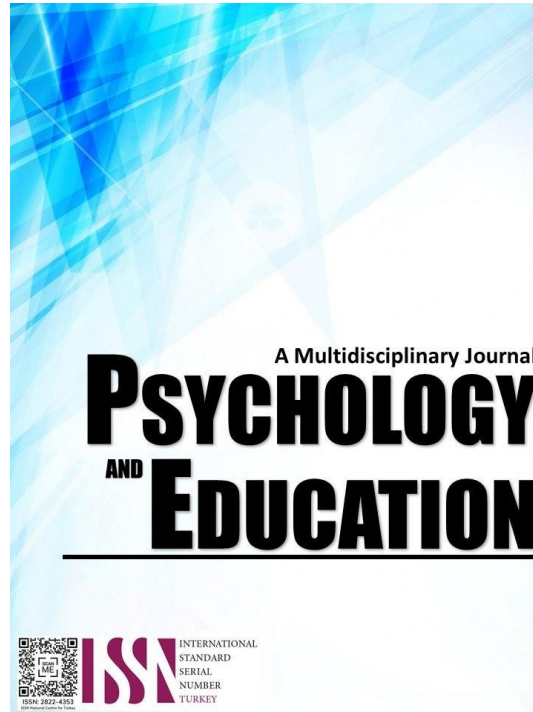


SOLID WASTE MANAGEMENT PRACTICES, POLICIES, AND THE PROBLEMS ENCOUNTERED BY THE SELECTED HIGHER EDUCATION INSTITUTION IN DASMARIÑAS CITY, CAVITE



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Solid Waste Management Practices, Policies, and the Problems Encountered by the Selected Higher Education Institution in Dasmariñas City, Cavite

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Abstract

The study was conducted to describe the solid waste management of selected higher education institution in the city of Dasmariñas, Cavite. Specifically, it aimed to describe the school characteristics of private colleges; describe the types and volume of solid waste generated daily by the private colleges; determine the solid waste management practices employed by the private colleges for different type of solid wastes; identify the problems encountered by the private colleges on solid waste management; identify the solid waste management policies complied by the private colleges; and determine if there is a relationship between solid waste generated and school characteristics. The participant schools were 29 private colleges in the City of Dasmariñas, Cavite. The respondents are the Pollution Control Officer or the person in-charged of solid waste management of private colleges in Cavite. There was also the participation of 200 students divided proportionally by the number of private colleges to make the study more reliable. Most of the respondents revealed that among the top solid waste that they generate is recyclable wastes in Rank 1; followed by biodegradable wastes then hazardous wastes. The least generated among the wastes is residual waste, all of them generated less than 25kg of residual wastes per day. They used various ways of storing their wastes but the most used is garbage bags, with regards to the collection/transportation of solid wastes to disposal sites, most schools relied on the local government units and only a handful were in contract with private firms to collect and transport their solid waste. Solid wastes from these schools are collected by LGU's weekly and private firms on a daily basis. Schools also employed certain methods of disposing of their wastes. Most of them chose land filling as their own way of disposal (48.28%). The rest used open dumping, composting, and incineration. From the study it was also found that the type/volume of solid wastes generated by schools is significantly associated with the schools' years of existence, population of students, faculty and staff, and operation hours per day.

Keywords: *solid waste, policies, practices, management*

Introduction

Waste is a very serious issue. The unsuitable waste disposal has been acknowledged as a very serious problem of anthropogenic origin and the environment is slowly destructing because of the disposal of huge quantities of waste. Rapid growth of the population, urbanization, modernization and intensifying economic activities have all subsidized to generation of waste (Singh et al., 2014). Solid waste management relates materials produced to human activities, and the process generally take on to endure its effects on health, the environment and aesthetics. It reduces or eliminates contrary impacts on the environment and human health rather supports economic development and enhanced the quality of life. In today's polluted world, learning the correct methods of handling the waste generated has become essential (Marello & Helwege, 2014). Thus, this study evaluated the extent of implementation of solid waste management practices in selected private universities and colleges (PUCs) in Cavite in terms of waste reuse, waste reduction, waste collection, waste recycling, waste treatment, and final waste disposal. This study would be significant in producing baseline data for policy makers and PUCs management to look deeper into the problem which is normally associated to urbanization.

All the methods of waste prevention and waste management oblige public participation. Oliva as cited by Villanueva (2013) said that education is an important component of solid waste management that should be present to create a good program for the community. According to Baula as cited by Punongbayan (2014), awareness complemented by participation is the key for students to be involved in the waste management program of the schools where effective and maintainable implementation of the proper waste management practices could be achieved.

Human activities create waste, and the amounts tend to increase as the demand for quality of life increases. This study will give an assurance that learning the methods of solid waste management is transferable and contributes to spread the discipline of solid waste management practices in the community.

Research Questions

Generally, the study was conducted in order to determine the solid waste management of private colleges in Cavite. Specifically, the study aimed to answer the following questions:

1. What are the demographic characteristics of private colleges in Cavite in terms of:
 - 1.1. years of existence;
 - 1.2. school population; and
 - 1.3. operation hours/day?

2. What is the percentage of solid waste generated daily by schools according to types and volumes in terms of:
 - 2.1. biodegradable wastes;
 - 2.2. residual wastes;
 - 2.3. recyclable wastes; and
 - 2.4. hazardous wastes
3. What are the solid waste management practices employed by the private colleges for different type of solid wastes in terms of:
 - 3.1. storage;
 - 3.2. collection and transportation;
 - 3.3. disposal; and
 - 3.4. waste reduction strategies?
4. What are the problems encountered by the colleges on solid waste management.
5. What are the solid waste management policies implemented by the private colleges in Cavite.
6. Is there a significant relationship between school demographic characteristics and solid waste generated, solid waste management practices, problems encountered and solid waste management policies?
7. What intervention plan should be proposed based from the findings of the study?

Methodology

Research Design

Descriptive and correlation method were utilized since the researcher aimed to describe and discuss the solid waste management in transitions using questionnaire in the study of solid waste management of private colleges in Cavite. Descriptive research is used as a tool to organize data into patterns that materialized during analysis. This often-used visual aids such as graphs and charts to support the reader. Descriptive research may be used to explore relationships between two or more variables. A correlational study is also used where a researcher seeks to understand what kind of relationships naturally occurring variables have with one another.

Respondents

The participant schools of the study were 29 private colleges in Cavite. The participants were the pollution control officers (PCO) or the person in charged in solid waste management practices of the college. There was also a participation of 200 students divided proportionally in number of private colleges to make the study more reliable.

This study also used the z-score formula to determine the sample size of the students and divided it proportionally by the number of private colleges in Cavite.

The researcher used purposive sampling technique which involves the non-random selection of elements based on the researcher's perception and knowledge about the population, which would be also useful when a group of experts are desire to validate research information, which is used to choose a total enumeration of pollution control officer in private colleges in Cavite. The purposive sampling technique is a type of non-probability sampling that is most effective when one needs to study a certain cultural domain with knowledgeable experts within. Purposive sampling may also be used with both qualitative and quantitative research techniques.

Instrument

The instrument used in this study was a self-made questionnaire with five parts. Part 1 focused on the demographic characteristics of private colleges in Cavite in terms of years of existence; school population; and operation hours/day. Part II revealed the percentage of solid waste generated daily by schools according to types and volumes in terms of biodegradable wastes; residual wastes; recyclable wastes; and hazardous wastes. Part III reflected the solid waste management practices employed by the private colleges for different type of solid wastes such as storage; collection and transportation; disposal; and waste reduction strategies. Part IV stated the problems encountered by the colleges on solid waste management; and Part V gave the solid waste management policies implemented by the private colleges in Cavite. The said questionnaire underwent face validation where three experts reviewed, examined and gave suggestions for the appropriateness, accuracy and validity of the instrument.

Procedure

The researcher presented a letter of request to collect the necessary information to each private college in Cavite. A survey questionnaire was used to gather the information and it was used as the source of primary data. The questionnaire for the pollution control officer was divided into three parts. The first part was to identify the school characteristics, which included the name of the school, years of existence, school population, and operating hours. The second part determined the solid waste management practices of college which included the generation of waste, storage, collection and transportation, disposal and waste reduction strategies. Last part was the problems encountered and policies complied by private colleges in Cavite.

For the verification purpose, the questionnaire of selected number of students was divided into three parts. The first part was to identify the basic profile of the respondent which included the name of the respondent (optional), and the name of school. The second part was

the solid waste management practices of the college which included the storage and waste reduction strategies. Last part was the problems encountered and policies complied by private colleges in Cavite. Their responses were evaluated and interpreted through the use of statistical tools and Likert scale to derive the results of the study.

Data Analysis

To obtain and analyze the results of the study, researcher used descriptive statistical tools. Frequency count was used in presenting the students, private colleges involved SWM in Cavite and it was used in presenting the waste reduction strategy. Next, frequency count and rank was used to present the type of waste generated by the private colleges. Likewise, frequency count and percentage were used to present the volume of waste generated daily by the private colleges and it were also used in presenting the solid waste management practices employed by the private colleges in Cavite. In addition, also the frequency count and percentage were used to identify the problems encountered by private colleges in Cavite.

Lastly, Likert scale was used in order to determine the degree of implementation of policies, procedures and regulations of private colleges in Cavite. The Likert scale is composed of three practices, each composed of sub-practices comprising of two to four statements and should be answered using the scale of 1-5 (5 - highly implemented, 4 - moderately implemented, 3 - occasionally implemented, 2 - poorly implemented, and 1 - not implemented). After identifying the averages of each statement, the general mean of the three practices was computed to determine the degree of implementation of policies, procedures and regulations of private colleges in Cavite. The frequency of the statement was measured on the basis of a five-point scale. Data collection was classified for analysis using descriptive statistics such as frequency counts and percentage.

Chi-square test was used to analyze the relationship of years of existence, school population, and school operation hour to daily volume of waste generated by schools.

Ethical Considerations

Ethics were taken into account at every stage of this research. The participants received a letter invitation, which they can accept or decline, prior to the data collection from the questionnaire responses provided by the respondents, or any further involvements. The letter included the goal of the study, the participants' rights, and the researcher's basic details, which were consulted with any questions or concerns they may have about the research. Additionally, the researcher gave informed consent, which the participants accepted, to ensure that their participation was voluntary and that there was no coercion or pressure during the invitation.

Results and Discussion

This section reports the result of the study. It discusses the findings presentation, analysis, interpretation and discussion about solid waste management of private colleges in Cavite.

School Characteristics of Private Colleges

The school characteristics of private colleges in Cavite include years of existence, school population, operation hours per day and type of school as shown in Table 1.

Table 1. School Characteristics of Private Colleges in Cavite

<i>Characteristics</i>	<i>Frequency (N=29)</i>	<i>Percentage (%)</i>
Years of Existence		
10-22	16	55.17
23-36	8	27.59
37-50	4	13.79
65 above	1	3.45
Mean: 44		
Max: 75		
Min: 13		
School Population		
below 1,000	18	62.07
1,001 – 3,500	8	27.59
more than 3,500	3	10.34
Mean: 2,085		
Max: 4,000		
Min: 170		
Operation Hours per day		
8-9	3	10.34
10-11	20	68.96
12-13	4	13.8
more than 13	2	6.9
Mean: 14		
Max: 11		

Min: 8

Years of existence. The average of years of existence of private colleges in Cavite is 44 years while the range is 62 years. In terms of years of existence, 55.17 percent of the participant schools have been in operation from 10 to 22 years, schools with 23 to 36 years of existence are at 27.59 percent, and those with 37 to 50 years of existence comprise 13.79 percent, while only one school has been in existence for 65 years and above.

The number of Higher Education Institutions in the Philippines has grown rapidly over the past decades. Between 2007 and 2016 alone, the number of HEIs increased from 1,776 to 1,943. That makes the Philippines the country with the highest number of HEIs in Southeast Asia. According to Manual of Regulations for Private Higher Education (2008) the school site of every private higher education institution must be suitable and adequate for its activities. The institution should own the site. If not owned, there should be a definite and feasible program for ownership thereof within a reasonable period, or reasonable and adequate provisions for continued use by the school through a long-term lease or usufruct of at least 10 years.

School population. The average of school population of private colleges in Cavite is 2,085 and the range is 3,830. Most of the participant schools have a population of below 1,000 (62.07%). This is followed by schools with students and staff numbering between 1,001-3,500 at 27.59 percent, and schools with population of more than 3,500 has the percentage of 10.34 percent. This result is supported by the study of Petersons (2017) that private colleges are generally smaller than public or private universities. In addition, the average enrolment at private colleges is only 2,000 students or lesser. Private universities, by contrast, can have over 30,000 students.

According to Petersons (2017) the major difference between public universities and private colleges lies in how they are funded. This affects students because funding is tied to tuition prices. As the Republic Act 10931 (Universal Access to Quality Tertiary Education Act) enters the law, Filipino students began benefitted from the free tuition law started in the school year of 2018 to 2019. The free tuition law signed by President Rodrigo Duterte covers a total of 112 state universities and colleges, and 78 local universities and colleges nationwide. It has a big effect for the students and parents to choose public tertiary schools than private schools (RA 10931, 2017).

Operation hours. The average of operation hours of private colleges in Cavite is 14 hours while the range is three hours. Out of the 29 participant schools in the study, 20 or 68.96 percent operated from 10-11 hours a day or 6am to 5pm. There were four schools that operated from 12-13 hours (13.8%), while three schools operated from eight to nine hours only at 10.34% and two schools operated for more than 13 hours a day.

As stated in Section 24 of Manual of Regulations for Private Higher Education, school facility shall be considering an extension class when administrative and support facilities are not available at the site but merely the classrooms. As a private sector and having a smaller establishment than private universities, it considers extension classes to support the needs of students. On the other hand, private schools rely on tuition, endowments and donations for them to choose extension classes than extending their establishments (College Resources, 2017).

Percentage of Solid Waste Generated Daily by Schools According to Types and Volumes

Solid waste, in any form, that must be properly managed. Every one of us knows that garbage is harmful, so we need to dispose our garbage properly (Smythe et al., 2010).

The types and volume of solid waste generated by schools includes biodegradable waste, residual waste, recyclable waste, and hazardous waste as shown in Table 2.

Table 2. *Percentage of solid waste generated daily by schools according to types and volumes*

Types Of Waste	Frequency	Volume (Weight)			
		less than 25kg	26kg – 50kg	51kg – 75kg	76kg – 100kg
		P (%)	P (%)	P (%)	P (%)
Biodegradable	29	65.52	24.14	10.34	0
Residual	29	100	0	0	0
Recyclable	29	58.62	24.14	10.34	6.9
Hazardous	29	86.2	6.9	0	6.9

Less than 25kg. Majority of the respondent schools generates residual waste daily at 100 percent average in less than 25kg category. Some example of these wastes are rubber, Styrofoam, dry cloth, feathers, leathers and napkins, which is not commonly consumed in school premises.

Followed by hazardous waste at 86.2 percent. Some examples of this waste are chemicals from labs, batteries, electrical wastes from computer labs and oil automotive fluids. According to Newhampshire Department of Environmental Service (2017), schools should try to reduce or eliminate as many of their waste streams as possible. If a school is not generating a hazardous waste, the associated disposal costs, potential spills, potential health and safety hazards, and record keeping requirements will not be applicable. It is good for the institution to generate hazardous waste less than 25kg to lessen the problem in disposing such waste.

Biodegradable waste at 65.52 percent and the third most generated waste in less than 25kg represent small private colleges in the study; in terms of their school population than other private colleges in Cavite. They generated this type of waste daily with this amount only without reaching at least 26kg to 75kg of waste per day. Some example of this waste is the kitchen waste, animal waste, yard trimmings and soiled wipes/pads.

Lastly, 17 out of 29 participant schools responded that they consumed less than 25kg of recyclable waste daily at 58.62 percent and majority of them reaches only less than 25kg because of having small number of students, faculty and staff that consumes such waste as shown in school population of private colleges in Cavite.

Twenty-six to 50kg. Out of 29 private colleges, 24.14 percent of biodegradable and recyclable are generated at 26kg-50kg and those who collected hazardous wastes are generated only 6.9 percent. No collection is made in residual. Philippine Solid Waste (2017) study reveals that there are significant shares of biodegradable and recyclable generated in the Philippines and based on the study by Sepideh Taghizadeh et.al. (2012) also shown that the daily generation of solid waste of the campus is 80 percent of recyclable and biodegradable and therefore, it is expected that some school would generate this kind of wastes in 26kg-50kg daily.

One of the 29 private colleges generated 26kg-50kg daily of hazardous waste, it has a characteristic that pose a risk to human health or the environment (Philippines Environment Monitor, 2001) and therefore expected that it would not generate a large portion of waste.

Fifty-one to 70kg. The results show that, the schools have generated biodegradable waste and recyclable waste at 10.34 percent average in 51-75kg category. Examples of biodegradable waste are kitchen or food waste, yard or garden waste, leaves and twigs. Whilst recyclable wastes are papers and cardboard waste, plastics, metals, glass, textiles, leather, rubber which are normally generated by the schools.

Biodegradable waste comprises about (10.34%) of SWM although primary data suggest that figures can range from 10 percent to as much as 11 percent. Typical bio-waste consists of kitchen or food waste and yard or garden waste. In addition, many school and office supply companies are responding to the growing demand for biodegradable products. According to physorg.com, some companies are now producing biodegradable pens, mechanical pencils, rulers, pencil cases, page protectors and project folders (Erwin, 2008). Sivakumar (2010) observed that the food waste is usually the predominant component in the waste stream due to the habit of fresh food consumption and composition of all other types of waste are low in all schools. It was found that, kitchen waste mostly consisting of biodegradable waste like vegetable peels, spoiled food and fruits, and food remains after consumption, are generated daily.

Recyclable wastes at 10.34 percent of SWM with an estimated volume of 51kg to 75kg generated wastes daily. Plastic packaging materials comprise around 27 percent of this waste fraction and followed by paper and cardboard waste, which contributes about 58 percent. The remaining 19 percent is made up of metals, glass, textile, leather and rubber. Students must have awareness about environmental problems so that they can play their role very effectively in proper waste management (Tartiu, 2011). They needed to have knowledge how to manage recyclable waste.

Seventy-six to 100kg. of recyclable waste generated in one (6.9%) school that is averaging 0.00761 tons/day, Sara Ojeda-Benitez et.al (2008) study about solid waste management in university and results shows that the common waste of the students in the school premises were plastics and papers and the large portion of waste is found in the recyclable and potentially recyclable categories which as whole represent 55% in the case of buildings, 88% in the case of gardens and 85% in the case of the community center. Plastic bags constitute a high amount of private colleges' waste composition and take hundreds of years to decompose. In addition, the process of recycling plastic bags is inefficient. Therefore, reducing plastic bags was proposed by several respondents as one of the solutions to improve the schools SWM system. One of the key components to reduce plastic bags is encouraging manufacturers and retailers to use recycled bags made of recyclable waste or materials for packaging goods (Tom & Janet, 2010).

Private colleges in Cavite approximately generate hazardous waste at 6.9 percent in 76kg-100kg category. Therefore, computer schools is one of the leading participant in the study that reaches this amount of wastes. Some example of this wastes are chemicals from labs, batteries, electrical wastes and oil automotive fluids. Many of these chemical substances are considered toxic or otherwise hazardous to humans and other living beings. If it is not properly disposed of, the consequences are dangerous (Yadav & Mishra, 2004). So, there is an urgent need to streamline and sensitize young minds to the environmental problems and concerns.

Solid Waste Management Practices Employed by the Schools

Without good solid waste management, you can't build a sustainable and liveable city. It's not just about technical solutions. There are climate, health, and safety impacts, as well as, important social considerations (Vasquez, 2018).

The solid waste management practices include generation of waste, storage, collection and transportation, disposal and waste reduction strategies as shown in Table 3.

Storage. Most of the school participants employed garbage bags as their means of storing solid wastes at 86.2 percent, others used empty drums and plastic containers at 6.9 percent each. The plastic bags are much cheaper than buying empty drums and plastic containers and it is more useful in wet wastes specifically in kitchen waste in schools. According to Sebola (2015), plastic garbage bags are fairly lightweight and are particularly useful for messy or wet rubbish, as is commonly the case with food waste, and are also

useful for wrapping up garbage to minimize odour.

Table 3. *Solid waste management practices of private colleges in Cavite*

Practices	Frequency (N=29)	Percentage (%)
Storage		
Empty drums	2	6.9
Garbage bags	25	86.2
Plastic Container	2	6.9
Collection		
Private Contractor	7	24.14
Local Government Unit	22	75.86
Responsibilities of contractors		
Collects only	11	37.94
Collect and Transports	18	62.06
Frequency of collection		
Daily	5	17.24
Weekly	24	82.76
Disposal		
Open dumping	5	17.24
Composting	5	17.24
Incineration	5	17.24
Land filling	14	48.28
Waste Reduction Strategies		
Decreasing consumption	1	3.45
Using paper bags, cups, etc. and recycling non-biodegradable	28	96.55

Collection. Solid wastes from the participant schools in the study are mostly handled by the Local Government Units having jurisdiction over them in terms of collection and transportation (75.86%). Only 24.14 percent of them have wastes handled under contract to private contractors. Under RA 9003, collection, transport and disposal of solid wastes are the responsibilities of the local government units (LGUs). At present, most LGUs administer their own collection systems or contract out this service to private contractors (Philippine Solid Waste at a Glance, 2017).

In addition, most of the responsibility of contractors are collecting and transporting only the waste from private colleges at 62.06 percent and 37.94 percent for collecting only. Collection, transport and disposal of solid wastes are the responsibilities of the local government units (Philippine Solid Waste at a Glance, 2017).

Frequency of collection of solid waste by LGU and private contractors were mostly on a weekly basis at 82.76 percent. Only 17.24 percent said that it is collected daily. When daily waste disposal is practiced, it helps to prevent additional pollution which can improve public health. Polluted air increases the risk of respiratory illness (Full Service Environmental Contractors, 2014). The numerous amount of the result in frequency of collection came from the private colleges that are mostly handled by LGU, which are based in a weekly schedule of collecting waste in a particular barangay in each town of Cavite.

Disposal. With regards to waste disposal, participants believed that land filling is used most at 48.28 percent, other employed open dumping, composting, and incineration at 17.24 percent each. Land filling of the solid waste is the economical and satisfactory method of disposal among other alternative disposal methods, but only if appropriate land is available within the economic hauling distance (Yaseen, 2017). Local Government Unit are most likely doing the land filling. According to National Solid Waste Management Status Report 2008-2014 (2015), prior to RA 9003, there are four sanitary landfills in the Philippines. These are at Carmona (Cavite), San Mateo (Rizal), Subic Base (SBMA) and Inayauan (Cebu) sanitary landfills. This is mandated by the Local Government Unit that landfills should be used in solid waste disposal.

Waste Reduction. The participants recycled non-biodegradable wastes and used paper bags, cups, and the likes as their strategy in reducing waste (96.55%) and only 3.45 percent said they decreased their consumption to reduce wastes. Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse and Recycle" waste hierarchy (Banerjee, 2015). The result of the study showed that it is better recycling non-biodegradable waste as a way of reduction instead of letting the wastes to be collected by LGUs and dispatch the wastes to landfills.

Cross Tabulation of Solid Waste Management Practices of Private Colleges in Cavite in terms of Collection

The researcher used a method of cross tabulation to quantitatively analyze the relationship between multiple variables in solid waste management practices of private colleges in terms of collection as shown in Table 4. Cross tabulation is also known as contingency tables or cross tabs, cross tabulation groups variables to understand the correlation between different variables.

Responsibilities of Contractors. The responsibilities of contractors under the management of local government units in collecting only the waste from the school premises is at 81.82 percent while 2 (18.18%) is under the private contractors. The collect and transport of

solid wastes from the school premises to landfills under the contract of LGUs is at 61.11 percent and 38.89 percent under the private contractors.

Table 4. *Cross tabulation of solid waste management practices of private colleges in Cavite in terms of collection*

	Local Government Unit		Private Contractor	
	Frequency	Percentage	Frequency	Percentage
Responsibilities of contractors				
Collects only	9	81.82	2	18.18
Collect and Transports	11	61.11	7	38.89
Frequency of collection				
Daily	0	0	5	100
Weekly	18	75	6	25

Frequency of Collection. All private contractors employed a daily basis of waste collection at 100 percent. While in the weekly basis of waste collection, 18 (75%) are under the local government units and only six (25%) are under management of the private contractors chosen by schools.

Problems Encountered on Solid Waste Management

According to the study of Rada et al., (2016) during the weeks of analysis, several critical issues were identified such as lack of attention in correctly separating waste by teachers and school staff, who should give examples of the correct behaviour; the lack of a regular emptying of bins located inside the classrooms; incorrect application of the SC by the students, due to carelessness or lack of information; the presence of additional waste fractions that could be collected separately and which are instead disposed of as residual fraction.

The problems encountered includes the list of common problems in schools when it comes to contractors, compliance of schools itself and concessionaire in the solid waste management of the school as shown in Table 5.

Table 5. *Problems encountered on solid waste management*

Problems	Frequency	Rank
Missed schedule of waste collection	20	1
Increasing cost of waste collection.	12	2
Colleges failed to comply with implementation of solid waste management system	10	3
Left overs or residues in the area after collection	8	4.5
Concessionaires failed to comply with implementation of school policy	8	4.5

*Some of the respondents indicated multiple responses

It is common for the schools to have problems on solid waste management. In this study, the collection schedule appeared to be the foremost. The schools experienced inconvenience from the contractors on the sudden change of time of collection and this resulted to the delay on collection and transportation of solid waste from the school to its final disposal. It is followed by increasing cost of waste collection, this included additional cost in storing their solid waste such as units to be used in storing the generated wastes daily and weekly. Although the companies and contractors agreed on specific terms, cost in collecting waste could also increase depending on the unexpected circumstances. These circumstances included the unnecessary increase in the price of oil, unexpected breakdown of the haulers, and unforeseen change of weather. (Damayo & Vidallon, 2016).

Third, the private college failed to comply with strict implementation of solid waste management system. For instance, the study in solid waste management policies implemented by private colleges revealed that the policy "Ensure the proper segregation, collection, transport, storage, treatment and disposal of solid waste through the formulation and adoption of the best environmental practices in ecological waste management excluding incineration." ranks lowest in the implementation of solid waste management policies by private colleges and therefore the private colleges would drive more efforts towards responsible waste management. In the study of Philippine Solid Waste (2017), the results reported that more than 15 years after the passage of RA 9003, enforcement and compliance with the law remains a daunting task due to technical, political and financial limitations of concerned agencies and LGUs.

Also problem seen are the left overs or residue of solid waste area after collection and concessionaires' compliance to the school policies in solid waste management. In these problems, the private colleges experienced inconvenience from the LGU or private contractors and lack of knowledge on proper solid waste management as well as lack of employee discipline. In addition, past studies have reported that collection, transfer, and transport processes are affected by poor collection schedules, improper bin collection systems, insufficient infrastructure, and low number of vehicles for waste collection (Moghadam, 2009).

Policies on Solid Waste Management

Table 6 shows the policies implemented to maintain their capability of producing favorable outcomes in terms of solid waste management. The policies are arrived from RA 9003 (Ecological Solid Waste Management Act of 2000).

Republic Act No. 9003 or the Ecological Solid Waste Management Act of 2000 is an act providing for an ecological solid waste management program, creating the necessary institutional mechanisms and incentives, declaring certain acts prohibited and providing penalties, appropriating funds therefor, and for other purposes.

The researcher enumerated seven policies to be able to determine whether the schools follow certain guidelines with regards to solid waste management. To determine degree of implementation of policies in colleges, the researcher use the Likert Scale as the measurement.

Table 6. Solid waste management policies implemented by private colleges

<i>Policies</i>	<i>Mean</i>	<i>Interpretation</i>
Ensure the protection of public health and environment.	5	Highly Implemented
Utilize the environmentally-sound methods that maximize the utilization of valuable resources and encourage resources conservation and recovery.	4.75	Highly Implemented
Set guidelines and target for solid waste avoidance and volume reduction through source reduction and waste minimization measures.	4.75	Highly Implemented
Ensure the proper segregation, collection, transport, storage, treatment and disposal of solid waste through the formulation and adoption of the best environmental practices in ecological waste management excluding incineration.	4.34	Highly Implemented
Encourage greater private sector participation in solid waste management.	4.66	Highly Implemented
Retain primary enforcement and responsibility of solid waste management with local government units while establishing a cooperative effort among the national government, other local government units, non-government organization and the private sector.	4.44	Highly Implemented
Strengthen the integration of ecological solid waste management and resource conservation and recovery topics into the academic curricula of formal and non-formal education in order to promote environmental awareness and action among the citizenry.	4.66	Highly Implemented
Overall	4.62	Highly Implemented

Ensuring the public health and environment got the highest rank because solid waste management launched for the health of people. The Zero Waste At My School (2018) stated that the unsound management of solid waste is one of the most serious environmental problems, given its high negative impact on natural resources and human health. Therefore, it is necessary to foster a culture at schools, aimed at alleviating the environmental and social problem caused by trash.

Ensuring the proper segregation, collection, transport, storage, treatment and disposal of solid waste through the formulation and adoption of the best environmental practices in ecological waste management excluding incineration got the lowest rank because it is ensuring the manners of the college students, their lack of knowledge about solid waste management is present in this statement. This result is supported by the study of Madrigal and Oracion (2018) that solid waste management awareness, attitude, and practices of the students and university employees are closely linked which suggest that one strategic approach to implement successfully a solid waste management program is education.

The result of the study in policies on solid waste management of private colleges shows that the participant schools are highly implementing the policies as required by RA 9003 (Ecological Solid Wastes Management Act) in their colleges. The participant schools got a score of 4.20 to 5 which has the equivalent of highly implemented as indicated in the Likert Scale of the study and with an overall mean of 4.62.

Significant Relationship between School Characteristics and Volume of Waste Generated by Schools per Day

The significant relationship of school characteristics that includes the years of existence, school population and school population to volume of waste generated by schools per day was shown in Table 7.

Table 7.1. Relationship of school characteristics to solid waste generated

<i>Variables</i>	<i>x² - values</i>	<i>p-value</i>	<i>Decision</i>	<i>Interpretation</i>
Years of Existence	23.40	0.0245	Reject Ho	Significant
Population	25.33	0.0457	Reject Ho	Significant
Operational Hours	16.96	0.0493	Reject Ho	Significant

Years of existence. Using Chi-squared test, years of existence is found to be significant with computed value of 23.40 and p-value of 0.0245. This indicate the years of existence has a significant relationship with volume generated by schools. However, the direction of relationship is not determined.

Patrick Foster (2019) study reveals that we live in a new generation of business, the strategies that have been working for decades can still work to grow your business today and this makes the business more popular and attracts more people and according to Vella Atienza (2008), if there is an increasing of population, the volume of waste generated per day is expected to continue increasing.

School population. Using Chi-squared test, school population is found to be significant with computed value of 25.33 and a p-value of 0.0457. This indicate the school population has a significant relationship with volume generated by schools. But, the direction of

relationship is not determined.

These findings are consistent with the findings of Damayo and Vidallon (2016) stated that the employee population could contribute to the volume of solid waste generated daily and Philippine Solid Waste (2017) revealed that the Philippine waste generation continues to rise with the increase in population and rapid economic growth. This means that as the school population increases, the volume of waste generated per day also increases.

School operation hours per day. Using Chi-squared test, school operation hours per day is found to be significant with computed-value of 16.96 and corresponding p-value of 0.0493. This indicate the school operation hours per day has a significant relationship with volume generated by schools. However, the direction of relationship is not determined.

The result revealed that the hypothesis is rejected means there is significant relationship between school operation hours and the volume of solid waste generated by school. However, the findings agree with Damayo and Vidallon (2016) who established that the volume of solid waste generation is dependent on the duration of the operation. This means that solid waste generated per day was dependent on how much time the school will operate. The longer the operation hours of the school, the higher the solid waste will be generated.

The result revealed that the volume of solid waste generation is dependent on the years of existence as well as the school population. However, the school operation hours could also be considered as another factor that could contribute to the volume of solid waste generated daily.

Table 7.2. Relationship of school characteristics to solid waste management practices

<i>Variables</i>	<i>x² - values</i>	<i>p-value</i>	<i>Decision</i>	<i>Interpretation</i>
Years of Existence	24.20	0.0191	Reject Ho	Significant
Population	26.31	0.0349	Reject Ho	Significant
Operational Hours	18.35	0.0313	Reject Ho	Significant

Years of existence. Using Chi-squared test, years of existence is found to be significant with a computed value of 24.20 and corresponding p-value of 0.0191. This indicate the years of existence has a significant relationship with solid waste management practices by schools. However, the direction of relationship is not determined.

School population. Employing Chi-squared test, school population is found to be significant with a computed value of 26.31 p-value of 0.0349. This indicate the school population has a significant relationship with solid waste management practices by schools. But, the direction of relationship is not determined.

School operation hours per day. Utilizing Chi-squared test, school operation hours per day is found to be significant with a computed value of 18.35 and a p-value of 0.0313. This indicate the school operation hours per day has a significant relationship with solid waste management practices by schools. However, the direction of relationship is not determined.

Table 7.3. Relationship of school characteristics to problems encountered

<i>Variables</i>	<i>x² - values</i>	<i>p-value</i>	<i>Decision</i>	<i>Interpretation</i>
Years of Existence	28.36	0.0049	Reject Ho	Highly Significant
Population	26.33	0.0347	Reject Ho	Significant
Operational Hours	20.06	0.0175	Reject Ho	Significant

Years of existence. Using Chi-squared test, years of existence is found to be high significant with a computed value of 28.36 and corresponding p-value of 0.0049. This indicate the years of existence has a significant relationship with problems encountered by schools. However, the direction of relationship is not determined.

School population. Employing Chi-squared test, school population is found to be significant with a computed value of 26.33 p-value of 0.0347. This indicate the school population has a significant relationship with problems encountered by schools. But, the direction of relationship is not determined.

School operation hours per day. Utilizing Chi-squared test, school operation hours per day is found to be significant with a computed value of 20.06 and a p-value of 0.0175. This indicate the school operation hours per day has a significant relationship with problems encountered by schools. However, the direction of relationship is not determined.

Table 7.4. Relationship of school characteristics to solid waste management policies

<i>Variables</i>	<i>x² - values</i>	<i>p-value</i>	<i>Decision</i>	<i>Interpretation</i>
Years of Existence	33.14	0.0009	Reject Ho	Highly Significant
Population	35.23	0.0023	Reject Ho	Highly Significant
Operational Hours	26.96	0.0014	Reject Ho	Highly Significant

Years of existence. Using Chi-squared test, years of existence is found to be high significant with a computed value of 33.14 and corresponding p-value of 0.0009. This indicate the years of existence has a significant relationship with solid waste management

policies by schools. However, the direction of relationship is not determined.

School population. Employing Chi-squared test, school population is found to be high significant with a computed value of 35.23 p-value of 0.0023. This indicate the school population has a significant relationship with solid waste management policies by schools. But, the direction of relationship is not determined.

School operation hours per day. Utilizing Chi-squared test, school operation hours per day is found to be high significant with a computed value of 26.96 and a p-value of 0.0014. This indicate the school operation hours per day has a significant relationship with solid waste management policies by schools. However, the direction of relationship is not determined.

Conclusions

The study concludes that years of existence, school population and school operation hours have a relationship with waste generated but the direction of the relationship is yet to be identified. Thus, if there is an increasing population, extending their operation hours and continues operating in the school industry, the volume of waste generated daily is expected to continue change and therefore might create serious damage to the environment and to human health if not be managed properly.

Based on the results and conclusion of the study, the following are highly recommended:

The study finds out that colleges failed to comply with implementation of solid waste management system. To strengthens the compliance with RA 9003 of private colleges in Cavite, the study recommended to put more effort into raising students' awareness by awareness campaigns that can bring about considerable changes in the attitude and perception of them towards solid waste management.

Also, the researcher have seen that most schools are implementing rules and regulations that helps to provide a sound solid waste management. But also, it is very important to have an available person or designated employee to strictly monitor the implementation of policies, procedures and regulations inside the school premises or they can execute fines to those who are not following the school rules and regulations implemented.

Lastly, for the future researchers, it is highly recommended to study the relationship of each type of solid waste and the volume level of solid wastes generated daily by schools to the school characteristics to conduct further studies connected to solid waste management. Also tackle the factors that affect the solid waste management practices in Cavite such as programs and project done by the LGUs.

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