TOWARDS A SUSTAINABLE FUTURE: OPTIMIZING SOLID WASTE MANAGEMENT STRATEGIES

Jannin Epa[1], Jazz Princess Bacis[2], Mariane Pantoja[3], Garth Kaysen Alferez[4], Carl Angelo Lim[5], Jhonna Fe Flores[6], Kinred Insalada[7], Marvic Tijano[8], Marifel Mae Bonocan[9], Marnie Dagle[10], Amy Faith Alcoran[11], Raquel Grace Cael[12], Mharjoe Isnaji[13], Mahal Rosel[14]
[12345678910111213]Colegio de San Francisco Javier, [14]Jose Rizal Memorial State University

Abstract

Solid waste management (SWM) remains a significant challenge for environmental sustainability, public health, and socio-economic development globally. This study focuses on the SWM practices at Colegio de San Francisco Javier, aiming to optimize these practices to foster a culture of environmental responsibility among students and staff, while contributing to the overall sustainability goals of the institution. A descriptive-quantitative approach was employed, using the Solid Waste Management Awareness and Practices Questionnaire (SWMAPQ) to assess the level of awareness, practices, and attitudes toward SWM among 524 students. The findings reveal a strong awareness and motivation towards SWM, although practical implementation remains inconsistent, particularly in areas such as waste segregation and recycling. The study underscores the importance of integrating SWM into educational curricula and implementing effective SWM policies to promote sustainable practices within educational institutions.

Keywords and phrases: *Solid waste management, environmental education, sustainability, waste segregation, educational institutions*

Introduction

Solid waste management (SWM) is a critical aspect of environmental sustainability, as improper disposal of solid waste leads to unsanitary conditions, environmental pollution, and public health risks (Ikhlayel, 2017). The growing global population, urbanization, and changing consumption patterns have exacerbated the challenges associated with waste disposal and environmental preservation. Educational institutions, such as Colegio de San Francisco Javier, are in a unique position to influence the attitudes and behaviors of future generations, making the optimization of SWM strategies within these institutions crucial for achieving broader sustainability goals (Gequinto, 2017).

The integration of effective SWM strategies in schools not only contributes to immediate environmental benefits but also fosters a culture of responsibility and sustainability among students (Tikka, Kuitunen, & Tynys, 2016). This study aims to explore the current state of SWM practices at Colegio de San Francisco Javier, focusing on the awareness, attitudes, and practices of students towards waste segregation, reduction, recycling, and disposal. Guided by the Diffusion of Innovations Theory (Rogers, 2003), this research seeks to understand how new ideas and practices related to

SWM can be effectively adopted within the school community.

SWM has become a significant concern for educational institutions due to the large amounts of waste generated daily, particularly from paper and other school-related materials (Molina & Catan, 2021). The implementation of effective SWM practices in schools is essential for reducing the overall waste generation, promoting resource conservation, and decreasing the environmental impact (Gequinto, 2017). Moreover, educational institutions serve as models for the broader community, and by adopting sustainable waste management practices, they can influence the attitudes and behaviors of students, staff, and the surrounding community (Panko & Sharma, 2019).

Despite the importance of SWM, several barriers hinder the effective implementation of waste management practices in educational institutions. These include a lack of awareness and knowledge about proper waste disposal methods, limited resources and infrastructure for waste collection and recycling, and the absence of comprehensive SWM policies (Derilo, 2021). Additionally, cultural and social factors can influence the attitudes and behaviors of students and staff towards waste management, making it challenging to achieve consistent and effective SWM practices (Evans et al., 2018).

Environmental education plays a crucial role in promoting sustainable SWM practices within educational institutions. By integrating environmental education into the curriculum, schools can increase students' awareness and understanding of environmental issues, including waste management (Anija-Obi, 2019). This knowledge can lead to positive attitudes towards SWM and encourage students to adopt sustainable behaviors, both within the school and in their broader communities (Tikka et al., 2016). Moreover, environmental education can empower students to become agents of change, advocating for better waste management practices within their schools and communities (Mangun & Malintad, 2018).

Methods

This study employed a descriptive-quantitative research design to assess the level of awareness, practices, and attitudes towards SWM among students at Colegio de San Francisco Javier. The descriptive method is particularly suitable for this type of research as it provides an accurate portrayal of the current state of SWM practices within the institution (Creswell, 2014). The study utilized the Solid Waste Management Awareness and Practices Questionnaire (SWMAPQ) to collect data from the participants.

Colegio de San Francisco Javier is a private educational institution located in Rizal, Zamboanga del Norte, Philippines. The school offers a range of educational programs from pre-school to tertiary education and is committed to providing relevant and innovative education locally and internationally. The school is situated in a rural area, surrounded by natural beauty, which underscores the importance of effective SWM practices to maintain a clean and sustainable environment.

The study's respondents comprised 524 students from the basic and tertiary education departments of Colegio de San Francisco Javier. The respondents included students from junior high school (grades 7-10), senior high school (grades 11-12), and various college departments, including Education, Business Administration, Social Work, Information Technology, and Hospitality Management. The total population sampling method was employed to ensure a comprehensive understanding of the SWM practices among the students.

The SWMAPQ, a standardized questionnaire, was used to assess the respondents' awareness, practices, and attitudes towards SWM. The questionnaire included four sections: demographic information, awareness of SWM principles, SWM practices, and attitudes towards SWM. The questionnaire was validated by experts in the field and pilot-tested among a small group of students before being administered to the full sample.

Data collection was conducted online over two weeks, from February 6-16, 2024. The respondents were assured of the confidentiality and anonymity of their responses, and ethical considerations were strictly adhered to throughout the data collection process. The data collected from the SWMAPQ were analyzed using descriptive statistics, including frequency distribution, percentage distribution, and weighted mean. These statistical measures were used to provide a detailed understanding of the respondents' awareness, practices, and attitudes towards SWM.

Ethical Considerations

Ethical considerations were central to the study's design and implementation. Informed consent was obtained from all participants, ensuring they were fully aware of the study's purpose, procedures, and potential risks. Data confidentiality was strictly maintained, with all identifying information anonymized in the analysis and reporting. The study adhered to the ethical guidelines set forth by the institutional review board and relevant national and international regulations.

Results

The majority of the respondents were female, comprising 64.9% of the sample, while male respondents accounted for 35.3%. The respondents were predominantly third-year college students (26.7%), followed by first-year college students (19.5%), and second-year college students (18.7%). A significant portion of the respondents (63.7%) reported a family income of 10,000 pesos or below, reflecting the socio-economic diversity of the student population.

Level of Awareness on Solid Waste Management Principles

The findings revealed that the respondents had a strong awareness of the general principles of SWM, particularly the negative impacts of improper waste disposal on health and the environment. The weighted mean for awareness of SWM principles was 3.39, indicating that the respondents were generally aware of the importance of proper

waste management. However, awareness of specific laws and ordinances related to SWM was lower, with weighted means ranging from 2.81 to 3.13, suggesting a need for increased education on these regulations (Molina & Catan, 2021).

Solid Waste Management Practices

The respondents' SWM practices were found to be inconsistent, with a weighted mean of 3.39. While students reported high levels of participation in waste segregation, particularly in separating biodegradable from non-biodegradable waste (3.59), their practices in other areas, such as reducing waste and recycling, were less consistent. For instance, the practice of reducing waste by buying in bulk had a weighted mean of 3.17, indicating that this practice was only sometimes followed.

Solid Waste Management Contribution and Motivation

The respondents demonstrated a strong motivation to contribute to SWM, with a weighted mean of 3.54. They reported feeling motivated to dispose of waste properly and to participate in waste management programs within the school. However, participation in these programs was not as widespread, with a weighted mean of 3.39, suggesting that while students are motivated, there may be barriers to their active involvement in SWM initiatives.

Attitudes Towards Solid Waste Management

The respondents displayed positive attitudes towards SWM, with a weighted mean of 3.64 for statements related to controlling and managing solid waste at school. The majority of respondents strongly agreed that proper waste segregation and disposal are good practices and expressed a willingness to contribute to SWM programs at the school level.

Discussion

The results of this study indicate that while students at Colegio de San Francisco Javier are aware of the importance of SWM and demonstrate a positive attitude towards it, there are gaps in the practical application of waste management practices. This gap between knowledge and practice is a common issue in SWM, particularly in educational institutions where resources and infrastructure for waste management may be limited (Derilo, 2021).

One of the key findings of this study is the strong motivation among students to engage in SWM. This motivation, however, does not always translate into consistent practice, particularly in areas such as waste reduction and recycling. This suggests that while students are willing to participate in SWM, there may be barriers that prevent them from fully engaging in these practices. These barriers could include a lack of resources, inadequate infrastructure for recycling, or insufficient education on the practical aspects of SWM (Evans et al., 2018).

The study also highlights the importance of environmental education in promoting sustainable SWM practices. By integrating SWM into the curriculum and providing students with practical knowledge and skills, schools can help bridge the gap between awareness and practice. This is particularly important in developing countries, where environmental education is often limited, and students may lack the practical knowledge needed to implement SWM practices effectively (Anija-Obi, 2019).

Moreover, the study underscores the role of educational institutions in promoting a culture of environmental responsibility. By adopting comprehensive SWM policies and involving students in the planning and implementation of these policies, schools can create a more sustainable learning environment and contribute to the achievement of global sustainability goals (Gequinto, 2017).

Conclusions

This study reveals that while students at Colegio de San Francisco Javier exhibit strong awareness of solid waste management (SWM) principles and are motivated to participate in waste management practices, there remains a significant opportunity to enhance environmental education and implement more effective SWM policies within the institution. To address this gap, it is recommended that the school take a holistic approach to integrating SWM into its curriculum, coupled with practical, hands-on experiences that bridge the gap between theory and practice. Additionally, the institution should focus on improving the infrastructure and resources dedicated to SWM and fostering a culture of environmental responsibility through continuous education and community engagement.

Key Recommendations:

Curriculum Integration: Educational institutions should embed SWM principles throughout the curriculum, ensuring that students receive a thorough and continuous education on environmental sustainability and waste management from an early age. This approach will cultivate an ingrained understanding and commitment to sustainable practices.

Practical Skills Development: Schools should provide students with opportunities to gain hands-on experience in waste management practices, such as recycling and composting. By doing so, students can apply theoretical knowledge in real-world settings, fostering practical skills that reinforce sustainable behaviors.

Infrastructure Enhancement: It is essential for educational institutions to invest in the necessary infrastructure, including recycling bins, composting facilities, and waste sorting stations, to facilitate effective SWM practices on campus. These resources will support the proper disposal and management of waste, making sustainable practices more accessible to the school community.

Ongoing Training and Workshops: Regularly scheduled workshops and training

sessions for both students and staff are crucial to staying informed about the latest SWM practices and technologies. These initiatives will ensure that the entire school community is equipped with up-to-date knowledge and skills to manage waste effectively.

Community Engagement: Institutions should actively encourage the participation of students, faculty, and staff in SWM initiatives. Creating a collaborative environment where everyone shares responsibility for environmental sustainability will enhance the effectiveness of these programs and build a strong culture of sustainability within the school.

The path towards a sustainable future is paved with the collective efforts of educational institutions, students, and the broader community. By integrating SWM into the educational framework, enhancing practical waste management skills, investing in infrastructure, and fostering an engaged community, Colegio de San Francisco Javier can set a powerful example of environmental stewardship. The recommendations provided in this study are not merely suggestions but a call to action for the institution to elevate its role in shaping environmentally responsible citizens. As the institution implements these strategies, it will not only contribute to the sustainability of its campus but also inspire other educational institutions to follow suit, creating a ripple effect that extends far beyond the school grounds. The commitment to sustainable waste management is a vital step in the broader pursuit of global environmental sustainability, and it is through such initiatives that true progress can be achieved.

Acknowledgment

The researchers would like to express their deepest gratitude to God, Rev. Fr. Rodel J. Agodera, Dr. Evangeline B. Recamara, and Ms. Mahal B. Rosel for their unwavering support and guidance throughout this study. The researchers also extend their appreciation to their families, friends, and classmates for their encouragement and assistance.

Disclosure: Use of AI Tools

In compliance with Threshold’s guidelines for the ethical use of artificial intelligence (AI) and automated tools in academic research, the authors disclose the use of OpenAI's ChatGPT for enhancing the quality and clarity of the manuscript. ChatGPT was utilized to assist in refining the language, structure, and formatting of the text, ensuring a high level of academic rigor and coherence. The authors confirm that all data analysis, critical interpretations, and conclusions presented in this manuscript were conducted independently by the research team. The AI tool was employed strictly for editorial assistance and did not influence the scientific content or ethical considerations of the study. All intellectual contributions from the AI tool are in accordance with the authors' original intentions and have been reviewed and approved by all co-authors. The use of ChatGPT complies with Threshold's ethical standards and guidelines for transparent reporting of AI involvement in research. The authors remain fully responsible for the integrity and accuracy of the content presented in this paper.

References

Anija-Obi, F. N. (2019). Environmental education and sustainable waste management practices in Nigeria. Journal of Environmental Science and Technology, 13(2), 54-66.

Derilo, L. D. (2021). Extent of Implementation of Solid Waste Management Program in Bacon District. Philippine Journal of Environmental Research, 25(1), 112-123.

Evans, G. W., & Otto, S. (2018). Children's environmental attitudes and behaviors: The influence of parents and school. Journal of Environmental Psychology, 60, 36-42.

Gequinto, A. C. (2017). Solid Waste Management Practices of Select State Universities in CALABARZON, Philippines. Journal of Environmental Health, 82(5), 18-22.

Ikhlayel, M. (2017). Environmental management and sustainability in developing countries: The case of solid waste management. Sustainable Development, 25(3), 180-189.

Mangun, D., & Malintad, M. (2018). Students as Agents of Change in Waste Management: A Case Study of Philippine Universities. Journal of Environmental Education, 49(4), 23-35.

Molina, R. A., & Catan, I. (2021). Solid Waste Management Awareness and Practices among Senior High School Students in a State College in Zamboanga City, Philippines. International Journal of Environmental Science and Technology, 18(3), 245-256.

Panko, J. M., & Sharma, A. (2019). Submerging students in practical environmental education: A case study. Environmental Education Research, 25(4), 521-534.

Rogers, E. M. (2003). Diffusion of Innovations (5th ed.). Free Press.

Tikka, P., Kuitunen, M., & Tynys, S. (2016). Education and Environmental Awareness: Attitudes and Knowledge of Students in Finland. Environmental Education Research, 12(1), 47-58.