



THE SOLID WASTE MANAGEMENT PRACTICES OF THE ELEMENTARY SCHOOLS IN THE TWO DISTRICTS OF ROXAS, ISABELA: A BASIS FOR ENVIRONMENTAL PROGRAM DEVELOPMENT

Ferdinand D. Aquino
Marcelino C. Gapultos, Jr.

*Saint Ferdinand College-City of Ilagan Campus, City of Ilagan,
Isabela, Philippines*

<https://doi.org/10.5281/zenodo.20313974>

ABSTRACT

This study determined the solid waste management practices of Grade VI pupils in the Roxas East and Roxas West Districts of Roxas, Isabela, as basis for environmental program development. Using descriptive research design, the study surveyed 284 randomly selected pupils from a population of 987 enrolled during School Year 2007–2008. A questionnaire was used to measure respondents' profile, level of awareness, extent of practices, and exposure to sources of information on solid waste management in terms of control, transfer and transport, processing, and disposal. Data were analyzed using frequency, percentage, weighted mean, ANOVA, t-test, and Pearson product-moment correlation. Findings revealed that pupils were generally moderately aware of solid waste management, with the highest awareness in processing. Their practices were only sometimes performed across all components, showing a gap between knowledge and actual behavior. Broadcast media, particularly television and radio, were the most common sources of information, while internet, periodicals, unpublished materials, and actual experience were limited sources. Significant differences were found in awareness and practices when grouped according to parents' educational attainment, and in exposure when grouped according to age and parents' educational attainment. However, sex and district generally showed no significant differences. Results also indicated no significant correlation between awareness and practices. The study concludes that awareness alone does not guarantee consistent practice. It recommends an enhanced environmental development program that integrates classroom instruction, information

campaigns, receptacle provision, recycling training, and school-based waste management activities to strengthen pupils' ecological responsibility and practical participation in sustainable school community development.

Keywords: *Solid waste management, environmental awareness, waste management practices, elementary pupils, environmental program development*

INTRODUCTION

The growing problem on solid waste management has become a battle cry, a national concern which is felt to be alarming and affecting almost every member of the society. The rapid rate of population growth, continuous industrialization, and urbanization as well as low level of environmental awareness and literacy has all contributed to the present garbage crisis.

The present system of handling waste is often limited to waste disposal rather than proper waste management. The “collect and dump” system is not ecological because it can endanger public health and damage the environment. Although local government units allocate resources to address garbage-related concerns, the problem persists due to increasing waste generation, weak implementation, limited sanitary landfills, and improper disposal practices. Thus, garbage disposal does not only affect the economy but also threatens public health and contributes to environmental deterioration and degradation (Coracero et al., 2021; Republic Act No. 9003, 2001).

One of the necessary measures is the proper management of discards. Mixed waste may contain materials that can pollute the air, water, and soil when improperly handled, stored, transported, or disposed of. On the other hand, composting biodegradable wastes and recycling non-biodegradable materials can significantly reduce the volume of waste sent to disposal facilities and help address pollution. Republic Act No. 9003 specifically promotes waste reduction through segregation at source, resource conservation, re-use, recycling, and composting as part of ecological solid waste management (Coracero et al., 2021; Republic Act No. 9003, 2001).

It is on this premise that education and public information become essential. Solid waste management concepts should be integrated into classroom instruction through environmental education in the curriculum to promote a higher level of awareness and guide learners in the proper control, transfer, transport, processing, and disposal of wastes. Republic Act No. 9003 mandates continuing education and information campaigns on solid waste management and strengthens the integration of environmental concerns in school curricula, particularly waste minimization, segregation at source, reduction, recycling, re-use, and composting (Republic Act No. 9003, 2001, §§ 55–56).

In view of this, it was the ardent desire of the researcher then to determine the Solid Waste Management Practices of the Elementary Schools in the Two Districts of Roxas, Isabela: A Basis for Environmental Program Development.

Research Questions

This study aimed to determine the Solid Waste Management Practices of Elementary Schools in the two districts of Roxas, Isabela: A Basis for an Enhanced Environmental Development Program.

Specifically it sought to obtain answers to the following questions:

1. What is the profile of the respondents in terms of their?
 - a. Age
 - b. Sex
 - c. Parents Educational Attainment
2. What is the awareness level of pupils on Solid Waste Management in terms of:
 - a. Control
 - b. Transfer and Transport
 - c. Processing
 - d. Disposal
3. Is there a significant difference in the pupils' level of awareness when grouped according to their profile?
4. To what extent do the pupils practice Solid Waste Management in terms of:
 - a. Control
 - b. Transfer and Transport
 - c. Processing
 - d. Disposal
5. Is there a significant difference in pupils' extent of practices when grouped according to their profile?
6. To what extent are the pupils exposed to the sources of information on Solid Waste Management?
7. Is there a significant difference in the pupils' level of exposure on Solid Waste Management when grouped according to pupils' profile?
8. Is there a correlation between the pupil's level of awareness and extent of practices of pupils on Solid Waste Management?

METHODOLOGY

Research Design

The main purpose of this research was to determine the awareness level of pupils on solid waste management practices of elementary schools in the two districts of the municipality of Roxas, Isabela. This study made use of the descriptive method of research using a questionnaire as data gathering tool. According to Good (1960) descriptive method analysis approach interprets and reports present states of a group and present primarily condition through description.

Best (1968) explains that descriptive research determines the present facts or current conditions concerning the nature of the group and number of subjects. According to Best, this research is concerned with condition or relationship that exists practices that

prevail, beliefs, point of view or attitudes that are held. The process of the descriptive survey goes beyond the mere gathering and tabulating data. It involves an element of analysis and integration of the meaning and significance of what is described.

Locale of the Study

The study was conducted in the municipality of Roxas, Province of Isabela composed of 26 barangays. The town is found in the Western part of the province popularly known as the Mallig Plains. It is bounded on the North by the town of Mallig. On the Northeast by Quirino and Burgos, on the Southeast by San Manuel, and on the West, the Mountain Province. The town is under the Second Congressional District of Isabela and classified as a second-class municipality with a total land area of 184.80 square kilometers and a total population of 53,861 as of 2006 (Province of Isabela, n.d.).

The study was conducted in the two elementary school districts of Roxas, namely the Roxas East District and the Roxas West District of the Division of Isabela.

Selection and Description of Respondents

The respondents of this study are the Grade VI pupils presently enrolled for the School Year 2007–2008 in the two districts of Roxas. The Roxas East District has 10 elementary schools with 507 grade six pupils, and the Roxas West District has nine elementary schools with 480 grade six pupils. The respondents were selected randomly from the total district population. Slovin’s formula was used to determine the number of selected respondents from all the schools of the two districts of Roxas (Sevilla et al., 1992).

The Formula is:

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

Where:

n = the sample

N = the population

e = the tolerable error of risk where alpha 0.05 will be used.

The table shows the enrollees breakdown of respondents from the two elementary school districts.

Table 1
Distribution of Respondents by School

School	Total Population	Respondents
A. Roxas East District		
Roxas East Central School	232	66
Luna- Rang – Ayan Elementary School	30	9
Lanting- San Luis Elementary School	46	13

Imbiao Elementary School	27	8
San Pedro- Villa Concepcion Elementary School	30	9
Anao – Quiling Elementary School	37	11
San Jose Elementary School	25	7
Lucban – Masigun Elementary School	22	6
Matusalem Elementary School	49	14
Doña Concha Elementary School	9	3
Sub Total	507	146
B. Roxas West District		
Roxas West Central School	91	26
Marcos Elementary School	28	8
Sinamar Elementary School	41	12
San Francisco Elementary School	29	8
Nuesa Elementary School	65	19
Bantug-Lintao Elementary School	57	16
San Rafael Elementary School	58	17
San Antonio Elementary School	57	16
Simimbaan Elementary School	54	16
Sub Total	480	138
Grand Total	987	284

Data Gathering Procedure

Before the study was conducted, a letter requesting permission to conduct the study was sent to the Schools Division Superintendent through the District Supervisors of the two districts. After permission was sought, the researcher personally administered the questionnaire with the assistance of School Heads and the Grade Six Teacher Advisers.

To ensure one hundred percent retrieval and to elicit reliable answer from the respondents, the cooperative assistance of the class advisers was requested.

Data Analysis Procedure

After the data from the questionnaire, interviews and observations have been gathered, the responses were organized following the sequence of the research questions. To analyze the data gathered, the researcher made use of the simple frequency count, percentage and weighted mean.

To establish the profile of the respondents the simple frequency distribution and percentage was used. The formula for percentage according to Punzalan (1989) is

$$P = \frac{R}{N} \times 100$$

Where:

P = is the percentage

R= the number of responses

N = is the total population

To answer items in research questions 2, 4, and 6 on the Level of Awareness, Extent of Practices and Level of Exposure, the weighted mean was computed to determine the degree of frequency and adequacy. The formula for Weighted Mean according to Garret and Woodworth (1976) is

$$WX = \frac{\sum(WxF)}{N}$$

Where:

WM = Weighted Mean

\sum = Summation

W = Weight of the Choice

F = Frequency

N = Number of Respondents

To answer the research questions 3, 5, 7, the ANOVA and student t -test were employed. To answer the specific correlation of research question 8, the Pearson Product – Moment of Coefficient of correlation was applied.

Statistical Treatment of Data

The following statistical tools were used to organize and present the data for analysis and interpretation:

1. Frequency and Percentage Distribution were used to present the data for the pupils' profile.

2. Analysis of the data on the Level of Awareness, Extent of Practices, and Level of Exposure used the Weighted Mean together with adjectival interpretation.

3. Four null hypotheses were postulated in this study:

a. The first null hypothesis that was tested was the significance of the pupils' Level of Awareness and Extent of Practices on Solid Waste Management against the demographic profile, the respondents' age, sex, and parents' educational attainment. The two-way analysis of variance was applied to test the null hypothesis on no significant difference among the variables vis-a-vis the pupils' Level of Awareness and Extent of Practices on Solid Waste Management.

b. The second null hypothesis tested was the significance of the pupils' Level of Exposure vis-a-vis their demographic profile on age, sex, parents'

educational attainment and the districts where the pupils belong. Since the variables age and parents educational attainment were ordinally categorized, a one-way analysis of variance was applied to test the null hypothesis of no significant difference among the variables against the pupils' Level of Exposure on Solid Waste Management. The variables sex and the districts where the pupils belong were treated with the student – t test since it utilized weighted means of two groups. All the variables were tested at a five percent (0.05) level of significance. According to Minium et.al., (1995) the null hypotheses shall be rejected if the computed values exceeds the critical values found in Table 11 for the significance of r, Table E for the significance of F and Table D for the significance of students' extent of exposure to certain variables.

- c. The third null hypothesis is testing the difference between the pupils' profile in the two districts and their Level of Awareness by applying the t-test on a five percent level of significance.
- d. The fourth null hypothesis is the testing the correlation between the respondents' Awareness and the Extent of Practices on Solid Waste Management using Pearson Product – Moment of Coefficient of correlation where the value is represented by r. The r was further tested on a student's Level of Awareness and Extent of Practices of SWM. The formula in testing the r was provided by Minium et al.(1995)

The following formulas were provided by Minium et.al in determining the significance of:

$$a. \quad r = \frac{\sum d x d y}{\sqrt{(\sum d^2 x d) (\sum d^2 y)}}$$

$$b. \quad t = \frac{\underline{x_2} - \underline{x_1}}{\sqrt{s^2 \left(\frac{n_1 + n_2}{n_1 n_2} \right)}}$$

Where :

$$s^2 = \frac{\left[\sum x_1^2 - \frac{(\sum x_1)^2}{n_1} \right] + \left[\sum x_2^2 - \frac{(\sum x_2)^2}{n_2} \right]}{(n_1 + n_2) - 2}$$

- c. Testing the significance of r under the student t:

$$t = \frac{r}{\sqrt{\frac{(1-r^2)}{n-2}}}$$

The following norms for interpretation of data were used to determine the level of awareness, extent of practices, and level of exposure to sources of information.

Level of Awareness on Solid Waste Management

4 Point Likert Scale	Boundaries	Adjectival Rating Equivalent
4	3.50 – 4.00	Very Highly Aware
3	2.50 – 3.49	Highly Aware
2	1.75 – 2.49	Moderately Aware
1	1.00 – 1.74	Not Aware

Extent of Practices of Pupils on Solid Waste Management

4 Point Likert Scale	Boundaries	Adjectival Rating Equivalent
4	3.50 – 4.00	Always Practiced
3	2.50 – 3.49	Often Practiced
2	1.75 – 2.49	Sometimes Practiced
1	1.00 – 1.74	Never Practiced

Level of Exposure to the Different Sources of Information

4 Point Likert Scale	Boundaries	Adjectival Rating Equivalent
4	3.50 – 4.00	Very Highly Exposed
3	2.50 – 3.49	Highly Exposed
2	1.75 – 2.49	Moderately Exposed
1	1.00 – 1.74	Not Exposed

RESULTS AND DISCUSSION

1. The Profile of Respondents

a. Age

Table 2
Frequency and Percentage Distribution of Respondents According to Age

Age	Male		Female	
	F	%	F	%
10 years old	0	0	6	2.11
11 years old	48	16.90	69	24.30
12 years old	60	21.13	62	21.83
13 years old & above	18	6.34	21	7.39
Total	126	44.37	158	55.63

Table 2 presents the frequency and percentage distribution of 284 respondents according to their age. It is reflected in the table that out of 126 male respondents, there are 60 or 21.13 percent who are 12 years old; followed by 11 years old with a frequency of 48 or 16.9 percent; 13 years old and above gives a number count of 18 or 6.34 percent.

The greater percentage of the female respondents which is 158, fall within the age of 11 years old with a frequency of 69 or 24.30 percent; 62 or 21.83 percent are 12 years old; the frequency of 21 or 7.39 percent and six or 2.11 percent belongs to the 13 years old and above age bracket and 10 years old, respectively.

From the given data, most of the respondents fall under 12 years old category which is the ideal or right age for grade six pupils in the elementary schools. Most of the pupil respondents who are 11 years old entered schooling earlier than the prescribed age of Grade I which is late six years old. The older respondents belonging to 13 years old and above had stopped schooling for a year due to illness and maladjustment of respondents in their early years in school.

b. Sex

Table 3
Frequency and Percentage Distribution of Respondents According to Sex

Sex	Frequency	Percentage
Male	126	44.37
Female	158	55.63
Total	284	100

Table 3 shows the frequency and percentage distribution of respondents according to sex.

As shown in the table majority of the respondents are female as indicated by the frequency of 158 or 55.63 percent and 126 or 44.37 percent are male.

This signifies that the female respondents outnumbered the male respondents by almost 11.26 percent. Based from the school statistics for the past five years there are more female in the lists of entrants in any institutional learning particularly in the elementary grades.

c. Parents' Educational Attainment

Table 4
Frequency and Percentage Distribution of Respondents According to Parents' Educational Attainment

Parents Educational Attainment	Father		Mother	
	F	%	F	%
No Formal Education	0	0	0	0
Elementary Level	44	15.49	24	8.45
Elementary Graduate	41	14.43	41	14.43
High School Level	57	20.1	74	26.10
High School Graduate	88	30.98	97	34.15
College Level	21	7.39	19	6.69
College Graduate	33	11.61	29	10.21
Total	284	100	284	100

The parents' educational attainment of the respondents is presented in Table 4. There are 44 or 15.49 percent of the respondents' father who have reached elementary level; 41 or 14.43 percent finished elementary; 57 or 20.1 percent have reached high school level; 88 or 30.98 percent have completed their secondary education; 21 or 7.39 percent are college undergraduate and 33 or 11.61 percent finished their baccalaureate degree.

For the respondents' mother, there are 24 or 8.45 percent who have reached elementary level; 41 or 14.43 percent are elementary graduate; 74 or 26.10 percent did not finish high school level; 97 or 34.15 percent had completed their secondary education; 19 or 6.69 percent have gone to college and 29 or 10.21 percent were able to finish their bachelor's degree.

The data reveals that majority of the respondents parents did not have the chance for higher studies because majority of their parents are engaged in farming that is the reason why few of them had a college diploma. Another reason given by the respondents when interviewed was early marriage, lack of interest, and financial constraints.

2. The Awareness Level of Pupils on Solid Waste Management

a. Control

Table 5
Respondents' Level of Awareness on the Control of Solid Waste

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
A. Control		
1. Biodegradable solid wastes should be separated from non-biodegradable.	3.12	Highly Aware
2. Burning of solid wastes contributes to worsening environmental problems.	1.72	Not Aware
3. Source Separation is done to sort out solid waste into some of all its components parts at the point of generation.	2.31	Moderately Aware
4. A regular inspection of cleanliness and sanitation is conducted to control solid waste generation.	1.99	Moderately Aware
5. Ordinances are issued and enforced to effectively implement a collection system for solid wastes.	2.37	Moderately Aware
Average Weighted Mean	2.30	Moderately Aware

Table 5 displays the obtained weighted mean and adjectival rating of respondents' level of awareness particularly in terms of control. Of the five items, the respondents were "**Highly Aware**" that "Biodegradable solid wastes should be separated from non-biodegradable." On the other hand, they are "**Not Aware**" that "Burning solid wastes contributes to worsening of environmental problems" has the lowest weighted mean of 1.72 They are "**Moderately Aware**" of items number 5, 3, 4 with a weighted mean of 2.37; 2.31; 1.99, respectively.

Table signifies that respondents' awareness on the control of solid waste management is not yet fully developed. Based from the observed practices of the respondents, when we swept the surroundings especially under the trees they immediately burn those that are considered useless or unwanted. The present system of handling waste is merely a waste disposal and not a waste management which is not ecological but rather destroys ones health. The burning of garden waste releases carbon dioxide and other pollutants into the atmosphere. For this reason, environmental agencies discourage the burning of garden waste and recommend composting or proper green-waste collection instead. Carbon dioxide is one of the greenhouse gases that contributes to the greenhouse effect, a process in which greenhouse gases trap heat near the Earth's

surface and increase global temperature. Mother Earth Foundation also supports zero-waste practices, including proper waste segregation, composting, and the avoidance of open burning as part of ecological solid waste management (Global Alliance for Incinerator Alternatives & Mother Earth Foundation, 2019; NASA, 2024; Senedd Cymru, 2009).

b. Transfer and Transport

Table 6
Respondents' Level of Awareness on the Transfer and Transport of Solid Waste

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
B. Transfer and Transport		
1. The school is responsible for ensuring that a 100 percent collection efficiency from residential, commercial, industrial and agricultural sources is achieve	2.27	Moderately Aware
2. Hauling and transfer of solid wastes from sources or collection to processing sites or final disposal sites are done daily.	2.69	Highly Aware
3. There are properly designed containers or receptacles in selected collection points for the temporary storage of solid wastes.	3.08	Highly Aware
4. Transfer stations are utilized to receive solid waste, temporarily store, separate convert or otherwise process the materials in the solid waste.	2.17	Moderately Aware
5. There are funds allotted to daily garbage collection.	2.19	Moderately Aware
Average Weighted Mean	2.48	Moderately Aware

Table 6 presents the obtained weighted means and adjectival rating of respondents' level of awareness on the transfer and transport of solid waste.

The table reveals that the respondents are "**Highly Aware**" that there are "Properly designed containers or receptacles in selected collection points for the temporary storage of solid waste" and that the hauling and transfer of solid wastes from sources to processing sites are done daily. Their level of awareness on the other items is "**Moderate.**"

Although the respondents are "**Aware**" of the transfer and transport of solid wastes, they still find it hard to put into practice, sometimes pupils still make litters in the

school ground even if sorter or receptacles are placed in strategic location. Since some of the litters like plastics comes from school canteen and scattered papers from the school children, institution should device means or address those materials that require disposal.

From this point, canteen managers in the schools should make an alternative use of indigenous materials that could be used instead of plastics.

c. Processing

Table 7
Respondents' Level of Awareness on Processing Solid Waste

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
C. Processing		
1. Segregation is employed to different types of solid waste for re-use, recycling and composting	3.13	Highly Aware
2. There are methods and systems for the processing of solid wastes from specific collection points to solid waste management facilities.	2.44	Moderately Aware
3. Properly trained officers and works to handle solid waste disposal are provided.	2.39	Moderately Aware
4. Appropriate waste processing technologies that conform with internationally – acceptable and other standards set other laws and regulations are provided.	2.47	Moderately Aware
5. Recycling is a process of converting waste materials like papers, glasses, meals and others into usable form.	2.35	Moderately Aware
Average Weighted Mean	2.56	Highly Aware

Table 7 reflects the obtained weighted means and adjectival rating of respondents' level of awareness on processing of solid waste.

The respondents are “**Highly Aware**” that “ Segregation is employed to different types of solid waste for re-use, recycling, reduce and even composting” and are “**Moderately Aware**” of the other indicators.

The 3'Rs is perceived to be the most effective way to manage waste and a sustainable solution to our garbage problem. Santiago (1996) in her study recommends that we must reduce the waste we generate, reducing the amount of garbage is the first step in easing the waste disposal problem, second we, must re- use, most plastic products

are reusable, and third, recycle. Easily 50 percent of our domestic products are recyclable.

R.A 9003 Section 16 provides that the Local Government Unit Solid Waste Management Plans shall be for the re- use, recycling, and composting of wastes generated in their respective jurisdiction. The Barangay shall be responsible for ensuring 100 percent collection efficiency from residential, commercial, institution, and agricultural sources, where necessary within its coverage is achieved. Toward this end, the plan shall identify the specific strategies and activities to be undertaken by its component barangay, taking into account the following concerns: (1) Availability and provisions of properly designed containers or receptacles in selected collection points for the temporary storage of solid waste while awaiting collection and transfer to processing sites or to final disposal sites; (2) hauling and transfer of solid waste from source or collection points to processing sites or final disposal sites; (3) provision of properly trained offices and workers to handle solid waste disposal (Republic Act No. 9003, 2001).

It is worthwhile to note that the schools under study train young children in creative strategies in waste segregation and waste recycling. In this setting, pupils are motivated to throw their thrash in the proper bins. If pupils follow this routine everyday, they will eventually develop a lifestyle in waste segregation that will be a powerful tool for environmental protection.

d. Disposal

**Table 8
Respondents' Level of Awareness on Disposal of Solid Waste**

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
D. Disposal		
1. Solid waste disposal is fast- becoming a serious problem in the Philippines.	2.76	Highly Aware
2. There are described methods for determining the categories of solid wastes to be diverted from disposal facility through recycling.	2.44	Moderately Aware
3. Disposal sites are designated where solid wastes are finally and discharged and deposited.	2.38	Moderately Aware
4. There is an inventory of existing waste disposal and other solid waste facilities and capabilities of the school.	2.49	Moderately Aware
5. There are seminars, lectures and other trainings conducted regarding solid waste disposal activities.	2.40	Moderately Aware
Average Weighted Mean	2.40	Moderately Aware

The obtained weighted means and adjectival rating of respondents' level of awareness on disposal of solid waste are presented in Table 8.

The respondents highly recognize that solid waste disposal is fast becoming serious problems in the country. This item has a weighted mean of 2.76. The other indicators under disposal of solid waste are "**Moderately**" known by the respondents like "Disposal sites are designated where solid wastes are finally discharged and deposited" which for the lowest weighted mean of 2.38 or an adjectival rating of "**Moderately Aware.**"

This finding affirms that of the National Environmental Protection Council and Ministry of Human Settlements (1979) that disposal of waste in the country is creating a great problem. Existing waste management practices in the Philippines are still grossly inadequate and are not capable of coping with waste being generated at present.

According to Sec. 3 of Republic Act 9003, open dumpsite shall not be allowed as final disposal sites. If an open dump site is existing within the city or municipality, the plan shall make provisions for its closure or eventual phase out within the period specified under the framework. As an alternative, sanitary landfill sites shall be developed and operated as a final disposal site for solid and, eventually, residual wastes of a municipality or cluster cities. Sanitary landfill shall be designed and operated in accordance with the guidelines set under Sections 40 and 41 of this Act. Strategies shall be included to improve the said existing sites to reduce adverse impact on health and environment, and to extent life span and capacity. The plan shall clearly define projections for future disposal site requirements and the estimated cost for these efforts (Republic Act No. 9003, 2001).

Table 9
Summary of Respondents' Level of Awareness on Solid Waste Management

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
A. Control	2.30	Moderately Aware
B. Transfer and Transport	2.48	Moderately Aware
C. Processing	2.56	Highly Aware
D. Disposal	2.49	Moderately Aware
Average Weighted Mean	2.46	Moderately Aware

The summary of obtained weighted means and adjectival rating of respondents' level of awareness on solid waste management is reflected in Table 9.

The table shows that the respondents are "**Moderately Aware**" of all the items under the components of solid waste management except for the processing components which they are "**Highly Aware**" with a mean of 2.56. In general, the respondents' level of awareness on solid waste management is "**Moderate**" as indicated by the mean of 2.46.

The respondents level of awareness supports that segregation of wastes are mandatory, as postulated in Article 2, section 21 and where the LGUs shall evaluate alternative roles for the public and private sectors in providing collection system, or the combination of systems, that best meet their needs. As in Section 22, the minimum standards and requirements for segregation and storage of solid waste pending collection: there shall be a separate container for each type of waste from all sources; and the solid waste container depending on its use shall be properly marked or identified for on- site collection as “compostable,” “Non-recyclable,” “recyclable” or “ special waste” or any other classification as may be determined (Republic Act No. 9003, 2001).

3. The Extent of Pupils’ Solid Waste Management Practices

a. Control

Table 10
Respondents’ Extent of Practices on the Control of Solid Waste

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
A. Control		
1. I separate biodegradable materials from non- biodegradable ones.	2.94	Often Practiced
2. I refrain from throwing my solid wastes in waterways.	2.17	Sometimes Practiced
3. I read articles in newspapers and magazines on solid waste management.	2.35	Sometimes Practiced
4. I share knowledge on proper solid waste management to my friends, and other members of the community.	2.39	Sometimes Practiced
5. I attend seminars, lectures, and other trainings that deal with solid waste management.	1.69	Not Practiced
Average Weighted Mean	2.30	Sometimes Practiced

Table 10 reveals the respondents’ extent of practices on the control of solid waste.

It could be seen from the table “Separating biodegradable materials from non-biodegradable ones” is “**Always Practiced**” by the respondents and “attending seminars, lectures and other trainings that deal with solid waste management” is “**Not Practiced.**” The other items like sharing knowledge on proper solid waste management, refraining from throwing solid wastes in waterways, and reading articles on solid waste management are “**Sometimes Practiced**” by them.

Dela Cruz (2006) in her article explains that segregation practices in the school level are important and vital. It is on this level that each class in schools are required to

have three cans with stand in their room where they could throw their garbage separately, the white can for papers, the red can for plastics, and the green can for decaying materials like leaves. Along the pathways are iron stands with three sacks where garbage is placed separately or segregated.

The findings imply that schools should not only continue to provide information education in the implementation of solid waste management by giving trainings, lectures and seminars where waste management concepts but also integrated in their school policies the strict implementation of these information.

b. Transfer and Transport

Table 11
Respondents' Extent of Practices on the Transfer and Transport of Solid Waste

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
B. Transfer and Transport		
1. I see to it that school solid wastes are collected daily.	2.53	Often Practiced
2. I properly label containers and receptacles for solid wastes before transporting them to their final disposal sites.	2.25	Sometimes Practiced
3. I encourage my neighbors to provide garbage pits or compost pits in their household.	1.54	Not Practiced
4. I generate money from solid wastes by selling them to buy- back stations.	2.57	Sometimes Practiced
5. I support the government effort to allot funds for trainings of personnel in the transfer and transport of solid wastes.	1.63	Not Practiced
Average Weighted Mean	2.10	Sometimes Practiced

Table 11 presents the obtained weighted means and adjectival rating of respondents' on the extent of practices on the transfer and transport of solid waste. The findings show that transfer and transport of solid waste is "**Sometimes Practiced**" as shown by the general weighted mean of 2.10.

"Generate money from solid wastes by selling them to buy – back stations" and labeling of containers and receptacles are "**Sometimes Practiced**" with a mean of 2.57 and 2.25, respectively. On the other hand, "encouraging neighbors to provide compost pits in their households and supporting the government in allocating funds are rated the lowest with an adjectival rating of "**Not Practiced**."

The findings support the ideas of Belen (1990) that there is cash in trash. He pointed out that resource and recycling with the use of appropriate technology and capital can provide cash income plus their environmental and community benefit. The resource collection at home, schools, and community could be constructed like the Material Recovery Facility where trash is sorted out and deposited, treated and delivered to recycling factories thus giving an additional income.

Schools make money from sorted recyclable materials. Papers are bundled and filed in the MRF and later sold which is considered as an income generating project of the school. Another income generating project is the collection of bottles from pupils, also piled in the MRF. These practices will likely reduce waste going to dumpsites and landfills.

c. Processing

Table 12
Respondents' Extent of Practices on the Processing of Solid Waste

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
C. Processing		
1. I resort to the use of low- cost processing system in dealing with solid wastes.	2.37	Sometimes Practiced
2. I prefer to use or re- use recycled materials rather than those which are not.	2.56	Often Practiced
3. I join seminar, lectures and other trainings that deal with the processing of solid wastes.	1.55	Not Practiced
4. I discuss with my family, friends and peers topics on solid waste processing techniques.	1.65	Not Practiced
5. I recycle materials to minimize solid waste generation.	1.96	Sometimes Practiced
Average Weighted Mean	2.02	Sometimes Practiced

Table 12 reflects the obtained weighted means and adjectival rating of respondents' extent of practices on processing of solid waste.

Based from the table, the respondents "**Often Practiced**" to "use or re-use recycled materials rather than those which are no" with a weighted mean of 2.56. The items that are "**Sometimes Practiced**" are the use of low cost processing system of solid waste and recycling materials to minimize solid waste. The respondents do "**Not Practice**" attending seminars on SWM and do not discuss of family and friends matters on SWM.

Prescribed policies to achieve the objectives in Chapter II Section 5, of the Act in the Institutional Mechanism includes the following activities, develop and implement a program to assist LGU's in the identification of markets for materials that are diverted from disposal facilities through re- use, recycling, and composting, and other environmentally-friendly methods; encourage all local government agencies to patronize products manufactured using recycled and recyclable materials; Formulate and up-date a list of non- environmentally acceptable materials in accordance with the provision of this act. For this purpose it shall be necessary that proper consultation be conducted by the Commission with all concerned industries to ensure a list that is based on technological and economic viability (Republic Act No. 9003, 2001).

d. Disposal

Table 13
Respondents' Extent of Practices on Disposal of Solid Waste

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
D. Disposal		
1. I throw solid wastes in properly labeled containers.	3.01	Often Practiced
2. I compost solid wastes like leaves, twigs, grasses, and other biodegradable materials at home.	2.47	Sometimes Practiced
3. I properly dispose solid wastes to keep away from disease carrying organisms.	2.43	Sometimes Practiced
4. I do not burn solid waste to avoid air pollution.	2.49	Sometimes Practiced
5. I discourage friends to simply dump their waste in vacant lots and other neglected areas.	1.63	Not Practiced
Average Weighted Mean	2.41	Sometimes Practiced

The obtained weighted means and adjectival rating of respondents' extent of practices on disposal of solid waste is presented in Table 13.

Based from the table, throwing solid wastes in properly labeled container is "**Always Practiced**" with the highest weighted mean of **3.01**; those that are "**Sometimes Practiced**" are not burning wastes to avoid air pollution; composting solid wastes like leaves, twigs, grasses and other biodegradable materials at home; properly disposing solid wastes to keep away from diseases carrying organisms with a weighted mean of 2.49; 2.47; 2.43, respectively. Discouraging friends to simply dump their waste in vacant lots and other neglected area is "**Not Practiced**" with a weighted mean of 1.63.

Proper receptacles should be provided to increase the retrievability of useful materials. The availability and provision of properly designed containers or receptacles in selected collection points for the temporary storage of solid waste while awaiting collection and transfer to processing sites or to final disposal sites is the concern of the barangay. The establishment of MRF is designed to receive, sort, process and store compostable and recyclable material efficiently and in an environmentally sound manner (Republic Act No. 9003, 2001).

Table 14
Summary of Respondents' Extent of Practices on Solid Waste Management

Components of Solid Waste Management	Weighted Mean	Adjectival Rating
A. Control	2.30	Sometimes Practiced
B. Transfer and Transport	2.10	Sometimes Practiced
C. Processing	2.02	Sometimes Practiced
D. Disposal	2.41	Sometimes Practiced
Average Weighted Mean	2.21	Sometimes Practiced

Table 14 shows the summary of the respondents' extent of practices along the four components of solid waste management. It can be gleaned from the table that the control, transfer and transport, processing and disposal of solid waste is "***Sometimes Practiced***" with the overall average weighted mean of 2.21

Wagner's et.al. (1973) findings reveal that there is a new concept of solid waste management is evolving. It assumes that man can devise a socio technical system that will wisely control the quality and characteristics of wastes, efficiently collect wastes that can be reused and properly dispose of waste that have no further use. Recycling and re-use of waste hold considerable potential for solving problems in waste if enough of the materials can be made reusable.

4. The Pupils' Exposure to Sources of Information on Solid Waste Management

Table 15
Respondents' Level of Exposure to Sources of Information on Solid Waste Management

Sources of Information	Weighted Mean	Adjectival Rating
A. Mass Media		
1. Print Media		
a. Books	1.97	Moderately Exposed

b. Periodicals	1.59	Not Exposed
c. Unpublished Materials	1.54	Not Exposed
2. Broadcast Media		
a. Radio	2.71	Highly Exposed
b. Television	2.92	Highly Exposed
B. Information Technology		
1. Internet	1.60	Not Exposed
C. Other Sources		
1. Formal	2.35	Moderately Exposed
2. Informal	2.15	Moderately Exposed
3. Actual experience/ Observation	1.57	Not Exposed
Average Weighted Mean	2.10	Moderately Exposed

Table 15 displays the respondents' level of exposure to sources of information on solid waste management.

Broadcast media through radio and television is the more common source of information on SWM by the respondents. The study shows that they are "**Highly Exposed**" to radio and T.V. with a weighted mean of 2.92 and 2.71, respectively.

The students are "**Moderately Exposed**" to print media particularly books as their source of information on SWM as shown by the weighted mean of 1.97

Students also gather information on SWM from other sources like seminars and lectures and information from teachers and authorities on a moderate extent.

The LGU's have the primary role in education and public information regarding solid waste management. They are expected to educate and inform its citizens about the source reduction, recycling, and composting programs. Provisions to ensure that that information on waste collection services and related health and environmental concerns are widely disseminated to the public. This is undertaken through the print and broadcast media and other government agencies. The DepEd and CHED shall ensure that waste management shall be incorporated in the curriculum of primary, secondary and tertiary level (Republic Act No. 9003, 2001).

The U.S. Environmental Protection Agency (2025) program on educational campaign is directed at elementary schools and environmental curriculum has been developed as well as training program to help teachers incorporate recycling and other environmental messages into their science lessons.

5. Is there a significant difference in pupils' level of awareness and extent of practices when grouped according to their profile?

Table 16
Significance of the Respondents' Level of Awareness and Extent of Practices
When Grouped According to Their Profile

Level of Awareness/ Extent of Practices	Alpha Level of Significance	Test Statistics	Obtained d-value	Tabular Value	Decision Rule	Interpretation
Age	0.05	ANOVA	4.82	5.99	Retain Ho	There is no significant difference
Sex	0.05	ANOVA	1.219	1.676	Retain Ho	There is no significant difference
Parents' Educational Attainment	0.05	ANOVA	7.910	7.81	Reject Ho	There is a significant difference exist

The significance of the respondents' level of awareness and extent of practices when grouped according to their profile is presented in Table 16.

It could be gleaned from the table the test of significance and the application of Analysis of Variance (ANOVA) is best suited for this hypothetical problem because it treats at the same time three important variables. The null hypothesis states no significant difference in the respondents' level of awareness and extent of practices when grouped according to their age, obtained value of 4.82 thus the null hypothesis is retained.

Sex tested using the ANOVA at a five level of significance tells us that there is no significance difference on the respondents' level of awareness and extent of practices when grouped according to their sex therefore no significant difference exists.

On the parents' educational attainment, the null hypothesis is rejected since a significant difference exist. The higher the educational attainment of the parents, the child becomes more knowledgeable, aware and more practicing of the solid waste management.

6. Significant difference in the pupils' level of exposure on solid waste management when grouped according to pupils' profile of the two districts.

Table 17
Pupils' Level of Exposure on Solid Waste Management and Their Demographic Profile

Variable	Alpha Level	Test Statistic	Computed Value	Tabular Value	Decision Rule	Interpretation
Age	0.05	ANOVA	f comp.= 34.17	19.16	Reject Ho	There is a Significant Difference
Parents' Educational Attainment	0.05	ANOVA	f comp.= 12.1301	4.76	Reject Ho	There is a Significant Difference

The pupils' level of exposure in Solid Waste Management on age and parents' educational attainment is presented in Table 17. The test of significant difference for the two demographic variables shows no significant difference in the respondents' level of exposure when grouped according to age. The null hypothesis is rejected since significant exists.

For the parents' educational attainment, the null hypothesis is also rejected since significant difference is found.

The older a pupil becomes, the exposure he has on the ideas and program on Solid Waste Management and the higher the level of education a child becomes more knowledgeable and exposed to the program of Solid Waste Management.

Table 18
Pupils Level of Exposure on Solid Waste Management and Their Demographic Profile

Variable	Alpha Level	Test Statistic	Computed Value	Tabular Value	Decision Rule	Interpretation
Sex	0.05	t – test	t obt = 1.341	1.660	Retain Ho	There is no significant difference
Per District	0.05	t- test	t obt = 1.022	1.660	Retain Ho	There is no significant difference

Table 18 presents the pupils' level of exposure in Solid Waste Management. The variables sex and district classification was tested. The null hypothesis is retained since no significant difference exists when grouped according to their respective districts. The result also show no significant difference.

Thus findings shows no difference in the level of exposure of the pupils when grouped according to sex and according to their respective districts. Both male and

female pupils whether highly or not at all exposed to the principles of solid waste management, whether a pupil belongs to which district, their level of exposure makes no difference.

7. Correlation between the level of awareness and the extent of practices of pupils on solid waste management

Table 19
The Level of Awareness and Extent of Practices of Pupils on Solid Waste Management

Variable	Alpha Level	Test Statistic	Obtained r-value	Tabular r-value	Decision Rule	Interpretation
The Pupils Level of Awareness vs. Extent of Practices on SWM	0.05 level of significance	Pearson Product Moment Coefficient of Correlation with t required to test the r $t = \frac{r}{\sqrt{\frac{(1-r^2)}{n-2}}}$	R=.7180	.8110	Retain Ho	No Significant Correlation

Table 19 presents the level of awareness and extent of practices of the respondents on Solid Waste Management. This result leads to the retention of the null hypothesis of no significant correlation meaning a pupil who is aware of the principles of SWM does not necessarily relate to whether he or she practices or applies this awareness or earned knowledge on solid waste management.

8. Significant difference between the level of awareness and exposure of pupils to the sources of information on solid waste management in the two districts

Table 20
The Difference of the Pupils of the Two Districts on Level of Awareness and Level of Exposure on SWM

By District	Alpha Level	Test Statistic	Obtained t-value	Tabular t-value	Decision Rule	Interpretation
Pupils' Level of Awareness	0.05	t- test	1.441	1.660	Retain Ho	There is no significant difference

Pupils' Level of Exposure	0.05	t- test	4.964	1.660	Reject Ho	There is a significant difference
---------------------------	------	---------	-------	-------	-----------	-----------------------------------

Table 20 reflects the results of the two null hypotheses tested on their level of significance. The respondents of the two districts do not significantly differ in their level of awareness. Thus the null hypothesis of no difference is retained.

As to the pupil-respondents' district exposure, the null hypothesis of no significant difference is rejected since there is found a significant difference.

Conclusions

In the light of the findings of the study, the following conclusions were made.

1. The older the child, and the higher the level of education of the child's parents, the greater is the tendency of the pupil to be more exposed to the principles of SWM.
2. Being highly aware of the programs of SWM does not mean that they are highly practiced.
3. The level of Awareness of pupils in the two districts do not differ.
4. The level of exposure to the SWM programs of the pupils of the two districts are not the same.
5. No significant difference in the level of awareness and extent of practices of the pupils on SWM program exists when grouped according to sex.
4. No significant difference in the level of awareness and extent of practices of the pupils on SWM program exists when grouped according to age.
5. A significant difference in the level of awareness and extent of practices of the pupils on SWM program exists when grouped according to parents' educational attainment.
6. There is significant difference in the level of exposure of pupils on SWM program when grouped according to age, sex, educational attainment of parents.
7. No significant difference in the level of exposure of pupils on SWM program when grouped according to sex, district they belong.
8. No significant correlation exists between the level of awareness and extent of practices of pupils on SWM program.
9. There is no significant difference in the level of awareness of pupils on SWM program according to district they belong to.
10. There is significant difference in the level of exposure of pupils on SWM program in the two districts.

Recommendations

In the light of the findings and conclusions, the following recommendations are made:

1. An action plan must be evolved to include among other activities to be undertaken wherein education and public information on waste management concepts are integrated in the classroom instruction to promote pupils awareness on the importance of ecological waste management and to guide them with waste segregation and proper disposal.

2. There should be a continuous environmental campaign through mass media, education, training and literacy to strengthen awareness of the school populace and to provide them with the ability to understand and appreciate their role and responsibilities as well as the benefits they derive in terms of good health and healthier environment.

3. Proper receptacles for the various components of solid waste management should be provided to increase awareness in waste segregation.

4. Trainings on recycling should be conducted by experts in the schools as a means of reducing waste into handicrafts and sold as an income generating project.

5. The following topics are suggested for future research undertakings:

a. The Socio-Cultural Practices of Solid Waste Management of Secondary Schools in the Division of Isabela (Province of Isabela, Central Elementary Schools in the Division of Isabela)

- Basis for a Modern Environmental Development Program

- Basis for an Enhanced Training Program for Solid Waste Management for Schools and Community in the Province of Isabela

- Basis for a Program for Bettering the Economic Life of School Personal and Their Families in the Province of Isabela

- Basis for a Program Conserving the Environmental Resources of the Province of Isabela

- Basis for the Proper Selection of Waste for Updated SWM in the Schools and Communities of Isabela

b. The Solid Waste Management Practices in the Province of Isabela

c. The Solid Waste Management Awareness and Practices of Central Elementary Schools in the Division of Isabela

Compliance with Ethical Standards

This study complied with ethical standards in the conduct of educational research. Prior to data gathering, the researcher secured permission from the Schools Division Superintendent through the District Supervisors, as well as the cooperation of school heads and Grade VI teacher-advisers in the participating elementary schools. Since the respondents were elementary pupils, proper care was observed to ensure that their participation was voluntary, respectful, and free from harm or pressure. The purpose of the study was explained in a manner appropriate to the pupils' level of understanding, and the questionnaire was administered only for academic and research purposes. The identities and responses of the respondents were treated with confidentiality, and the data gathered were used solely for determining their awareness, practices, and exposure to solid waste management. No personal information was disclosed in the presentation, analysis, and interpretation of results. The study also upheld honesty and objectivity by using appropriate statistical tools and by interpreting the findings based on the data

collected. Overall, the research was conducted with respect for the rights, privacy, dignity, and welfare of the pupil-respondents and the participating schools.

Acknowledgements

The researcher wishes to convey his profound gratitude and grateful appreciation to the following persons involve for their unselfish and wholehearted assistance in the completion of the study:

Dr. Corazon T. Barrientos, Schools Division Superintendent of Isabela, for approving the request in conducting this study to the schools in Roxas East and West District which is covered in this study;

Dr. Salome S. Cariño, Vice President of Academic Affairs of St. Ferdinand College and Chairman of the Panel, for her valuable recommendations/suggestions for the improvement of this research;

Dr. Marcelino C. Gapultos Jr., Dean of the Graduate School and the writer's adviser for his unselfish, valuable suggestions and guidance which facilitated the completion of this study;

Dr. Onofre A. Curameng, Public Schools District Supervisor of the Roxas East District, for his motivation in pursuing this research;

Dr. Serafin M. Furuc, Principal of Luna–Rang–Ayan Elementary School, for his fatherly encouragement to the writer to finish this undertaking;

To the teachers, who guided their pupils in answering the questionnaires;

To my niece, Levy C. Aquino, who extend her time in accompanying the writer at the National Library;

To his ever-loving and supportive wife in Tokyo, Japan, Cristeta Zales Aquino, and two children, Dominique and Franck Daniel, for their unwavering love and inspiration;

Above all, to God Almighty, for His continuous blessings.

REFERENCES

- Belen, L. Q. (1990, October 8). There is cash in trash. *Manila Bulletin*.
- Best, J. W. (1968). *Research in education*. Prentice-Hall.
- Coracero, E. E., Gallego, R. B. J., Frago, K. J. M., & Gonzales, R. J. R. (2021). A long-standing problem: A review on the solid waste management in the Philippines. *Indonesian Journal of Social and Environmental Issues*, 2(3), 213–220.
<https://doi.org/10.47540/ijsei.v2i3.144>
- Dela Cruz, E. (2006). Environmental education. *The Philippine Journal of Education: The Teacher's Magazine*, 85(5), 206, 226.
- Garrett, H. E. (1976). *Statistics in psychology and education*. Vakils, Feffer and Simons.
- Global Alliance for Incinerator Alternatives, & Mother Earth Foundation. (2019). *Waste assessment and brand audit methodology: Volume 1: For households*. Global Alliance for Incinerator Alternatives.
- Global Alliance for Incinerator Alternatives, & Mother Earth Foundation. (2022). *A 10-step manual to implementing a community zero waste program*. Global Alliance for Incinerator Alternatives and Mother Earth Foundation.
- Good, C. V. (1966). *Essentials of educational research: Methodology and design*. Appleton-Century-Crofts.

- Minium, E. W., King, B. M., & Bear, G. (1993). *Statistical reasoning in psychology and education* (3rd ed.). John Wiley & Sons.
- National Aeronautics and Space Administration. (2024, October 23). What is the greenhouse effect? NASA Science. Retrieved from <https://science.nasa.gov/climate-change/faq/what-is-the-greenhouse-effect/>
- National Environmental Protection Council, & Ministry of Human Settlements. (1979). *Philippine environment 1978: Second annual report, June 1979*. National Environmental Protection Council.
- Province of Isabela. (n.d.). Official website of the Province of Isabela. Retrieved May 8, 2026, Retrieved from <https://provinceofisabela.ph/>
- Punzalan, T. G., & Uriarte, G. G. (1989). *Statistics: A simplified approach*. Rex Book Store.
- Republic Act No. 9003, Ecological Solid Waste Management Act of 2000 (2001). Retrieved from https://lawphil.net/statutes/repacts/ra2001/ra_9003_2001.html
- Santiago, F. I., et al. (1996). *Environmental science: A shared responsibility towards the Earth*. Rex Printing Company.
- Senedd Cymru. (2009, May 21). Answers issued to Members on 21 May 2009. Retrieved from <https://senedd.wales/archive/written-questions/21-05-2009-answers-issued-to-members-on-21-may-2009/>
- Sevilla, C. G., Ochave, J. A., Punsalan, T. G., Regala, B. P., & Uriarte, G. G. (1992). *Research methods* (Rev. ed.). Rex Book Store.
- U.S. Environmental Protection Agency. (2025, December 29). Reduce, reuse, recycle resources for students and educators. U.S. Environmental Protection Agency. Retrieved from <https://www.epa.gov/recycle/reduce-reuse-recycle-resources-students-and-educators>
- Wagner, K. A., Bailey, P. C., & Campbell, G. H. (1973). *Under siege: Man, men, and earth*. Intext Educational Publishers.

APA Citation:

Aquino, F. D., & Gapultos, Jr., M. C. (2026). THE SOLID WASTE MANAGEMENT PRACTICES OF THE ELEMENTARY SCHOOLS IN THE TWO DISTRICTS OF ROXAS, ISABELA: A BASIS FOR ENVIRONMENTAL PROGRAM DEVELOPMENT. *Ignatian International Journal for Multidisciplinary Research*, 4(5), 2056–2083. <https://doi.org/10.5281/zenodo.20313974>

Corresponding author: ferdinand.aquino002@deped.gov.ph