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Awareness, Attitude, and Practices on Solid Waste Management: Bases for an Enhanced Environmental Management System

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Abstract

Aim: The purpose of this study was to determine the awareness, attitude, and practices of the students of recognized maritime higher education institutions (MHEIs) with regard to solid waste management.

Methodology: This study used a descriptive-correlational design using surveys to determine the relationship between the variables. This study was conducted at recognized maritime higher education institutions (MHEIs) in Western Visayas (Region VI) with 225 respondents. The participants in the study were determined by using stratified random sampling.

Results: The students had very high awareness, positive attitude, and very good practices on solid waste management. There was no significant difference existed when participants were grouped by program, but a significant difference existed when grouped by school. Significant positive correlations were noted among awareness, attitude, and practices.

Conclusion: Students from recognized MHEIs in Western Visayas are fully aware of the current situation in the country's struggle towards improper waste management. They also possess a positive attitude towards environmental protection and preservation. Lastly, correct practices are innate to them with little room for improvement.

Keywords: awareness, attitude, practices, solid waste management

INTRODUCTION

Solid waste management is regarded as an urgent global issue that requires the government and its citizens to act immediately. Waste in the Philippines has been increasing steadily and is predicted to do so in the years to come. Sanitary landfill shortages, improper disposal, growing volumes of solid waste, and lax enforcement of laws are some of the issues related to the country's solid waste management (Coracero et al., 2021).

The majority of municipal solid waste (MSW) is made up of residential waste, which includes kitchen scraps, yard waste, paper and cardboard products, glass bottles, plastic containers and sando bags, foils, soiled tissues, and diapers. Special wastes include batteries, waste electrical and electronic equipment, and containers containing household cleaning agents. In 2010, waste generation rates ranged from as low as 0.10 kg/capita/day in non-metropolitan towns to 1.00 kg/capita/day in both HUCs and Metro Manila. In the Philippines, the average generation rate per person is 0.40 kg. (Solid Waste Management Status Report, 2018).

Through the enactment of Republic Act 9003, the Ecological Solid Waste Management Act, which calls for a systematic, all-encompassing, and ecological waste management program to ensure the protection of public health and the environment, the Philippines has worked to enhance the management of solid waste. The National Ecology Center, which is in charge of information dissemination, consultation, education, and training of various local government units on ecological waste management, has strengthened the implementation of solid waste management plans and prescribes policies in conjunction with the National Solid Waste Management Commission (Department of Natural Resources, 2019).



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Improper disposal of waste is turning into one of the biggest problems facing communities worldwide. A study that looked at how urban residents' perceptions and awareness of waste management that may affect greenhouse gas emissions in the region was carried out in Benin City. Four residential zones made up the city: planned estates, suburban, center, and intermediate. Using a self-administered survey, data was gathered from 2720 randomly chosen residents using blocking. The results indicated a low degree of awareness regarding improper disposal of garbage, which encourages the implementation of sustainable mitigation and adaptation strategies throughout the region (Adekola et al., 2021).

Another survey was conducted among Bacolod City's Trinitarian students to determine their knowledge, attitudes, and practices on proper management. The findings demonstrated that although students only sometimes practice waste management on campus, they are highly aware of it and have a positive attitude. (Abalajon et al., 2019).

A state college conducted a different study that used a researcher-made instrument and a descriptive-quantitative approach. The definition of solid waste, the consequences of inappropriate disposal, activities that are prohibited about solid waste, school initiatives regarding solid waste, the significance of solid waste management, and students' duties were all found to be adequately covered by the students. However, students do not know much about the various rules that pertain to solid waste management (Molina & Catan, 2021).

The results of a positive study by Reyes and Madrigal (2020), which assessed the degree of awareness, attitude, and practice of solid waste management (SWM) among high school students at a Diocesan Catholic school, revealed that students, irrespective of their sex or academic standing, demonstrated a high degree of awareness, a very positive attitude, and a great deal of SWM practice. Additionally, a strong correlation between students' sex and academic level and awareness and practice was discovered.

Environmental and public health are seriously threatened by improper waste disposal. Effective waste management is becoming increasingly important as populations continue to rise and become more urbanized. Inadequate waste disposal techniques can contaminate the environment and cause irreversible harm to ecosystems, as well as a host of health problems for populations (Scale Climate Action, 2023).

Students' views of the environment are positively impacted by environmental education in schools (Prasetiawan & Wasisto, 2021). To successfully convert the institution to a circular economy, it is advised to raise awareness of environmental education, launch participatory environmental initiatives, and bolster the essential sustainability competences (Owojori et al., 2022).

Since internationally recognized standards for environmental management offer a framework for management to plan, execute, and continuously improve their environmental performance, organizations can choose to embrace them. Organizations may make sure they are taking proactive steps to reduce their environmental impact, abide by applicable regulatory requirements, and accomplish their environmental goals by following this standard (ISO:14001, 2015).

Objectives

This study aimed to look into the awareness, attitude, and practices of students of recognized Maritime Higher Education Institutions (MHEIs) in Western Visayas (Region VI) with regard to solid waste management (R.A. 9003).

Specifically, the study sought answers to the following questions:

1. What is the level of awareness, attitude, and practices of students on solid waste management when taken as an entire group, and when grouped by program and by school?
2. Which among the environmental awareness indicators are dominant?
3. What is the dominant environmental attitude of the students?
4. What are the dominant environmental practices of students?
5. Is there a significant difference in the level of awareness, attitude, and practices of students on solid waste management when grouped by program and by school?
6. Is there a significant relationship among the awareness, attitude, and practices of students on solid waste management?
7. Based on the results of the study, what proposed actions for the enhancement of the environmental management system can be developed?



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Hypothesis

Given the stated research problem, the following hypotheses were tested on a 0.05 level of significance:

Hypothesis 1: There is no significant difference in the level of awareness, attitude, and practices of students on solid waste management when grouped by program and when grouped by school.

Hypothesis 2: There is no significant relationship among attitude, attitude, and practices of the students on solid waste management.

METHODS

Research Design

This descriptive-correlational study was to determine the awareness, attitude, and practices of the students of recognized maritime higher education institutions (MHEIs) in Western Visayas (Region VI) with regard to solid waste management (R.A. 9003).

Population and Sampling

The participants in this research were two hundred twenty-five (225) determined through stratified proportional random sampling of recognized MHEIs in Western Visayas (Region VI).

Instrument

A 43-item questionnaire, validated and subjected to reliability (Cronbach's alpha 0.88), answerable by a 5-point Likert scale on awareness, attitude, and practices was administered to the participants as a data gathering instrument.

Data Collection

Upon retrieval of the accomplished copies of the instrument, these were scored and the scores were classified, tabulated, and subjected to appropriate statistical analysis via the SPSS.

Treatment of Data

Statistical tools utilized were means, standard deviations, ranks, t-test for independent samples, One-way ANOVA, and Pearson's r. Alpha level was set at .05.

Ethical Considerations

The researcher ensured that all research protocols involving ethics in research were complied with for the protection of all people and institutions involved in the conduct of the study.

RESULTS and DISCUSSION

Awareness on Solid Waste Management

Table 1
Means and Description for Awareness on Solid Waste Management

Category	M	Awareness Description
A. Entire Group	4.37	Very High
B. Program		
BSMar-E	4.40	Very High
BSMT	4.34	Very High



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C. School		
School A	4.40	Very High
School B	4.26	Very High
School C	4.32	Very High
School D	4.38	Very High

Scale	Awareness
4.21 – 5.00	Very High
3.41 – 4.20	High
2.61 – 3.40	Average
1.81 - 2.60	Low
1.00 – 1.80	Very Low

Table 1 shows the data on the awareness on solid waste management. When taken as an entire group, students' awareness is "Very High" (M=4.37, SD=0.42).

When grouped according to program, BSMar-E students' awareness is "Very High" (M=4.40, SD=0.36) while BSMT students' awareness is "Very High" (M=4.34, SD=0.47).

When grouped according to school, School A's awareness is "Very High" (M=4.40, SD=0.39), School B's awareness is "Very High" (M=4.26, SD=0.52), School C's awareness is "Very High" (M=4.32, SD=0.40), and School D's awareness is "Very High" (M=4.38, SD=0.34).

The respondents' very high awareness on solid waste management is a positive sign that reflects a broader shift towards a more sustainable and environmentally conscious society. By fostering this awareness through education, community engagement, and advocacy, the younger generation can be empowered to play a pivotal role in addressing global environmental challenges (Santos & Pastrana, 2021; Debrah et al., 2021; Reyes & Madrigal, 2020).

Attitude on Solid Waste Management

Table 2
Means and Description for Attitude on Solid Waste Management

Category	Attitude	
	M	Description
A. Entire Group	4.33	Positive
B. Program		
BSMar-E	4.34	Positive
BSMT	4.32	Positive
C. School		
School A	4.38	Positive
School B	4.29	Positive
School C	4.26	Positive
School D	4.35	Positive

Scale	Attitude
3.67 – 5.00	Positive



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2.33 – 3.66 Neutral
 1.00 – 2.33 Negative

Table 2 reflects the data on the attitude toward solid waste management. When taken as an entire group, students' attitude is "Positive" (M=4.33, SD=0.27).

When grouped according to program, BSMar-E students' attitude is "Positive" (M=4.34, SD=0.27) while BSMT students' attitude is "Positive" (M=4.32, SD=0.28).

When grouped according to school, School A's attitude is "Positive" (M=4.38, SD=0.26), School B's attitude is "Positive" (M=4.29, SD=0.29), School C's attitude is "Positive" (M=4.26, SD=0.28), and School D's attitude is "Positive" (M=4.35, SD=0.26).

Students' positive attitudes toward solid waste management are indicative of a shift toward a more environmentally conscious and responsible society. This mindset, when nurtured through education and community engagement, can contribute to meaningful changes in waste management practices, influencing not only the present but also shaping a more sustainable future (Debrah et al., 2021; Comighud & Lalamonan, 2020; Reyes & Madrigal, 2020).

Practices on Solid Waste Management

Table 3
Means and Description for Practices on Solid Waste Management

Category	Practices	
	M	Description
A. Entire Group	4.09	Very Good
B. Program		
BSMar-E	4.14	Very Good
BSMT	4.05	Very Good
C. School		
School A	4.20	Very Good
School B	3.95	Very Good
School C	3.98	Very Good
School D	4.16	Very Good

Scale	Practices
4.21 – 5.00	Excellent
3.41 – 4.20	Very Good
2.61 – 3.40	Good
1.81 - 2.60	Fair
1.00 – 1.80	Poor

Table 3 shows the data on practices on solid waste management. When taken as an entire group, students' practices are "Very Good" (M=4.09, SD=0.47).

When grouped according to program, BSMar-E students' practices are "Very Good" (M=4.14, SD=0.42) while BSMT students' practices are "Very Good" (M=4.05, SD=0.52).



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When grouped according to school, School A's practices are "Very Good" (M=4.20, SD=0.49), School B's practices are "Very Good" (M=3.95, SD=0.51), School C's practices are "Very Good" (M=3.98, SD=0.43), and School D's practices are "Very Good" (M=4.16, SD=0.37).

A nearly perfect score on environmental practices suggests a combination of knowledge, practical application, innovation, community engagement, advocacy, collaboration, continuous improvement, curriculum integration, leadership, and support. It reflects a holistic and well-rounded approach to environmental sustainability. Improving environmental practices requires a combination of individual and collective efforts (Reyes & Madrigal, 2020).

Dominant Environmental Awareness Indicators

Table 4
Means, Ranks, and Descriptions of the Students' Environmental Awareness Indicators

Question	M	Rank	Description
1. Wastes can be reduced through 3Rs (Reduce, Reuse, Recycle).	4.67	1	Very High
2. Improper solid waste management has a negative effect on the environment.	4.64	2	Very High
3. Biodegradable wastes consist of vegetable and fruit scraps, fish scraps, dried leaves, leftover food and the like which has a color code of "green".	4.53	3.5	Very High
4. There is a school policy on waste segregation.	4.53	3.5	Very High
5. There are four classifications of solid waste (Biodegradable, Residual, Recyclable, and Special Waste).	4.50	5	Very High
6. Recyclable wastes consist of paper, carton, tin cans, pet bottles, plastics, and the like which has a color code of "blue".	4.47	6	Very High
7. Special wastes must be handled separately from other types of waste.	4.46	7	Very High
8. Residual wastes consist of sanitary napkin, disposable diapers, candy wrappers, sachets, cigarette butts and the like which has a color code of "black".	4.29	8.5	Very High
9. Special wastes consist of paint, spray canisters, thinner, battery, broken appliances and the like which has a color code of "red".	4.29	8.5	Very High
10. Environmental awareness is included in our curriculum.	4.27	10	Very High
11. Republic Act No. 9003, also known as the "Ecological Solid Waste Management Act of 2000", is an act that ensures proper segregation, collection, transport, storage, treatment, and disposal of solid waste.	4.23	11	Very High
12. Littering, throwing, or dumping of waste in public places is a crime punishable with a fine of not less than three hundred (Php300)	4.15	12	High



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	but not more than one thousand (Php1000) pesos or renderable of a community service for not less than one (1) day to not more than fifteen (15) days, or both			
13.	Our school is conducting an awareness seminar on solid waste management at the start of each academic year.	4.13	13	High
14.	Open burning of waste is crime punishable with a fine of not less than three hundred (Php300) but not more than one thousand (Php1000) pesos or imprisonment of not less than one (1) day to not more than fifteen (15) days, or both.	4.00	14	High

Table 4 shows the data on the dominant environmental awareness indicators of the entire group. Results showed that among the fourteen (14) environmental awareness indicators listed, question eleven (11), which states that waste can be reduced through 3Rs (Reduce, Reuse, Recycle) ranked first.

On the other hand, question fourteen (14), which states that open burning of waste is a crime punishable with a fine of not less than three hundred (Php300) but not more than one thousand (Php1000) pesos or imprisonment of not less than one (1) day to not more than fifteen (15) days, or both, ranked last.

By integrating the 3Rs into waste management practices, individuals, businesses, and communities can contribute to a more sustainable and circular economy. These principles not only address the environmental impact of waste but also promote responsible consumption, conserve resources, and support the overall well-being of both local and global ecosystems (Green Coast, 2022).

Dominant Environmental Attitude

Table 5
Means, Ranks, and Descriptions of the Students' Environmental Attitude

Question	M	Rank	Description
1. Environmental education is very important.	4.85	1	Positive
2. Improper solid waste management is a threat to the environment.	4.76	2	Positive
3. I want the school cleanliness to be sustained for the future students.	4.74	4	Positive
4. I want our school to be clean and tidy.	4.74	4	Positive
5. Proper solid waste management is also my responsibility.	4.74	4	Positive
6. I admire people who practice proper waste segregation.	4.68	6	Positive
7. Activities such as coastal clean ups have increased my awareness on environmental issues.	4.62	7	Positive
8. I get disturbed seeing my environment in a dirty condition.	4.54	8	Positive
9. I can greatly contribute in the minimization of waste.	4.44	9	Positive
10. I have a drive for environmental sustainability.	4.39	10	Positive
11. Waste segregation is an easy task.	4.38	11	Positive



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12. I am obedient to our schools' environmental plans and programs.	4.26	12	Positive
13. I am one of the contributors of waste.	4.03	13	Positive
14. Proper solid waste management is the sole responsibility of the school.	1.46	14	Negative

Table 5 shows the data on the dominant environmental attitude of the entire group. Results showed that among the fourteen (14) environmental attitudes listed, question one (1), which states that environmental education is very important, ranked first.

On the other hand, question three (3), which states that proper solid waste management is the sole responsibility of the school, ranked last.

Environmental education is a cornerstone for fostering a sustainable and environmentally conscious society. By equipping individuals with knowledge, skills, and a sense of responsibility, it contributes to building a more resilient and harmonious relationship between humans and the natural world (Earth.Org, 2023). While educational institutions play a significant role in promoting and implementing proper solid waste management practices, it's important to note that waste management is not solely their responsibility.

Dominant Environmental Practices

Table 6
Means, Ranks, and Descriptions of the Students' Environmental Practices

Question	M	Rank	Description
1. Our school provides a separate container for each type of waste.	4.64	1	Excellent
2. Our school practices waste minimization such as 3Rs (Reduce-Reuse-Recycle).	4.43	2	Excellent
3. I segregate and dispose my waste into the appropriate waste bin (Biodegradable / Residual / Recyclable).	4.39	3	Excellent
4. I keep my waste in my bag/pocket until I can find a proper waste bin.	4.37	4	Excellent
5. Waste bins inside our school are properly labeled and color-coded.	4.36	5.5	Excellent
6. Our school encourages everyone to participate in solid waste management.	4.36	5.5	Excellent
7. Our school sets guidelines for solid waste avoidance and volume reduction through source reduction and waste minimization (reduce-reuse-recycle, composting, recovery and others).	4.32	7	Excellent
8. Our school prepares and distributes information, education, and communication materials on solid waste management.	4.27	8	Excellent
9. Our school integrates solid waste management and resource conservation topics into our curricula.	4.25	9	Excellent
10. Wastes inside the classrooms and offices are collected regularly and handled properly.	4.19	10	Very Good



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11. Our school uses a Materials Recovery Facility (MRF).	4.16	11	Very Good
12. I participate in school activities that promotes protection and preservation of the environment.	4.11	12	Very Good
13. I avoid the use of single-use plastics (drinking straw, coffee stirrer, etc.)	3.89	13	Very Good
14. I throw my waste anywhere if I can't find a waste bin nearby.	3.25	14	Good
15. I practice proper waste disposal when someone is watching.	2.43	15	Fair

Table 6 indicates the data on the dominant environmental practices of the entire group. Results showed that among the fifteen (15) environmental practices listed, question number one (5), which states that the school provides separate containers for each type of waste ranked first.

On the other hand, item number nine (9), which states that students only practice proper waste disposal when someone is watching ranked last.

Providing separate containers for different types of waste is a positive step toward promoting responsible waste management practices within the school community. It not only contributes to environmental sustainability but also fosters a culture of awareness and responsibility among students and staff.

Every small action contributes to a larger impact. While practicing responsible waste disposal when someone is watching is a positive step, making it a consistent habit regardless of external observation ensures a more meaningful and lasting contribution to environmental sustainability and community well-being.

Inferential Data

Difference in Awareness, Attitude, and Practices of Students by Program

Table 7

Results for the Differences in the awareness, attitude and practice of students by program

Compared Groups	N	M	SD	t	df	Sig
Awareness						
BSMar-E	118	4.40	.359	1.00	224	.318
BSMT	107	4.34	.469			
Attitude						
BSMar-E	118	4.34	.266	.638	224	.524
BSMT	107	4.32	.281			
Practices						
BSMar-E	118	4.14	.415	1.368	224	.173
BSMT	107	4.05	.523			

The t-test results in Table 7 show that the students in both programs did not at all differ significantly in their awareness, attitude, and practices on solid waste management as shown by obtained sig values which were higher than the set alpha level of .05.



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Specific difference results were: awareness, $t(224) = 1.00, p = .318$; attitude, $t(224) = .638, p = .524$; and practices, $t(224) = 1.368, p = .173$.

This finding implies that, in the context of this study, both programs may have similar levels of awareness, attitude, and practices concerning solid waste management. Further research and exploration of potential influencing factors may provide additional insights into the observed similarities between the two groups.

Differences in the awareness, attitude and practice of students by school.

Table 8
Difference in Awareness, Attitude, and Practices of Students by School

	Compared Group	Sum of Squares	df	Mean Squares	F	Sig.
Awareness	Between Group	1.304	3	.435	2.570	0.055
	Within Group	37.538	222	.169		
	Total	38.842	225			
Attitude	Between Group	.521	3	.174	2.372	0.071
	Within Group	16.267	222	.073		
	Total	16.788	225			
Practices	Between Group	2.584	3	.861	4.042	0.008*
	Within Group	47.305	222	.213		
	Total	49.889	225			

One-way ANOVA results in Table 8 revealed that there were no significant differences in the students' awareness, $F(3,222) = 2.57, p = 0.055$, and attitude, $F(3,222) = 2.37, p = 0.71$. However, there is a significant difference in the practices among the participants, $F(3,222) = 4.04, p = 0.008$.

Using the Scheffé Test for multiple comparison, results show that School A performs significantly higher than School B, $p = 0.042$.

The observed differences in waste management practices may suggest variations in the effectiveness of waste management programs or initiatives between the schools.

Further investigation into the specific factors contributing to the higher waste management practices in School A could provide insights for improvement in waste management education and initiatives.

Correlations among the Variables

Table 9
Correlation Matrix for the Variables

Variable	Variable	
	Attitude	Practices
Awareness		
Pearson Correlation	.443**	.528**
Sig. (2-tailed)	.000	.000
N	225	225



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Attitude		
Pearson Correlation	1	.340**
Sig. (2-tailed)		.000
N		225
Practices		
Pearson Correlation		1
Sig. (2-tailed)		
N		

Table 9 shows the matrix for the correlations among the variables.

Significant positive correlations were found between awareness and attitude, $r(225) = .443$, $p = .000$; between awareness and practices, $r(225) = .528$, $p = .000$; and between attitude and practices, $r(225) = .340$, $p = .000$. Results further showed that awareness significantly affects attitude and practices.

These results underscore the importance of targeted awareness campaigns and educational programs to positively influence attitudes and practices related to solid waste management. Strategies to enhance awareness may contribute not only to improved attitudes but also to tangible changes in waste management behavior.

While significant correlations were identified, the cross-sectional nature of the study limits the ability to establish causation. Longitudinal studies could provide insights into the temporal relationships between awareness, attitude, and practices.

Conclusions

Students from recognized MHEIs in Western Visayas seem fully aware of the current situation of the country's struggle towards improper waste management. They believe in the existence of the "threat" to the environment and have a positive attitude towards environmental protection and preservation. They are also aware of the do's and don'ts in terms of common practices on solid waste management and acts that are seemingly beneficial and malevolent.

The findings are a glowing testimonial account of how students are now aware of the negative impacts brought about by human-related activities. They also show that information dissemination by the government and other inter-related agencies, and environmental education is successfully implemented by educational institutions.

One important implication of the findings is that the current curriculum in BSMar-E and BSMT integrates environmental protection and preservation.

Regional culture and differences as well as the style of government can greatly affect awareness, attitude, and practices on solid waste management.

Most certainly, the present findings will boost the maritime students' solid reputation of being unquestionably skilled world-class seafarers with big hearts for the environment.

Recommendations

The maritime higher education institutions in Western Visayas must strive to maintain, and even further improve not just their very good instructional delivery, but also their awareness, attitude, and practices on solid waste management and on environmental protection and preservation.

There should be stricter implementation and imposition of fines and penalties for violators. Filipinos are known to be well-disciplined in other countries but not in their own. The very reason is that law enforcement is weak and people are not afraid of the fines and penalties at stake. People seem to always think that wrongdoings in the Philippines can go unpunished.



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