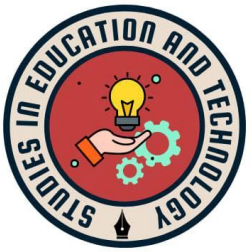
ISSN (online): 2094-9030



Studies in Technology and Education

Volume 3, Issue 2, 2024 | https://www.azalpub.com/index.php/ste

OPEN ACCESS

RESEARCH ARTICLE

SOLID WASTE MANAGEMENT RELATIVE TO IMPLEMENTATION OF POLICIES AND PROGRAMS TOWARDS SAFE AND HEALTHY ENVIRONMENT

Editha G. Espiritu
Anao -Kiling Elementary School
Schools Division Office of Isabela

Article Info
Received:
February 19, 2024

Accepted:
April 09, 2024

Published:
May 16, 2024

Keywords
Environment
Elementary
Challenges
Stakeholders
Management

Suggested Citation:

Espiritu, E. G. (2024). Solid Waste Management Relative to Implementation of Policies And Programs Towards Safe And Healthy Environment. Studies in Technology and Education, 3(2), 46-65.

Abstract

This study aims to investigate solid waste management programs and policies implemented to promote a safe and healthy school environment in Anao-Kiling Elementary School, Roxas, Isabela. Fifty internal and 30 external stakeholders served as respondents of the study. This research uses a descriptive-normative approach to assess stakeholders' awareness, implementation levels, and challenges. The data were collected through structured questionnaires and interviews, and analyzed through statistical tools such as percentages, weighted means, ANOVA, Chi-Square C-Test, and Pearson's correlation coefficient. The results showed that there is a high level of awareness among respondents regarding the policies of segregation, reduction, reuse, and recycling. However, challenges remain regarding waste disposal, showing the need for improvements in the overall implementation of the program and advocacy efforts. In addition, the level of stakeholder participation varied, with composting of biodegradable waste showing the highest level of implementation. Internal stakeholders experienced excessive waste, whereas external stakeholders experienced problems such as a lack of time. There was a significant relationship between existing programs, dissemination, and implementation levels. However, the respondents' perceptions and their profile variables did not show a significant correlation. Conclusions emphasize stakeholder representation, adequate dissemination of program information, and the need for targeted solutions to address implementation challenges. As a result of this study, holistic waste management strategies are crucial to creating a sustainable and healthy educational environment.

*Corresponding author: editha.espiritu005@deped.gov.ph

INTRODUCTION

Filipino children and youth require access to free and high-quality education, and their communities play a significant role in ensuring the success of this education. It is crucial for Filipino children and youth to not only attend school but also stay in school and thrive academically. This can only be achieved when all stakeholders in education work together effectively. However, this collaboration poses a considerable challenge for these stakeholders. In relation to the importance of education, securing a healthy environment is also crucial for the well-being of individuals and societies. The quality of the environment can vary depending on an individual's or society's physical and mental well-being, and it plays a vital role in meeting their basic needs and desires. When the quality of the environment fails to meet society's needs, a sense of threat arises, leading the society to take action to mitigate the threat.

One way to ensure a healthy environment is through the implementation of various environmental policies, such as the Solid Waste Management (SWM). Solid waste management continues to be a major challenge, particularly in urban areas with rapid population growth and increasing garbage generation. The role of SWM in achieving sustainable development is emphasized in international development agendas, charters, and visions. Sustainable SWM aligns with several United Nations' Sustainable Development Goals (SDG), including clean water and sanitation (SDG 6), sustainable cities and communities (SDG 11), climate change mitigation (SDG 13), protection of life on land (SDG 15), and sustainable consumption and production patterns (SDG 12). It also promotes a circular urban economy that reduces resource consumption, encourages materials reuse and recycling, reduces pollution, saves costs, and fosters green growth. This shows that SWM practice is important in various settings, including educational institutions (United Nations Department of Economic and Social Affairs, n.d.)

To describe, Solid Waste Management (SWM) encompasses a wide range of activities aimed at effectively managing unwanted residues, highlighting its significance for sustainable development (Powell, 2018). In the context of Philippine cities, Manalo (2022) sheds light on the composition of waste, emphasizing the prevalence of organic and recyclable materials. Despite legislative measures, Ferronato and Torretta (2019) emphasize the persistent challenges faced by developing countries in SWM, citing improper practices and lack of cooperation as primary issues. These literatures highlight the pressing concern of SWM, particularly in schools, where effective waste management serves as an indicator of governance and reform effectiveness. Challenges in this area include stakeholder participation, the complexity of waste, and regulatory compliance. While laws like Republic Act 9003 exist to regulate SWM in the Philippines, implementation gaps persist due to various factors. Moreover, their findings highlight the importance of stakeholder collaboration, proper waste segregation, and adherence to regulatory frameworks. Addressing these challenges is crucial not only for the well-being of communities but also for achieving sustainable development goals and ensuring a healthier environment for future generations. Hence, this study.

With this, the research aims to assess the profile of respondents, including internal and external stakeholders, evaluate existing solid waste management programs in terms of knowledge, dissemination, and advocacy; determine the level of dissemination of these programs; evaluate implementation levels focusing on participation and sustainability; identify challenges faced by stakeholders; analyze relationships between perceptions and

profile variables; investigate relationships between profiles and dissemination levels; explore relationships between profiles and implementation levels; and assess relationships among existing programs, dissemination, and implementation levels.

METHODOLOGY

This study employed a descriptive-normative methodology to investigate awareness, implementation, and challenges associated with solid waste management (SWM) programs at Anao-Kiling Elementary School. Eighty respondents who were chosen through purposive and random sampling participated in the survey, which included pupils, their parents, teachers, members of the barangay council, representatives of non-governmental organizations, and religious leaders.

The survey questionnaire used in the study was based on research by Nawawi et al. (2022). Its primary purpose was collecting information and assessing various aspects of the respondents. These aspects included the profile of the respondents and the evaluation of existing solid waste management programs. The questionnaire aimed to gather information about these programs' knowledge, dissemination, and advocacy. It also sought to determine the level of dissemination and implementation of these programs, focusing on participation and sustainability. Additionally, the questionnaire aimed to identify the challenges faced by stakeholders, analyze the relationships between perceptions and profile variables, investigate the relationships between profiles and dissemination levels, profiles and implementation levels, and assess the relationships among existing programs, dissemination, and implementation levels. In addition, an unstructured interview was conducted to gain additional insight into the study.

This study was approved by the Schools Division Superintendent of the Division of Isabela, as well as by the Public School District Supervisor and the School Head. Prior to their participation, informed consent was obtained from all adult respondents, while assent was obtained from the minor respondents. They were assured of the confidentiality and anonymity of their responses, and their data were treated with utmost privacy. To ensure the accuracy and completeness of the data, the researcher personally administered and retrieved the questionnaires. The responses were then compiled, consolidated, and tabulated for further analysis.

SPSS tools were used to perform data entry and analyses. Analyses were conducted using statistical tools such as Percentage, Weighted Mean, ANOVA, Chi-Square C-Test, and Pearson's Coefficient of Correlation. Responses were analyzed using a 5-point Likert Scale to assess the implementation of policies and programs relative to SWM.

RESULTS AND DISCUSSION

Profile of the Respondents

Table 1 shows the distribution of respondents at Anao-Kiling Elementary School, categorized into internal and external stakeholders. Parents make up 18.80% of the total respondents, followed by pupils at 31.30% and teachers at 12.50%. This shows that the respondents are predominantly internal stakeholders covering 62.60% of the total. On the other hand, external stakeholders, such as Barangay Council, NGOs, and Religious Groups,

each make up 12.50% of the total respondents showing that there are 10 respondents for each classification of external stakeholders. This diverse representation allows for a comprehensive assessment of perspectives and insights regarding solid waste management programs at the school.

Table 1. Distribution of Respondents in Terms of Internal and External Stakeholders

Respondents	Frequency	Percent
Internal Stakeholders		
Parents	15	18.80
Pupils	25	31.30
Teachers	10	12.50
External Stakeholders		
Barangay Council	10	12.50
Non – Government Organization	10	12.50
Religious Group	10	12.50
Total	**80**	**100.00**

Level of Knowledge Awareness of Policies on Solid Waste Management

Table 2 shows the awareness levels of respondents regarding solid waste management policies. The overall mean of 4.29 shows that they are fully aware of the policies that pertain to it.

Specifically, in terms of segregation policies, it can be gleaned from the table that the respondents are fully aware on practices of segregating biodegradable materials, separating recyclable waste, separating, and segregating garbage in different containers, and segregating recyclable items for collection as emphasized by the means ranging from 4.38 to 4.48. However, it has been shown that the respondents are only aware on the practice of separating non-harmful wastes from toxic and hazardous wastes as shown by the mean of 4.19. In general, the respondents have a comprehensive understanding of segregation policies, with an average mean score of 4.38, indicating they are fully aware of the segregation practices in the school's waste management program.

Studies such as Nawawi et al. (2022) emphasize that increasing awareness levels directly impact behavior and practices concerning solid waste management. This is further supported by Booth et al., (2019), who found that respondents exhibited a high level of awareness regarding different types of wastes, policies, and legal aspects of waste segregation. Additionally, Amasuomo & Baird (2016) concluded that the level of awareness and attitude of individuals significantly influence the solid waste management process.

As to the awareness levels of respondents regarding solid waste management practices on "reduce" policy, the respondents are fully aware of practicing packing lunch in a reusable lunchbox, bringing water in a reusable water bottle, and being cautious and responsible to every waste one produce as indicated by the mean score ranging from 4.22 to 4.42. On the other hand, they are aware on the policy of borrowing, sharing, and/or renting things that are needed occasionally and buying only what is needed so that one will not end up throwing away extra food with means of 4.14 and 4.19, respectively. Overall, the respondents demonstrate a strong understanding of reduction practices, with an average mean score of 4.24, suggesting a promising foundation for effective

implementation of reduction measures, contributing to waste minimization and environmental sustainability.

Debrah et al. (2021) underscores the significance of enhancing awareness on solid waste management through formal education for sustainability, particularly in developing countries. Similarly, research by Nawawi et al. (2022) emphasizes that heightened awareness levels can positively influence behaviors and practices related to solid waste management. Furthermore, the study by Reodica (2021) highlights the crucial role of school leaders in sustainability projects, emphasizing the importance of leadership in crafting policies and fostering an eco-friendly culture within educational institutions.

Regarding the respondents' awareness of solid waste management policies related to "Reuse", the mean scores range from 4.12 to 4.39 representing full awareness on policies or practices such as reusing old materials than buying a new one, keeping those unfilled papers and using it as scratch, reusing grocery bags and washable food containers, while they are aware on reusing scrap paper into memo pads with a mean of 4.17. The respondents demonstrate a strong understanding of reuse practices, with an average mean score of 4.30. This high awareness suggests a positive attitude towards reusing materials, contributing to waste reduction efforts and promoting environmental sustainability within the school community.

Reodica (2021) highlights the role of school heads in sustainability of zero waste management projects. They formulate environmental policies, develop an eco-friendly culture, and ensure waste management programs' sustainability. They also raise environmental awareness among stakeholders, encouraging responsible behavior. Qaderi et al. (2021) emphasizes the importance of promoting attitude change and sustainable environmental practices through educational programs, fostering positive attitudes towards waste management practices.

On the other hand, respondents have shown full awareness regarding "Recycle" policies, including creating decorations, promoting recycling, generating income, and using recycled products out of redesigned waste materials as indicated by the mean scores range from 4.20 to 4.33. On the other hand, redesigning waste materials into a new product as a policy has a mean of 4.10 showing respondents' awareness. Overall, the respondents have a strong understanding of recycling practices, demonstrating a positive attitude towards waste reduction and environmental sustainability as shown by the overall mean of 4.23.

Research shows that school principals play a crucial role in creating environmental policies, fostering eco-friendly cultures, and ensuring program sustainability. Their leadership is essential for promoting environmental awareness, solid waste management, and recycling practices among students and the community (Reodica, 2021). Moreover, the adoption of recycling practices in schools is influenced by various factors, and understanding stakeholders' perspectives, particularly principals, is crucial for policy implementation. The Consolidated Framework for Implementation Research (CFIR) is a valuable tool for interpreting study results and developing effective strategies in school settings, as highlighted by Wendt et al. (2023).

Table 2. Respondents' Level of Knowledge Awareness of Policies on Solid Waste Management

Indicators	Mean	Description
Segregation	**4.38**	**Fully Aware**
Segregation of waste into biodegradable and non-biodegradable.	4.41	Fully Aware
Separation of wastes into recyclable and non - recyclable or residuals which have no potential for reuse and recycling.	4.48	Fully Aware
Separation of non-harmful wastes from toxic and hazardous wastes	4.19	Aware
Separation and segregation of garbage in different containers	4.46	Fully Aware
Recyclable items are segregated for collection.	4.38	Fully Aware
Reduce	**4.24**	**Fully Aware**
Borrowing, sharing, and/or renting things that are occasionally. needed	4.14	Aware
Purchasing only the necessary items to avoid unnecessary food. waste	4.19	Aware
Packing lunch in a reusable lunchbox to eliminate the need to purchase wrapped or packaged food at school	4.23	Fully Aware
Choosing to bring water in reusable water bottles instead of purchasing water in single-use plastic bottles at school	4.42	Fully Aware
Exercising caution and taking responsibility for every waste that is generated.	4.22	Fully Aware
Reuse	**4.3**	**Fully Aware**
Opting to reuse old materials instead of purchasing new ones.	4.36	Fully Aware
Preserving unfilled papers and utilizing them as scratch paper.	4.20	Fully Aware
Using grocery bags multiple times for various purposes instead of disposing of them after a single use.	4.38	Fully Aware
Reusing washable food containers instead of disposable ones	4.39	Fully Aware
Repurposing scrap paper by turning it into memo pads for reuse.	4.17	Aware
Recycle	**4.23**	**Fully Aware**
Transforming waste materials through redesign into new products	4.10	Aware
Creating decorative items using plastic wrappers and other colorful waste materials	4.20	Fully Aware
Advocating for the significance of recycling	4.32	Fully Aware
Launching income-generating initiatives utilizing waste materials.	4.22	Fully Aware
Using recycled products out of redesigned waste materials	4.33	Fully Aware
Disposal	**3.92**	**Aware**
Disposing of garbage in an irresponsible manner, such as throwing and leaving it anywhere.	3.84	Aware
Engaging in the practice of burning waste materials.	3.86	Aware
Discarding waste materials in open dumps instead of proper waste management systems.	3.96	Aware
Properly disposing of biodegradable waste by composting it in a designated compost pit.	4.01	Aware
Incorrectly disposing of hazardous, toxic, or special waste, such as laboratory leftovers (chemicals) or electronic waste, in regular garbage containers.	3.93	Aware
Overall Mean	**4.21**	**Fully Aware**

Lastly, table 2 shows respondents' awareness of waste management policies on "Disposal" at Anao-Kiling Elementary School. The mean scores range from 3.84 to 4.01, indicating a general understanding of waste disposal practices which specifies that there is a room for improvement in areas like throwing and leaving garbages anywhere including open dumps, burning of waste materials, disposal of biodegradable wastes into a compost pit, and disposal of hazardous/toxic/special wastes in any garbage container.

Studies have shown that education plays a crucial role in shaping individuals' awareness of waste management practices. More educated individuals tend to be more knowledgeable about sustainable waste management options and are more likely to implement them effectively (Mochache et al., 2020). Therefore, enhancing educational programs within Anao-Kiling Elementary School could be a key strategy to improve waste management practices among students, staff, and the broader school community. In relation, the finding is in consonance with the study of Madarang (2023) where environment is one of the vital components of having a positive school climate. Moreover, practices on making the school environment by both the internal and external stakeholders had been always observed by the school heads and teacher-respondents.

Level of Dissemination of the Existing Programs on Solid Waste Management

Table 3 reveals that the level of dissemination of the SMW at Anao-Kiling Elementary School has been disseminated properly as shown by the overall mean of 4.16.

As to the segregation policies, solid waste management programs, including campaigns on segregation, labeling of bins, and visibility of the Material Recovery Facility, have been fully successful in disseminating information and resources about waste segregation as manifested in the mean scores ranging from 4.20 to 4.27. However, there is room for improvement in areas like providing visible waste receptacles outside classrooms and trash bins for special wastes with means of 3.95 and 4.15, respectively. Strengthening dissemination strategies could improve the effectiveness of waste segregation practices and promote a cleaner and healthier school environment.

The role of school heads in sustainability projects, as highlighted by Reodica (2021), is focused on the importance of leadership in formulating environmental policies, fostering eco-friendly cultures, and ensuring the continuity of programs. Through active leadership, school heads can drive environmental awareness, conduct capacity-building activities, and engage stakeholders to support initiatives like solid waste management and recycling.

Moreover, Johnson et al. (2013) demonstrates the significance of continuous education and awareness campaigns in sustaining waste management practices. By incorporating waste management training into regular educational programs, conducting awareness campaigns, and providing adapted resources, institutions can effectively reduce biohazardous waste and improve waste segregation practices over time.

On the other hand, Anao-Kiling Elementary School has successfully implemented solid waste management programs to reduce plastic usage. These include implementing a no-plastic policy in the canteen, promoting paper packaging, encouraging biodegradable materials, orienting canteen vendors on plastic avoidance, and conducting symposiums.

The mean scores ranged from 4.17 to 4.28, with an overall mean of 4.20, indicating a level of dissemination classified as "Fully Disseminated." The strategies used effectively communicate the importance of reducing plastic waste, contributing to a more environmentally friendly school community.

These findings align with the study of Nazemi et al. (2014), which emphasizes that proper solid waste management practices, such as separated collection, training programs, and capacity building, can significantly reduce waste management issues. Furthermore, the results from the study highlight the pivotal role of school leaders in ensuring the sustainability of zero waste management projects through policy formulation, eco-friendly culture development, and stakeholder support (Reodica, 2021). Moreover, the study of Prata et al., (2019) underscores that effective solid waste management plays a crucial role in reducing plastic pollution in the environment, thereby preventing the fragmentation of plastics into harmful microplastics. The research further supports the significance of implementing waste management programs in schools, showing a positive relationship between awareness, implementation, and program performance (Prisco & Cubillas, 2022).

As to the "Reuse" programs, including composting, gardening, and tire reuse. The mean scores range from 4.05 to 4.25, with an overall mean of 4.13, indicating moderate success on dissemination. Strategies like placard posting and orientations effectively communicate the importance of reusing materials, contributing to a more sustainable and environmentally conscious school community. Research on school gardens indicates that they are more prevalent in elementary and K-8 schools compared to secondary schools, with a focus on enhancing academics. The most taught subjects in school gardens include science, environmental studies, nutrition, language arts, and math. Teachers often take the lead in managing these initiatives, showcasing the educational value and impact of such programs (Parmer et al., 2009; Hermann et al., 2006; Duncan et al., 2016).

When it comes to recycling programs, including information on paper recovery, plastic waste transformation, tiny house creation, recyclable materials, and Material Recovery Facility usage. The mean scores range from 4.05 to 4.27, indicating moderate success in disseminating recycling information. Stakeholders are familiar with recycling initiatives and proper MRF utilization, contributing to a more environmentally conscious school environment. The success of the recycling programs at Anao-Kiling Elementary School is supported by research on sustainability and public health nutrition in schools. Studies emphasize the importance of integrating healthy and environmentally sustainable food initiatives in educational settings (Black et al., 2015). Additionally, research highlights the development of an entrepreneurial education model to enhance recycling skills among elementary school students, underscoring the significance of such programs in fostering environmental awareness and practical skills (Dharmawati et al., 2020).

Lastly, table shows the distribution of respondents regarding waste disposal programs at Anao-Kiling Elementary School. Key indicators include familiarizing stakeholders with special waste disposal, composting facilities, collection schedules, drop-off centers, and residual waste. The mean scores range from 4.01 to 4.32, indicating successful dissemination. Stakeholders are familiar with the existimg program on waste disposal procedures and designated facilities, contributing to an efficient and environmentally friendly system.

Table 3. Weighted Mean and Qualitative Description of the Level of Dissemination of the Existing Programs on Solid Waste Management

Indicators	Mean	Description
Segregation	**4.17**	**Disseminated**
Promoting and advocating for the practice of waste segregation through a campaign.	4.20	Fully Disseminated
Labelling of trash bins for proper waste segregation	4.25	Fully Disseminated
Placing Conspicuous trash bins for special waste	4.15	Disseminated
Providing evident waste receptacles outside the classrooms	3.96	Disseminated
Ensuring the visibility of MRF to all school personnel	4.27	Fully Disseminated
Reduce	**4.24**	**Fully Disseminated**
Implementing a "no plastic" policy in the canteen	4.26	Fully Disseminated
Encouraging the use of paper packaging in school	4.24	Fully Disseminated
Advising the school personnel the use of biodegradable materials	4.28	Fully Disseminated
Orienting school canteen vendors and strengthening on plastic avoidance policy	4.27	Fully Disseminated
Conducting symposium on School's policy on plastic avoidance in canteens	4.17	Disseminated
Reuse	**4.13**	**Disseminated**
Displaying informative placards that provide guidance. on the proper composting of biodegradable waste	4.05	Disseminated
Hosting a compost application orientation for gardening purposes.	4.08	Disseminated
Re-introducing the reusing used tires as decorative flower. pots	4.14	Disseminated
Orienting the school personnel on the use of compost products or soil from the compost pit were used.	4.14	Disseminated
Re-using practices are widely disseminated	4.25	Disseminated
Recycle	**4.16**	**Disseminated**
Informing and reminding stakeholders on recovering and recycling papers	4.18	Disseminated
Directing stakeholders on plastic waste turned into pillows as one of the products of recycling	4.05	Disseminated
Explaining stakeholders about drinking straws and popsicle sticks made into tiny houses among others	4.13	Disseminated
Briefing stakeholders about products out of recyclable materials show promise	4.18	Disseminated
Orienting the people on the proper utilization of MRF	4.27	Fully Disseminated
Disposal	**4.10**	**Disseminated**
Familiarizing and practicing proper disposal of special wastes	4.32	Fully Disseminated
Orienting the people about on-site establishment of composting facilities for biodegradable wastes	4.03	Disseminated
Observing collection schedules for specific category of segregated solid waste in the area	4.09	Disseminated
Familiarizing selves on the designation of drop-off center/MRF	4.01	Disseminated
Properly informing the stakeholders on residual waste disposal	4.04	Disseminated
Overall Mean	**4.16**	**Disseminated**

Level of Dissemination of the Existing Programs on Solid Waste Management
Level of Dissemination on the Advocacy Orientation of the Existing Programs on Solid Waste Management

Table 4 details the Level of Dissemination on the Advocacy Orientation of the Existing Programs on Solid Waste Management at Anao-Kiling elementary School. The overall mean of 4.20 shows that the orientation has been fully disseminated to the respondents.

In terms of waste segregation, focusing on classrooms, offices, and canteens. The school has successfully promoted waste segregation, ensured infrastructure availability and encouraged responsible waste management practices among students and staff. The overall mean score is 4.20, indicating a highly disseminated level of advocacy orientation. This implies that the respondents have their full awareness on the segregation programs of the school which would yield to better SWM practice.

As to the School's advocacy orientation programs for reducing plastic usage in the canteen, the indicators include avoiding plastics, using biodegradable materials, and orienting canteen vendors. The school has effectively disseminated policies, ensuring widespread compliance among vendors and staff, with an overall mean score of 4.24. This imply that the school canteen is fully compliant on the SWM existing programs for waste reduction.

On the other hand, as to the "Reuse" advocacy orientation programs, including composting, gardening, and tire reuse. The school has effectively disseminated policies promoting material reuse, resulting in widespread adoption and implementation among stakeholders, with an overall mean score of 4.26, indicating successful policy implementation.

Meanwhile, the recycling advocacy orientation programs, including paper recovery, plastic waste transformation, and recyclable product showcase, the level of advocacy orientation is classified as "Disseminated," suggesting there's room for improvement in raising awareness and engagement among stakeholders. This means that further efforts should be made to enhance the dissemination and promotion of recycling advocacy programs within the school community. This could involve implementing targeted awareness campaigns, organizing educational workshops or seminars, and actively involving all stakeholders.

Lastly, the table shows that Anao-Kiling Elementary School's waste disposal program has been categorized as "Disseminated," with a mean score of 4.18. The programs focus on proper waste disposal, composting, collection schedules, and drop-off centers. Despite efforts, there's room for improvement in certain areas for more effective waste management strategies. This result suggests that the school should focus on addressing the identified areas for improvement to further enhance their waste management programs under disposal. This could involve conducting awareness campaigns or educational sessions to reinforce proper waste disposal practices among stakeholders. It may also be beneficial to provide additional resources or training to staff members responsible for waste management to ensure they have the necessary knowledge and skills.

Table 4. Weighted Mean and Qualitative Description on the Level of Dissemination on the Advocacy Orientation of the Existing Programs on Solid Waste Management

Indicators	Mean	Description
Segregation	**4.24**	**Fully Disseminated**
Segregation practice is evident in classrooms, offices and canteen	4.22	Fully Disseminated
Waste is segregated into at least two types in areas with designated bins.	4.27	Fully Disseminated
Receptacle for special waste is necessary wherever applicable	4.12	Disseminated
All waste receptacles outside the classrooms are well-managed.	4.23	Fully Disseminated
MRF is available in its designated area	4.37	Fully Disseminated
Reduce	**4.24**	**Fully Disseminated**
Avoidance of use of plastics in canteen	4.19	Disseminated
No more plastics used as secondary packaging material, instead use paper / brown bags	4.23	Fully Disseminated
Most foods are packed using biodegradable materials	4.22	Fully Disseminated
Orientation of school canteen vendors on plastic avoidance policy for strict implementation	4.27	Fully Disseminated
Implement School's policy on plastic avoidance in canteens	4.29	Fully Disseminated
Reuse	**4.26**	**Fully Disseminated**
Composting of biodegradable waste	4.19	Disseminated
Actual application of compost in gardening	4.18	Disseminated
Reuse used tires as decorative flowerpots	4.23	Fully Disseminated
Use of compost products or soil from the compost pit were used in the garden	4.33	Fully Disseminated
Re-use practices are evident	4.36	Fully Disseminated
Recycle	**4.10**	**Disseminated**
Informing and reminding stakeholders on recovering and recycling papers	4.09	Disseminated
Directing stakeholders on plastic waste turned into pillows as one of the products of recycling	4.05	Disseminated
Explaining stakeholders about drinking straws and popsicle sticks made into tiny houses among others	4.01	Disseminated
Briefing stakeholders about products out of recyclable materials show promise	4.14	Disseminated
Orienting the people on the proper utilization of MRF	4.23	Fully Disseminated
Disposal	**4.18**	**Disseminated**
Proper disposal of special wastes *for* collection is inside sacks to facilitate collection by the LGU	4.31	Fully Disseminated
On site establishment of composting facilities for biodegradable wastes	4.08	Disseminated
Observance of collection schedules for specific category of segregated solid waste	4.12	Disseminated
Designate drop-off center/MRF that is ideal, sturdy, labeled, and actual sales on recyclable waste	4.17	Disseminated
Residual waste due for collection is inside sacks to facilitate collection by the LGU.	4.23	Fully Disseminated
Overall Mean	**4.20**	**Fully Disseminated**

Challenges Faced by Internal and External Stakeholders on the Implementation of Solid Waste Management Programs

Based on the findings presented in Table 5, it is evident that there are several challenges faced in implementing Solid Waste Management Programs at Anao-Kiling Elementary School. These challenges are experienced by both the internal and external stakeholders involved in the program.

For the internal stakeholders, some of the challenges identified include a lack of awareness about waste segregation, open dumping, excessive garbage use, unavailability of compost pits, lack of waste segregation monitoring, irregular waste collection, inability to recycle and burn plastics and papers, inability to sustain the program due to overlapping activities, and insufficient solid waste management infrastructure. These challenges are "slightly serious" based on the mean scores ranging from 2.00 to 2.52, with an overall category mean of 2.22. While these challenges may not be extremely severe, they still require attention and the implementation of mitigation strategies for effective waste management.

Studies have shown that solid waste management is a prevalent challenge in many countries, especially in educational institutions like schools (Joseph, 2019). The role of school heads is crucial in ensuring the sustainability of waste management projects, including formulating environmental policies, developing eco-friendly school cultures, and engaging stakeholders to support waste management and recycling initiatives (Dev, 2018). Additionally, community participation plays a significant role in the performance of waste segregation programs, highlighting the importance of involving all stakeholders in waste management efforts (Moqbel et al., 2020).

On the other hand, external stakeholders also face challenges in the implementation of the waste management program. These challenges include poor stakeholder participation, lack of volunteerism, poor relationships, inadequate information dissemination, unclear discussions, financial constraints, lack of reporting mechanisms, non-recognition of donations, limited time for program implementation, and poor attendance of stakeholders. These challenges are also categorized as "slightly serious," highlighting the need to address them to improve the effectiveness and inclusivity of waste management initiatives.
It can be deduced on the finding that community participation is vital in the success of waste management programs. By involving community members and volunteers, the school can create a sense of ownership and shared responsibility for waste management. This can be achieved through awareness campaigns, community clean-up drives, and collaboration with local organizations and businesses. Addressing the challenges faced by external stakeholders, such as poor participation and inadequate information dissemination, is essential. Clear communication, regular meetings, and effective reporting mechanisms can help improve stakeholder engagement and ensure their active involvement in waste management initiatives.

Overall, the findings suggest that there are several challenges faced in implementing Solid Waste Management Programs at Anao-Kiling Elementary School. These challenges require attention and the implementation of appropriate strategies to ensure effective waste management. The involvement of both internal and external stakeholders, including school heads, community members, and volunteers, is crucial in overcoming these challenges and promoting sustainable waste management practices.

Table 5. Challenges Encountered in the Implementation of Solid Waste Management Programs of the Stakeholders

Indicators	Mean	Description
Internal Stakeholders	**2.22**	**Slightly Serious (SS)**
Lack of awareness about segregation and waste management rules and policies in the school community	2	Slightly Serious (SS)
Habit of open dumping among people in the area	2.16	Slightly Serious (SS)
Excessive use of garbage or waste materials like paper and Plastics	2.52	Slightly Serious (SS)
Unavailability of compost pits in school	2.14	Slightly Serious (SS)
Lack of monitoring on segregation of waste by the school personnel	2.1	Slightly Serious (SS)
Irregularity of waste collection in the school	2.28	Slightly Serious (SS)
Unable to recycle, reuse and reduce solid wastes	2.08	Slightly Serious (SS)
Burning of plastics and papers inside the school	2.16	Slightly Serious (SS)
Unable to sustain the program due to overlapping of activities in the school-community	2.34	Slightly Serious (SS)
Insufficient solid waste management infrastructure in school	2.4	Slightly Serious (SS)
External Stakeholder	**2.02**	**Slightly Serious (SS)**
Poor participation of stakeholders in the implementation of solid waste management programs and policies	1.97	Slightly Serious (SS)
The spirit of volunteerism in the participation of solid waste management program is not evident at all	2.07	Slightly Serious (SS)
There is a poor relationship among school staff, parents and other stakeholders	1.9	Slightly Serious (SS)
Poor dissemination of information regarding the activities solid waste management	1.87	Slightly Serious (SS)
Proposals and suggestions on the conduct of the programs on solid waste management are not discussed and clear to everyone	2.07	Slightly Serious (SS)
There is no establishment on the financial constraints in the implementation of the program	2.13	Slightly Serious (SS)
Report funds generated during the implementation of the program are not properly established	2.13	Slightly Serious (SS)
Non recognition and appreciation for donations extended by the external stakeholders in the program implementation	1.93	Slightly Serious (SS)
Limited amount of time extended to the implementation of the program due to other concerns in the community	2.17	Slightly Serious (SS)
Poor attendance of external stakeholders during the implementation of the solid waste management programs in the school community	2	Slightly Serious (SS)
Overall Mean	**2.12**	**Slightly Serious (SS)**

Level of Implementation of the Solid Waste Management Programs

Table 6 shows Anao-Kiling Elementary School's implementation of the Solid Waste Management Program for sustainability. The program includes earth-friendly practices, optimization, continuous monitoring, and waste prevention. The implementation is classified as "Implemented," indicating significant effort in promoting sustainability. However, ongoing monitoring is needed for long-term effectiveness. On the other hand, there is a full implementation on programs such as prioritizing waste intervention and practicing the habit of reusing, reducing, and recycling as shown by the mean of 4.29 and 4.37, respectively. Overall, the program of SWM has been implemented at the locality as indicated by the mean of 4.14.

Table 6. Level of Implementation of the Solid Waste Management Program

Indicators	Mean	Description
Sustaining eco- friendly habits and practices while in school, off-campus activities and at home	4.08	Implemented
Implementing activities and programs to the optimum efforts	4.03	Implemented
Continuous monitoring and evaluation of the solid waste programs in the school community	4.14	Implemented
Conducting symposiums on the benefits of solid waste management for both stakeholders	3.94	Implemented
Prioritizing waste prevention programs and activities in the school	4.29	Fully Implemented
Practicing the habit of reusing, reducing and recycling, segregating, and disposal	4.37	Fully Implemented
Overall Mean	**4.14**	**Implemented**

Relationship between Respondents' Perception on Existing Programs, Levels of Dissemination, and Level of Implementation of Solid Waste Management Programs and their Profile Classification

The table 7 analyzes the relationship respondents' perception on existing programs, levels of dissemination, and level of implementation of solid waste management programs and their profile classification.

The null hypothesis (Ho) is accepted, indicating no significant relationship between respondents' perceptions on existing programs and their profile classification. The results suggest that respondents' perceptions of solid waste management programs are not significantly influenced by their identification or stakeholder category. Reodica (2021) highlights the crucial role of school principals in ensuring the sustainability of zero waste management projects. It emphasizes that school principals are instrumental in formulating environmental school policies, fostering eco-friendly school cultures, and ensuring program sustainability through stakeholder support. By promoting environmental awareness and capacity building among stakeholders, particularly on issues related to solid waste management and recycling, school principals can cultivate environmentally responsible behavior among students and the broader community.

Additionally, Hettiarachchi et al. (2018). supports the notion of enhancing sustainable municipal solid waste management in developing countries through initiatives like organic waste buyback. These approaches not only contribute to achieving the Sustainable

Development Goals set by the United Nations but also advocate for sustainable practices in waste management, aligning with the broader agenda of environmental sustainability.

In terms of the relationship between respondents' profile and the level of dissemination of solid waste management programs, the null hypothesis is accepted for stakeholders, indicating no significant relationship. The results suggest that stakeholder status does not significantly influence dissemination levels. The importance of stakeholders in waste management was highlighted in various studies. For instance, collaborative approaches involving local governments, NGOs, companies, and other stakeholders have been shown to increase citizen participation in waste management initiatives through effective communication and interaction (Fatmawati et al., 2022). Additionally, involving stakeholders as communication partners in research dissemination efforts can enhance the dissemination of research findings by understanding the roles of various stakeholders and engaging them in specific communication activities (Elwy et al., 2022).

Lastly, the relationship between respondents' profile and the implementation of solid waste management programs shows that there is no significant relationship between respondents' identification or stakeholder status and the level of implementation, with probability values .155 for stakeholders. Therefore, stakeholder status does not significantly influence the implementation levels of these programs.

This finding aligns with previous research that has highlighted various challenges and issues in solid waste management. For instance, studies have pointed out the absence of clear assignment of responsibilities among ministries and departments, hindering effective waste management planning (Mmereki, 2018). Additionally, research has shown significant relationships between demographic factors such as sex, age, and social class with awareness, knowledge, and practices of solid waste management (Agwu, 2012).

Table 7. Relationship between Respondents' Perception on Existing Programs, Levels of Dissemination, and Level of Implementation of Solid Waste Management Programs and their Profile Classification

SWM Indicators	Probability	Decision	Remarks
Perception on Existing SWM Programs	.278	Accept H_o	Not Significant
Level of Dissemination of SWM Programs	.141	Accept H_o	Not Significant
Level of Implementation of SWM Programs	.155	Accept H_o	Not Significant

Relationship between and among the Perceived Existing Programs of the School in Solid Waste Management, Level of Dissemination and Implementation of Solid Waste Management Programs

Table 8 analyzes the relationship between existing solid waste management programs, their dissemination, and implementation levels. The probability value for each comparison is.000, rejecting the null hypothesis (Ho). The results show a significant relationship between existing programs and the level of dissemination, implementation, and dissemination of these programs. This suggests that the effectiveness of existing programs significantly

influences the dissemination and implementation levels of solid waste management initiatives.

Effective solid waste management programs rely on various factors such as management support, visibility, resource commitment, and communication of implementation efforts. These elements contribute to increasing the visibility of the program, securing necessary resources, and emphasizing the importance of implementation endeavors, all of which are vital for successful waste management initiatives (Damschroder et al., 2011). Furthermore, the dissemination of information about program benefits, strict enforcement measures, and the ability to treat sorted waste effectively are essential components that can enhance the performance of waste management programs. Strong leadership within local authorities is crucial for driving these aspects forward and improving the overall recycling performance of urban areas (Knickmeyer, 2020).

Table 25. Relationship between and among the Perceived Existing Programs of the School in Solid Waste Management, Level of Dissemination and Implementation of Solid Waste Management Programs

Group	Probability	Decision	Remarks
Existing Programs and Level of Dissemination	.000	Reject Ho	Significant
Existing Programs and Level of Implementation	.000	Reject Ho	Significant
Level of Dissemination and Level of Implementation	.000	Reject Ho	Significant

CONCLUSION

The study indicates that the respondents are aware of waste management practices, including waste segregation, reduction, reuse, recycling, and proper disposal. However, there is still a need to focus on specific areas, such as raising awareness about the proper disposal of special wastes and implementing reduction practices. The study emphasizes the importance of stakeholder participation in waste management programs. Although stakeholder status does not significantly influence implementation levels, it is crucial to consider the specific characteristics and needs of different stakeholder groups. These findings contribute to the existing knowledge on waste management by highlighting the importance of stakeholder engagement and the need for fitted approaches to address specific challenges.

Moreover, the study suggests that schools should prioritize waste management as part of their sustainability initiatives. By investing in awareness campaigns, stakeholder engagement, and infrastructure development, schools can encourage values of environmental responsibility and contribute to creating a cleaner and healthier school community. Furthermore, the findings can guide policymakers and waste management agencies in developing comprehensive waste management strategies that address different stakeholders' specific challenges and needs.

REFERENCES

Agwu, M. O. (2012). Issues and challenges of solid waste management practices in port-harcourt city, nigeria- a behavioural perspective. *American Journal of Social and Management Sciences, 3(2), 83-92.* https://doi.org/10.5251/ajsms.2012.3.2.83.92

Amasuomo, E. and Baird, J. (2016). Solid waste management trends in Nigeria. *Journal of Management and Sustainability, 6(4), 35.* https://doi.org/10.5539/jms.v6n4p35

Black, J., Velazquez, C. E., Ahmadi, N., Chapman, G. E., Carten, S., Edward, J., … & Rojas, A. (2015). Sustainability and public health nutrition at school: assessing the integration of healthy and environmentally sustainable food initiatives in vancouver schools. *Public Health Nutrition, 18(13), 2379-2391.* https://doi.org/10.1017/s1368980015000531

Booth, M. E. A., Taqueban, N. A., Azcarraga, J. D., Masusi, M. V., Platon, C. M., Benavidez, M. F., … & Mendoza, R. M. O. (2019). Waste segregation awareness and practices of janitorial services in atertiary educational institution: influencing the institutions drive to sustainable campus. *Journal of BIMP-EAGA Regional Development, 5(2), 108-120.* https://doi.org/10.51200/jbimpeagard.v5i2.3273

Damschroder, L. J., Goodrich, D. E., Robinson, C., Fletcher, C. E., & Lowery, J. C. (2011). A systematic exploration of differences in contextual factors related to implementing the move! weight management program in va: a mixed methods study. *BMC Health Services Research, 11(1).* https://doi.org/10.1186/1472-6963-11-248

Debrah, J. K., Vidal, D. G., & Dinis, M. A. P. (2021). Raising awareness on solid waste management through formal education for sustainability: a developing countries evidence review. *Recycling, 6(1), 6.* https://doi.org/10.3390/recycling6010006

Derqui, B. and Fernández, V. (2017). The opportunity of tracking food waste in school canteens: guidelines for self-assessment. *Waste Management, 69, 431-444.* https://doi.org/10.1016/j.wasman.2017.07.030

Dev, B. (2018). Automatic waste segregation using image processing and machine learning. *International Journal for Research in Applied Science and Engineering Technology, 6(5), 2617-2618.* https://doi.org/10.22214/ijraset.2018.5428

Dharmawati, D. M., Nadiroh, N., & Marini, A. (2020). Developing entrepreneurship education model in improving the skills of recycling of elementary school students. *Al Ibtida: Jurnal Pendidikan Guru Mi, 7(1), 117.* https://doi.org/10.24235/al.ibtida.snj.v7i1.5127

Duncan, D. W., Collins, A., Fuhrman, N. E., Knauft, D. A., & Berle, D. (2016). The impacts of a school garden program on urban middle school youth. *Journal of Agricultural Education, 57(4), 174-185.* https://doi.org/10.5032/jae.2016.04174

Elwy, A. R., Maguire, E. M., Kim, B., & West, G. (2022). Involving stakeholders as communication partners in research dissemination efforts. *Journal of General Internal Medicine, 37(S1), 123-127.* https://doi.org/10.1007/s11606-021-07127-3

Fatmawati, F., Mustari, N., Haerana, H., Niswaty, R., & Abdillah, A. (2022). Waste bank policy implementation through collaborative approach: comparative study—makassar and bantaeng, indonesia. Sustainability, 14(13), 7974. https://doi.org/10.3390/su14137974

Ferronato, N., &Torretta, V. (2019). Waste mismanagement in developing countries: A review of global issues. *International journal of environmental research and public health, 16(6), 1060.*

Hermann, J., Parker, S. T., Brown, B. J., Siewe, Y. J., Denney, B. A., & Walker, S. (2006). After-school gardening improves children's reported vegetable intake and physical activity. *Journal of Nutrition Education and Behavior, 38(3), 201-202. https://doi.org/10.1016/j.jneb.2006.02.002*

Hettiarachchi, H., Meegoda, J. N., & Ryu, S. (2018). Organic waste buyback as a viable method to enhance sustainable municipal solid waste management in developing countries. *International Journal of Environmental Research and Public Health, 15(11), 2483. https://doi.org/10.3390/ijerph15112483*

Johnson, K. M., González, M., Dueñas, L., Gamero, M., Relyea, G., Luque, L. E., … & Caniza, M. (2013). Improving waste segregation while reducing costs in a tertiary-care hospital in a lower–middle-income country in central america. Waste Management &Amp; Research: *The Journal for a Sustainable Circular Economy, 31(7), 733-738. https://doi.org/10.1177/0734242x13484192*

Joseph, J. (2019). Smart waste management using deep learning with iot. International *Journal of Networks and Systems, 8(3), 37-40. https://doi.org/10.30534/ijns/2019/10832019*

Kasavan, S., Ali, N. I. M., & Masarudin, N. A. (2020). Quantification of solid waste in school canteens - a case study from a hulu selangor municipality, selangor. Planning Malaysia, 18(11). https://doi.org/10.21837/pm.v18i11.717

Knickmeyer, D. (2020). Social factors influencing household waste separation: a literature review on good practices to improve the recycling performance of urban areas. *Journal of Cleaner Production, 245, 118605. https://doi.org/10.1016/j.jclepro.2019.118605*

Madarang, J. M. (2023).Culture and climate of public secondary schools in Isabela inthe new normal. *Studies in Technology and Education,1(2), 71-86.*

Manalo, J. (2022).PH Solid Waste Management Commission and Japanese government develop manual to promote safe disposal, healthy environment. *Philippine Daily Inquirer. March 9, 2022.*

Mmereki, D. (2018). Current status of waste management in botswana: a mini-review. Waste Management &Amp; Research: *The Journal for a Sustainable Circular Economy, 36(7), 555-576. https://doi.org/10.1177/0734242x18772097*

Mochache, M., Yegon, R., & Wakindiki, I. I. (2020). Market town household solid waste management: a case study of embu, kenya. *Journal of Applied Sciences and Environmental Management, 24(1), 105. https://doi.org/10.4314/jasem.v24i1.15*

Molina, R. A. and 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. https://doi.org/10.21601/aquademia/9579

Moqbel, S., Abu-Zurayk, R., Bozeya, A., Alsisan, R., & Bawab, A. A. (2020). Assessment of sustainable recycling at the university of jordan. *International Journal of Sustainability in Higher Education, 21(6), 1111-1129. https://doi.org/10.1108/ijshe-11-2019-0334*

Nawawi, S. A., Muniandy, I., Fauzi, N. M., Nor, A. N. M., Ibrahim, N., Jamil, R. M., … & Nazarie, W. N. F. W. M. (2022). Awareness and practices on municipal solid waste management among students at university Malaysia Kelantan jeli campus. IOP Conference Series: Earth and Environmental Science, 1102(1), 012007. https://doi.org/10.1088/1755-1315/1102/1/012007

Nazemi, S., Roudbari, A., & Yaghmaeian, K. (2014). Design and implementation of integrated solid wastes management pattern in industrial zones, case study of shahroud, Iran. *Journal of Environmental Health Science and Engineering, 12(1). https://doi.org/10.1186/2052-336x-12-32*

Parmer, S., Salisbury-Glennon, J. D., Shannon, D., & Struempler, B. (2009). School gardens: an experiential learning approach for a nutrition education program to increase fruit and vegetable knowledge, preference, and consumption among second-grade students. *Journal of Nutrition Education and Behavior, 41(3), 212-217. https://doi.org/10.1016/j.jneb.2008.06.002*

Powell, Peter. (2018). Environmental literacy in teacher training: Attitudes, knowledge, and environmental behavior of beginning students. J Environ Educ, 39(1): 45-59.

Prata, J. C., Silva, A. L. P., Costa, J. P. d., Mouneyrac, C., Walker, T. R., & Rocha-Santos, T. (2019). Solutions and integrated strategies for the control and mitigation of plastic and microplastic pollution. *International Journal of Environmental Research and Public Health, 16(13), 2411. https://doi.org/10.3390/ijerph16132411*

Prisco, A. A. and Cubillas, A. U. (2022). Ecological solid waste management program of elementary schools in agusan del norte division: success stories, challenges and prospects. *International Journal of Scientific and Research Publications (IJSRP), 12(1), 335-345. https://doi.org/10.29322/ijsrp.12.01.2022.p12144*

Qaderi, P., Muradi, M. A., & Haqiqat, S. A. Q. (2021). Assessment of public awareness level regarding solid waste management: a case study of pol-e-khumri, afghanistan. *International Journal of Innovative Research and Scientific Studies, 4(4), 200-204. https://doi.org/10.53894/ijirss.v4i4.85*

Reodica, C. (2021). Role of the school heads in the sustainability of zero waste management projects. *International Journal of Research Studies in Education, 10(9). https://doi.org/10.5861/ijrse.2021.664*

United Nations Department of Economic and Social Affairs. (n.d.). Sustainable development: The 17 goals. United Nations. *Retrieved from https://sdgs.un.org/goals*

Wendt, J., Scheller, D. A., Flechtner-Mors, M., Meshkovska, B., Łuszczyńska, A., Lien, N., … & Steinacker, J. M. (2023). Barriers and facilitators to the adoption of physical activity policies in elementary schools from the perspective of principals: an application of the consolidated framework for implementation research–a cross-sectional study. Frontiers in Public Health, 11. https://doi.org/10.3389/fpubh.2023.935292