation	3.97	Aware
19. Importance of recycling	4.13	Aware
20. Importance of reusing	4.05	Aware
21. Importance of reducing wastes	4.07	Aware
22. Waste minimization practices like reuse, recycle and reduce	3.85	Aware
23. Proper implementation of 5Rs (refuse, reduce, reuse, repurpose, recycle)	3.85	Aware
24. Different types of solid wastes.	3.69	Aware
25. Identification of biodegradable and non-biodegradable	4.02	Aware
26. Identification between hazardous and non-hazardous wastes	3.35	Uncertain
27. Prohibited actions stated by the law	3.20	Uncertain
28. Contribution of improper waste disposal to global warming	3.47	Aware
29. Importance of proper disposal of wastes	3.85	Aware
30. Different practices with regards to SWM	3.53	Aware
Grand Mean	3.63	Aware

*Legend: 4.21-5.00 (Strongly Aware); 3.41-4.20 (Aware); 2.61-3.40 (Uncertain); 1.81-2.60 (Not Aware); 1.0-1.80 (Strongly Not Aware)

Level of Practices on Solid Waste Management Awareness

Based on the responses provided in Table 4, the mean scores indicate the students' engagement in waste segregation practices at school. The highest mean score of 3.51 was observed for item 2, "I segregate recyclable wastes from non-recyclable wastes at school," interpreted as "Often." This suggests that students frequently practice the segregation of recyclable and non-recyclable wastes at school.

Similarly, items 1, 3, and 4, which pertain to segregating biodegradable and non-biodegradable wastes, segregating dry and wet wastes, and segregating harmful/toxic wastes, respectively, all received mean scores above 3.40, indicating that

students engage in these practices often. However, item 5, "I segregate reusable items at school," received a mean score of 3.34, interpreted as "Sometimes." This suggests that students practice segregating reusable items at school occasionally.

Overall, the grand mean of 3.44 indicates that students generally engage in waste segregation practices at school "Often." This implies that students have a good level of awareness and implementation of waste segregation practices, which is crucial for effective solid waste management. The findings of Bautista's study (2019) support the results obtained in this study, indicating that students recognize the importance of segregating solid waste.

Table 4. Practices on Solid Waste Management in terms of segregation.

Responses	Mean	Interpretation
1. I segregate biodegradable and non-biodegradable wastes at school.	3.49	Often
2. I segregate recyclable wastes from non-recyclable wastes at school.	3.51	Often
3. I segregate dry wastes from wet wastes at school.	3.45	Often
4. I segregate harmful/toxic wastes at school.	3.41	Often
5. I segregate reusable items at school.	3.34	Sometimes
Grand mean	3.44	Often

*Legend: 4.21-5.00 (Always); 3.41-4.20 (Often); 2.61-3.40 (Sometimes); 1.81-2.60 (Rarely); 1.0-1.80 (Never)

Table 5 indicates that students exhibit a positive attitude towards sustainable consumption practices, as reflected in their responses regarding their purchasing behavior and waste responsibility. With a grand mean of 3.48, which suggests an "often" interpretation, it is evident that students demonstrate a conscious effort to minimize waste generation and adopt environmentally friendly choices. The finding that most students "often" buy only what they need to avoid wasting food (mean = 3.58) showcases their awareness of the issue of food waste. This behavior aligns with the principles of responsible consumption and sustainable food practices, emphasizing the importance of reducing food waste and its associated environmental impacts. By making mindful purchasing decisions, students contribute to the reduction of food waste, thereby promoting resource conservation and addressing the global challenge of food security. The respondents' tendency to sometimes buy items in bulk to reduce packaging (mean = 3.25) and sometimes prefer reusable items over disposable ones (mean = 3.39) signifies their recognition of the significance of reducing packaging waste. Although the mean scores for these items are slightly lower, they still indicate a conscious effort to make sustainable choices. Encouraging students to consistently prioritize bulk purchases and the use of reusable products can lead to a substantial reduction in plastic waste and contribute to a more sustainable and circular economy.

The finding that students "often" bring water in reusable bottles/tumblers instead of purchasing single-use plastic bottles at school (mean = 3.57) showcases their commitment to reducing plastic waste. This behavior demonstrates a preference for sustainable alternatives and highlights the role of individual actions in reducing plastic pollution, particularly within educational settings. Lastly, the high mean score of 3.59 for the statement "I am cautious and responsible for every waste I produce" indicates that students are mindful of their waste generation and take responsibility for their actions. This sense of personal accountability is crucial in cultivating a sustainable mindset and encouraging students to adopt sustainable practices beyond the school environment. It suggests that students are aware of the environmental consequences of their waste and strive to minimize their ecological footprint.

Overall, the findings demonstrate that students exhibit a commendable level of awareness and engagement in sustainable consumption practices. These positive attitudes and behaviors hold great potential for creating a more environmentally conscious society, where individuals actively contribute to waste reduction, resource conservation, and a sustainable future. By building upon these attitudes through education and further promoting sustainable consumption practices, schools can play a vital role in shaping responsible and environmentally aware citizens.

Table 5. Practices on Solid Waste Management in terms of reduction.

Responses	Mean	Interpretation
1. I buy only what I need so that I will not end up throwing away extra foods.	3.58	Often
2. I buy items in bulk to reduce packaging.	3.25	Sometimes
3. I prefer to buy reusable items rather than disposable ones.	3.39	Sometimes
4. I bring water in reusable water bottles/tumblers rather than buying water in single-use plastic bottles at school.	3.57	Often
5. I am cautious and responsible for every waste I produce.	3.59	Often
Grand mean	3.48	Often

*Legend: 4.21-5.00 (Always); 3.41-4.20 (Often); 2.61-3.40 (Sometimes); 1.81-2.60 (Rarely); 1.0-1.80 (Never)

Depicted in Table 6, the results provide insights into the behaviors and practices of students regarding reuse. The item with the highest mean of 3.64, "I keep those unfilled papers and use them as a scratch," indicates that students frequently engage in the practice of reusing paper for various purposes. This suggests that students recognize the value of extending the lifespan of paper materials and reducing waste. Moreover, the mean scores of items such as reusing grocery bags (3.52) and reusing washable food and water containers (3.51) demonstrate that students often adopt these sustainable practices. These findings align with the existing literature, which emphasizes the importance of reusing materials to minimize waste and conserve resources and save energy (Griffiths, 2010).

However, item number 1, "I reuse my old materials rather than buying new ones," obtained a mean score of 3.20, indicating that students only occasionally engage in this behavior. While the mean score for this item is lower compared to others, it is still noteworthy that students exhibit some degree of willingness to reuse their old materials. Encouraging students to embrace this practice more frequently can significantly contribute to waste reduction and promote a more sustainable lifestyle.

Overall, the grand mean score of 3.50 suggests that students generally exhibit a tendency to engage in reuse practices. This finding underscores the importance of fostering a culture of reuse within educational institutions. By promoting and reinforcing the benefits of reusing materials, schools can empower students to make conscious choices that contribute to waste reduction and resource conservation. It is worth noting that the mean scores for all items in Table 4 fall within the "Often" interpretation range, indicating that students are actively involved in reuse practices to varying degrees. This demonstrates a positive attitude towards reusing materials and a recognition of the environmental and societal benefits associated with such behaviors.

Table 6. Practices on Solid Waste Management in terms of reuse.

Responses	Mean	Interpretation
1. I reuse my old materials rather than buying new ones.	3.20	Sometimes
2. I reuse grocery bags.	3.52	Often
3. I kept those unfilled papers and used it as a scratch.	3.64	Often
4. I reuse washable food and water containers.	3.51	Often
5. I give my intact and unused clothes and toys to the less fortunate person.	3.61	Often
Grand mean	3.50	Often

*Legend: 4.21-5.00 (Always); 3.41-4.20 (Often); 2.61-3.40 (Sometimes); 1.81-2.60 (Rarely); 1.0-1.80 (Never)

The results presented in Table 7 indicate the mean at which students engage in creative activities that involve recycling waste materials. The mean scores for all items in this table fall within the "Sometimes" interpretation range, suggesting that students occasionally participate in these practices. Item 5, "I use plastic bottles as a flowerpot," obtained the highest mean score of 3.17, indicating that students sometimes recycle plastic bottles for decorative purposes. This finding suggests that students recognize the potential for transforming waste materials into functional or aesthetically pleasing items, specifically in the context of using plastic bottles as flowerpots. Although the mean score is relatively higher for this item compared to others, there is still room for further encouragement and promotion of such creative endeavors.

On the other hand, items such as converting waste materials into a new product (2.79), initiating income generation from waste materials (2.86), and using cans to create profitable items (2.73) obtained relatively lower mean scores. These results suggest that students engage in these practices less frequently. However, it is important to acknowledge that even though the mean scores are lower, students still exhibit some level of involvement in these activities.

The overall grand mean score of 2.92 indicates that students generally participate in creative projects involving waste materials, but their engagement is not as consistent or frequent.

This suggests that there is potential for further development and encouragement of these practices among students. By providing guidance, resources, and inspiration, schools can foster an environment that nurtures students' creativity and encourages them to explore innovative ways to repurpose waste materials.

Table 7. Practices on solid waste management in terms of recycle.

Responses	Mean	Interpretation
1. I convert waste materials into a new product.	2.79	Sometimes
2. I use plastic bottles and wrappers to make decors.	3.07	Sometimes
3. I initiate generating income out of waste materials.	2.86	Sometimes
4. I use cans to create profitable items.	2.73	Sometimes
5. I use plastic bottles as a flowerpot.	3.17	Sometimes
Grand mean	2.92	Sometimes

*Legend: 4.21-5.00 (Always); 3.41-4.20 (Often); 2.61-3.40 (Sometimes); 1.81-2.60 (Rarely); 1.0-1.80 (Never)

Table 8 provides valuable insights into the waste disposal practices of students. It is evident that there is a mix of understanding and adherence to proper waste disposal practices among the respondents.

Item 3, "I dispose biodegradable wastes in a compost pit," obtained the highest mean score of 3.25, indicating that students have a reasonable understanding of the importance of composting biodegradable waste. However, the fact that this practice is reported as being done only sometimes suggests that there is room for improvement in terms of consistently implementing this environmentally friendly method of waste disposal. Educating students on the benefits of composting and providing practical guidance on setting up compost pits could help increase the frequency of this practice.

On the other hand, item 4, "I throw my garbage everywhere," received the lowest mean score of 2.38, indicating that students rarely engage in this improper waste disposal practice. This is a positive finding, suggesting that students are generally aware of the negative consequences of littering and understand the importance of proper waste disposal.

However, it is important to note that even though the score is low, any instances of improper waste disposal should be addressed and discouraged through educational initiatives and reinforcing the importance of responsible waste management.

Items 1 and 2, which involve burning waste materials and throwing garbage in open dumps, received mean scores of 2.92 and 3.09, respectively, indicating that these practices are also done only sometimes by the students. These findings highlight the need for further education on the hazards associated with burning waste and the negative environmental impacts of open dumping. Raising awareness about the legal provisions and penalties related to these practices, as stipulated in R.A. 9003, can help discourage students from engaging in such activities.

Overall, the findings emphasize the importance of strengthening the implementation of waste management laws and promoting proper waste disposal practices among students. The fact that students show some level of understanding, even if not consistently implemented, suggests that educational interventions can have a positive impact. Integrating waste management education into the curriculum, organizing awareness campaigns, and providing practical guidance on waste segregation, composting, and responsible disposal can help foster a culture of sustainable waste management among students.

Table 8. Practices on solid waste management in terms of disposal

Responses	Mean	Interpretation
1. I burn waste materials.	2.92	Sometimes
2. I throw my garbage in open dumps.	3.09	Sometimes
3. I dispose biodegradable wastes in a compost pit.	3.25	Sometimes
4. I throw my garbage everywhere	2.38	Rarely
5. I disposed chemical and toxic wastes in leak-proof containers.	2.75	Sometimes
Grand mean	2.89	Sometimes

*Legend: 4.21-5.00 (Always); 3.41-4.20 (Often); 2.61-3.40 (Sometimes); 1.81-2.60 (Rarely); 1.0-1.80 (Never)

The results align with previous research by Madrigal and Oracion (2017), which highlights the adverse effects of indiscriminate waste disposal on both

human health and the environment. By addressing the gaps in knowledge and reinforcing the importance of responsible waste disposal, schools can contribute to mitigating these effects and instilling responsible waste management practices in students.

The association between students' profile (age, sex, and year-level) and their level of awareness and practices on solid waste management

The results of the chi-square tests indicate a significant relationship between students' profile variables (sex, age, and year level) and their level of awareness on solid waste management (Table 9).

For the variable "Sex," the computed chi-square value is 17.281, with 4 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 9.488. The p-value for this test is 0.002, which is less than 0.05. Therefore, the null hypothesis was rejected and concludes that there is a significant association between sex and students' level of awareness on solid waste management.

This suggests that there are differences in awareness levels between male and female students, and sex can be considered as a contributing factor to the variation in awareness. This finding is consistent to the study of (Magdayo *et al.*, 2022; Ifegbesan, 2010) that there is significant relationship between students' sex and the level of solid waste awareness.

Similarly, for the variable "Age," the computed chi-square value is 40.129, with 8 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 15.507. The p-value for this test is 0.000, which is less than 0.05. Hence, the null hypothesis was rejected and concludes that there is a significant association between age and students' level of awareness on solid waste management. This implies that different age groups of students exhibit varying levels of awareness, and age can be considered as a significant factor in influencing their awareness.

Lastly, for the variable "Year Level," the computed chi-square value is 30.398, with 12 degrees of

freedom. The critical chi-square value at a significance level of 0.05 is 21.026. The p-value for this test is 0.002, which is less than 0.05. Therefore, the null hypotheses were rejected and infer that there is a significant association between year level and students level of awareness on solid waste management. This indicates that students in different academic years have varying levels of awareness, and the year level can be considered as a significant factor in determining their awareness.

Overall, these chi-square test results reveal that students' profile variables, such as sex, age, and year level, are significantly related to their level of awareness on solid waste management. These findings highlight the importance of considering these demographic factors when studying students' awareness and designing interventions to improve solid waste management education. Understanding the influence of sex, age, and year level on awareness can help tailor educational programs to specific student groups and effectively promote sustainable waste management practices.

Table 9. The relationship between the students' profile (sex, age, year-level) and their awareness on solid waste management

Variables	Computed χ^2 value	Degree of Freedom	χ^2 critical value at 0.05	p-value	Interpretation
Sex	17.281	4	9.488	0.002	Rejected
Age	40.129	8	15.507	0.000	Rejected
Year Level	30.398	12	21.026	0.002	Rejected

H_0 : There is no significant relationship between the students' profile (gender, age, year-level) and their awareness on solid waste management.

The results of the chi-square tests indicate a mixed relationship between students' profile variables (sex, age, and year level) and their practices on solid waste management (Table 10).

Starting with the variable "Sex," the computed chi-square value is 5.685, with 4 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 9.488.

The p-value for this test is 0.224, which is greater than 0.05. Therefore, the null hypothesis was accepted and concludes that there is no significant association between sex and students' practices on solid waste management. This suggests that the gender of the students does not play a significant role in influencing their practices.

Moving on to the variable "Age," the computed chi-square value is 45.350, with 8 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 15.507. The p-value for this test is 0.000, which is less than 0.05. Hence, the null hypothesis was rejected and concludes that there is a significant association between age and students' practices on solid waste management. This indicates that different age groups of students have distinct practices when it comes to managing solid waste.

Lastly, for the variable "Year Level," the computed chi-square value is 25.179, with 12 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 21.026. The p-value for this test is 0.014, which is less than 0.05. Therefore, the null hypothesis was rejected and infers that there is a significant association between year level and students' practices on solid waste management. This suggests that students in different academic years have varying practices when it comes to managing solid waste.

In summary, the results indicate that age and year level has a significant association with students' practices on solid waste management, while sex does not. This suggests that factors related to age and academic progression influence the way students engage in solid waste management practices. Understanding these relationships can inform the development of targeted interventions and educational programs to promote sustainable waste management practices among students.

Table 10. The relationship between the students' profile (sex, age, year-level) and their practices on solid waste management

Variables	Computed χ^2 value	Degree of Freedom	χ^2		Interpretation
			critical value	p-value	
			0.05		
Sex	5.685	4	9.488	0.224	Accepted
Age	45.350	8	15.507	0.000	Rejected
Year Level	25.179	12	21.026	0.014	Rejected

H_0 : There is no significant relationship between the students' profile (gender, age, year-level) and their practices on solid waste management.

The association between the awareness of the Junior High School students and their practices on solid waste management.

The chi-square test results indicate a significant relationship between the level of awareness of the students and their practices on solid waste management across multiple variables: segregation, reduction, reuse, recycling, and disposal (Table 11).

For the variable "Segregation," the computed chi-square value is 18.157, with 4 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 9.488. The p-value for this test is 0.001, which is less than 0.05. Thus, the null hypothesis was rejected and concludes that there is a significant association between the level of awareness of segregation and students' practices. This suggests that students who have a higher level of awareness of segregation practices are more likely to implement proper waste segregation in their daily routines. This finding is consistent to the study of Bautista (2019) that there is a significant relationship between the level of awareness of the students and their practices on solid waste management in terms of segregation.

For the variable "Reduce," the computed chi-square value is 14.980, with 4 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 9.488. The p-value for this test is 0.005, which is less than 0.05. Therefore, the null hypothesis was rejected and determines that there is a significant association between the level of awareness of waste reduction and students' practices. This implies that students who have a higher level of awareness of waste reduction practices are more likely to engage in behaviors that minimize waste generation.

Similarly, for the variable "Reuse," the computed chi-square value is 21.057, with 4 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 9.488. The p-value for this test is 0.000, which is less than 0.05. Hence, the null hypothesis was rejected and concludes that there is a significant association between the level of awareness of reuse and students' practices. This indicates that students who have a higher level of awareness of reuse practices are more likely to incorporate reusing behaviors into their waste management strategies.

In terms of the variable "Recycle," the computed chi-square value is 67.561, with 4 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 9.488. The p-value for this test is 0.000, which is less than 0.05. Thus, the null hypothesis was rejected and determines that there is a significant association between the level of awareness of recycling and students' practices. This suggests that students who have a higher level of awareness of recycling practices are more likely to actively participate in recycling activities.

Lastly, for the variable "Disposal," the computed chi-square value is 88.490, with 4 degrees of freedom. The critical chi-square value at a significance level of 0.05 is 9.488. The p-value for this test is 0.000, which is less than 0.05. Therefore, the null hypothesis was rejected and concludes that there is a significant association between the level of awareness of proper waste disposal and students' practices. This implies that students who have a higher level of awareness of proper disposal practices are more likely to dispose of waste in an environmentally responsible manner. In summary, the results indicate that the level of awareness of students is significantly associated with their practices on solid waste management, specifically in the areas of segregation, reduction, reuse, recycling, and disposal. This suggests that raising awareness and knowledge about these waste management practices can have a positive impact on students' behaviors and actions. Educational interventions and awareness campaigns focusing on these areas can be implemented to encourage and promote sustainable waste management practices among students.

Table 11. The relationship between the level of awareness of the students and practices on solid waste management.

Variables	Computed χ^2 value	Degree of Freedom	χ^2 critical value at 0.05	p-value	Interpretation
Segregation	18.157	4	9.488	0.001	Rejected
Reduce	14.980	4	9.488	0.005	Rejected
Reuse	21.057	4	9.488	0.000	Rejected
Recycle	67.561	4	9.488	0.000	Rejected
Disposal	88.490	4	9.488	0.000	Rejected

H_0 : There is no significant relationship between the level of awareness of the students and their practices on solid waste management.

Conclusion

The study provides valuable insights into the level of awareness and practices of junior high school students regarding solid waste management (SWM). The findings highlight both positive aspects and areas for improvement in students' awareness and practices related to solid waste management.

Firstly, the study revealed that most respondents rely on school as the primary source of information on SWM, followed by the internet and television. These findings underscore the critical role of educational institutions in disseminating knowledge and increasing awareness among students.

However, traditional mediums such as newspapers and radio had a lower impact in comparison. Thus, there is a need to leverage digital platforms and explore innovative ways to enhance SWM education.

Regarding awareness, students demonstrated a fair level of overall awareness of SWM, with a particularly strong understanding of the importance of recycling. However, there was uncertainty regarding specific laws, school orientations, policies, and prohibited actions related to SWM. These findings emphasize the need for teachers to integrate relevant laws and policies into their lessons to ensure comprehensive understanding among students.

In terms of waste segregation practices, students generally engaged in these practices often, including segregating recyclable and non-recyclable wastes, biodegradable and non-biodegradable wastes, and harmful/toxic wastes. However, the mean of segregating reusable items was reported as "sometimes," indicating room for improvement in this area. Students demonstrated positive attitudes towards sustainable consumption practices, such as buying only what they need to avoid wasting food, preferring reusable items over disposable ones, and bringing water in reusable bottles/tumblers. These behaviors indicate a conscious effort to minimize waste generation and make environmentally friendly choices. Schools can further promote and reinforce these attitudes to foster a culture of responsible consumption.

The study also highlighted students' involvement in reuse practices, with a strong tendency to reuse paper and engage in practices such as reusing grocery bags and washable food and water containers. However, the mean of reusing old materials was reported as sometimes.

Encouraging students to embrace this practice more consistently can significantly contribute to waste reduction and resource conservation.

In terms of creative recycling activities involving waste materials, students reported occasional participation. While students showed some level of involvement in repurposing waste materials, there is potential for further development and encouragement of these practices. Schools can provide guidance, resources, and inspiration to nurture students' creativity and foster a culture of waste repurposing.

Regarding waste disposal practices, students demonstrated a mix of understanding and adherence. While they had a reasonable understanding of composting biodegradable waste and showed minimal engagement in improper practices such as throwing garbage everywhere, there is room for improvement in consistently implementing proper waste disposal methods.

Education on composting benefits and the hazards associated with burning waste and open dumping can help strengthen students' waste management practices.

Moreover, the study found a significant association between students' profile variables (sex, age, and year level) and their level of awareness on SWM. Furthermore, the study depicted the influence of students' profile (age and year-level) and their practices in SWM. These findings highlight the importance of considering these factors when designing targeted educational interventions to enhance students' awareness and practices in SWM. Lastly, it was revealed that the level of awareness of students is significantly associated with their practices on solid waste management, specifically in the areas of segregation, reduction, reuse, recycling, and disposal. This suggests that raising awareness and knowledge about these waste management practices can have a positive impact on students' behaviors and actions.

In conclusion, this study underscores the importance of continuous education and awareness initiatives to enhance students' awareness and practices in SWM. By leveraging educational institutions as key platforms for SWM education, promoting sustainable consumption practices, fostering a culture of reuse and waste repurposing, and strengthening waste disposal methods, schools can play a vital role in shaping responsible and environmentally aware citizens. These efforts contribute to effective SWM, resource conservation, and a sustainable future.

References

Al-Shuaibi J, Hamdan-Mansour AM, Azzeghaiby SN. 2014. Foreign language anxiety among students studying foreign languages. *Life Science Journal* **11(8)**, 197-203.

Asianet Fiber. 2023. Importance Of Internet Technology For Easy Life. Retrieved June, 2023, from <https://asianetbroadband.in/importance-of-internet-technology-for-easy-life>

Atienza, Vella. 2008. Breakthroughs in Solid Waste Management: Lessons from Selected Municipality and Barangay in the Philippines, *Asian Review of Public Administration* **XX (1-2)**, 8298.

- Bautista PR.** 2019. Level of awareness and practices on solid waste management (SWM) among college students. *Journal of Biodiversity and Environmental Sciences* **14(1)**, 131-138.
- Gakungu NK, Gitau AN, Njoroge BNK, Kimani MW.** 2012. Solid waste management in Kenya: A case study of public technical training institutions. *ICASTOR Journal of Engineering* **5(3)**, 127-138.
- Grades Fixer.** 2018. Overview of The Role of Television in Our Life. Retrieved June, 2023, from <https://gradesfixer.com/free-essay-examples/the-role-of-television-in-our-life>
- Ifegbesan A.** 2010. Exploring Secondary School Students' Understanding and Practices of Waste Management in Ogun State, Nigeria. *International Journal of Environmental and Science Education* **5(2)**, 201-215.
- Kagawa F.** 2007. Dissonance in students' perceptions of sustainable development and sustainability: Implications for curriculum change. *International Journal of Sustainability in Higher Education*.
- Madrigal DV, Oracion EG.** 2017. Solid waste management awareness, attitude, and practices in a Philippine Catholic Higher Education Institution. *Recoletos Multidisciplinary Research Journal* **5(2)**.
- Magdayo ED, Jr Bitantos BL, Artizona NO, Lapu-hapo KR,** 2022. Solid Waste: Awareness, Characterization and Management among Mindanao State University- Buug Campus Constituents. *Asian Journal of Advanced Multidisciplinary Researches* **2(2)**.
- Marello M, Helwege A.** 2018. Solid waste management and social inclusion of wastepickers: opportunities and challenges. *Latin American Perspectives* **45(1)**, 108-129.
- Michalos AC, Creech H, Swayze N, Maurine Kahlke P, Buckler C, Rempel K.** 2012. Measuring knowledge, attitudes and behaviours concerning sustainable development among tenth grade students in Manitoba. *Social indicators research* **106**, 213-238.
- Molina RA, Catan I.** 2021. Solid waste management awareness and practices among senior high school students in a state college in Zamboanga City, Philippines. *Aquademia* **5(1)**, ep21001.
- Music Business Association.** 2016. Millennials turn from Radio to embrace streaming. Retrieved June 2023, from <https://musicbiz.org/news/music-bizloop-study-millennials-turn-radio-embrace-streaming>
- Paghasian MC.** 2017. Awareness and practices on solid waste management among college students in Mindanao State University Maigo School of Arts and Trades. In 3rd International Conference on Education and Training ICET pp. 5-12. Atlantis Press.
- Republic Act No. 9003.** The Ecological Solid Waste Management Act of 2000. Retrieved June 2023, from <http://www.gov.ph/2001/01/26/republic-act-no-9003-s-2001>
- Republic Act No. 9512.** National Environmental Awareness and Education Act of 2008. Retrieved June 2023, from <https://www.officialgazette.gov.ph/2008/12/12/republic-act-no-9512>
- Tuncer G, Ertepinar H, Tekkaya C, Sungur S.** 2005. Environmental attitudes of young people in Turkey: effects of school type and gender. *Environmental Education Research* **11(2)**, 215-233.
- United States Environmental Protection Agency.** 2023. Criteria for the Definition of Solid Waste and Solid and Hazardous Waste Exclusions. Retrieved June, 2023, from <https://www.epa.gov/hw/criteria-definition-solid-waste-and-solid-and-hazardous-waste-exclusions>.
- World Health Organization.** 2023. Compendium of WHO and other UN guidance on health and environment. Retrieved June 2023, from <https://www.who.int/tools/compendium-on-health-and-environment/solid-waste>
- Yamane, Taro.** 1967. *Statistics: An Introductory Analysis*, 2nd Ed., New York: Harper and Row.