PERCEIVED CHARACTERISTICS OF CAMPUS CAFETERIA SOLID WASTE MANAGEMENT

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ABSTRACT

This study describes the solid wastes management practices of the campus cafeteria of Lyceum of the Philippines University-Laguna. It aims to classify the type of solid wastes, identify the average daily wastes generation of the cafeteria and to describe the cafeteria patron's perception on solid waste management. The study is a quantitative type of research and was conducted in the campus cafeteria, Lyceum of the Philippines University- Laguna. Interview was conducted to list down all available consumables and possible waste products from the main food counter and from the eight stalls that serves variety of food. All possible solid wastes were classified and the average daily wastes generation were identified. Using G-power the researcher identified 67 respondents to validate perception on the solid wastes management. The study found that trashes, rubbishes, and garbages were the classified soilid wastes generated in the campus cafeteria. Color coding bins will be applicable to improve solid wastes management. The estimated average daily wastes generation of the campus cafeteria was 16.3 kg per day. The top three major wastes generated were plastic wrappers (23%), plastic cups (22%) and paper cups (15%), respectively. Respondents generally agreed to the solid wastes management practices. Linking solid wastes management in the curriculum or in the syllabi, installation of color coding bins throughout the campus, improving solid wastes collection and planning a campaign to launch the project of solid wastes management were suggested. Aside from the provided color coding bins for solid wastes in the cafeteria, the maintenance of hygienic drinking fountain were also indicated.

***Key Words**: solid wastes management, solid waste classification, daily wastes generation*

INTRODUCTION

School cafeteria is a food service location in the academic institutions where students and employees buy their food and carry to the table or take out the food. In LPU- Laguna cafeteria have eight stalls that sell a variety of food like milk tea, nachos, sandwich, pizza, rice meals,

shawarma, drinks and more. The school cafeteria must practice waste management because it is one of the places in the school that produces a lot of solid waste. In the study of Schultz (2011), he mentioned that much of the trash or waste comes from the packaging of the food we buy with an average of 30 kg of lunch waste per year. It is being produced and it equates to 8509 kg of lunch waste for just one average school. In college, they load up the tray and as they move the line they full the tray with the food. It can say that college student buy more food than they can eat which leads to the food waste (Hyde, 2001).

Waste management is simply known as the processing or disposal and monitoring of waste to minimize the consequence on human and environment. Waste management is also a treating waste and offers a variety of solutions to recycle items that do not belong to the trash. Rinkesh (2009) found out that there are many ways to manage waste but there are some methods that can be harmful to the environment and to the people. One of these is incineration. The advantage of incineration is that waste volumes are reduced by an estimate of 80% - 95%, and the need for land and landfill space is greatly reduced. The disadvantage is that the incineration needs a facility to build and it is very expensive. The smoke and ash emitted by the chimneys of incinerators include acid gases, nitrogen oxide, heavy metals, particulates, and dioxin, which is a carcinogen which can cause cancer (Greentumble, 2015). In relation to major waste increase and problems with disposals, bulk numbers of additional wastes came from school cafeteria nationwide must be regulated through the schools solid waste management scheme (Herron, 2015).

Waste management problems are high on the list of environmental concerns of the general public, particularly for people in developed countries (Rhyner, 1995). In the case of the Philippines, they generate more than 10,000 tons of solid wastes per day in Metro Manila accounting more than 50% of the total waste or 5800 tons a day (Bennagen, 2002). Randa (2015) stated that the Philippines have the world's 3rd biggest source of plastic leaking into the ocean. The country generates 2.7 million metric tons of plastic garbage each year, 20% or 521,000 tons of which ends up in the ocean. Moreoever, Filipinos produces wastes more than the average of the world. The global average is 0.3% and Filipinos produce 0.7% per person a day (Alave, 2011).

Solid wastes affect people and the environment, particularly the land pollution. Large amounts of solid wastes become leftover, and the leftover materials sent to the landfill site and end up polluting the environment (Rinkesh, 2009). Rushton, 2003 on his study on pollution and health risks summarizes the effects land pollution in the possible epidemic and spreading of such diseases. According to the British Medical Bulletin, the solid waste

may affect the birth defects and the reproductive disorder and may cause cancer. The Reproductive effects associated with landfill sites have been extensively researched and include low birth weight (less than 2500 g), fatal and infant mortality, spontaneous abortion, and the occurrence of birth defects. (Rushton, 2003)

Reducing the solid waste can help not only our school environment but also our country. Herron (2015) stated that reducing solid wastes can slow the depletion of natural resources, help reduce pollution associated with the extraction of raw materials, and conserve valuable landfill space. Some waste reduction methods also serve to reduce hazardous constituents in the solid waste. Craig (2008) identified some measures to start a well planned solid waste management scheme in a certain cafeteria by knowing the classification of wastes and ranking its volume. It will be easy to set a method on how to minimize wastes by doing some clasiification and volume ranking (Hyde, 2001).

Sarah et.al (2015) classified wastes products presence in restaurants. Among the seven types namely; (type 0) trash, (type 1) rubbish, (type 2) rufuse, (type 3) garbage, (type 4) pathological wastes, type (5) non-solid by product wastes, (type 6) solid by-product wastes. Among the type of wastes mentioned in the study of Sarah, only (type 0) trash, type (1) rubbish and type (type 3) garbage were present in restaurants. Trash is a mixture contain up to 10% by weight of plastic bags, laminated paper, disposable plactics and rubber wastes. Rubbish is a mixture of combustible wastes such as paper, cardboards, cartoons, foliage, this mixture contains up to 20% moisture by weight of cafeteria waste, but contains no treated papers, plastics or rubber wastes. Whiile garbage are consists of animal and vegetable wastes from cafeteria and like installations.

Herron (2015) stated that policy on waste minimization in a certain institution must be practiced and implemented as part of their corporate social responsibility. Investing in organized trash/garbage bins will be beneficial not only for the environment but also in terms of economic benefits of transforming wastes into money. Color codes of solid wastes helps to impose disciplines in a certain institutions. Codes such as yellow for cans, blue for paper, red for plastics, and green for organic wastes can use to set the mind of people to segregate wastes.

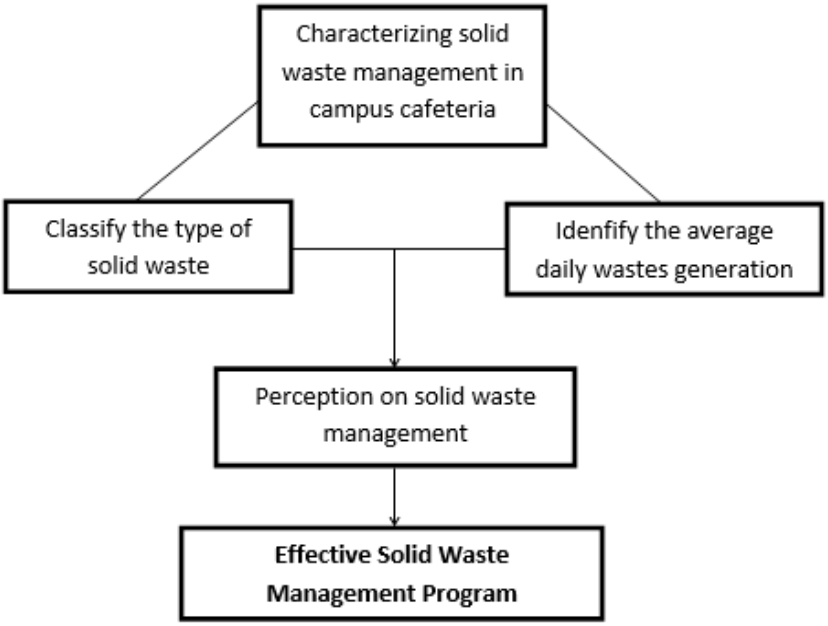

Figure: 1 Conceptual Framework

In order to set an effective solid waste management program in the campus cafeteria, it is necessary to characterize first its existing solid wastes management. Classification of the type of solid wastes generated as well as identifying the average daily waste generation will be helpful in developing effective waste management program (Craig, 2008). In addition, campus cafeteria patrons' perception of solid waste management will serve as another basis in the effective implementation of the solid waste management program.

Objectives of the Study

The study aims to (1) classify the type of solid wastes generated in campus caferia (2) identify the average daily wastes generation of the cafeteria (3) describe the cafeteria patron's perception on solid waste management.

METHODOLOGY

The study is a quantitative type of research and was conducted in the campus cafeteria of Lyceum of the Philippines University- Laguna. Interview was conducted to list down all available consumables and possible waste products from the main food counter and from the eight stalls that serve variety of food. All possible solid wastes were classified and the average daily wastes generation were identified. Using G-power, the researcher identified 67 respondents to validate perception on the solid wastes management. The survey questionnaire was adapted and modified from Craig (2008) study on improving cafeteria patrons' waste disposal.

RESULTS AND DISCUSSION

Classification of waste products available in campus cafeteria

The campus cafeteria wastes are classified as trashes, rubbishes and garbages. Trashes are classify as the plastics use in food and beverages packaging while rubbishes classify as the paper, cardboards, cartoons used in packaging of foods available in cafeteria food stalls and take out purchases in the main counter. Foliage is also considered rubbish that also included in the list of wastes products available in the cafeteria. Left overs are considerd garbage and this will be abundance after a long day of operations. Table 1 shows the classification of solid wastes generated in the cafeteria and Table 2 shows the color coding bins for solid wastes disposal in campus cafeteria.

Table 1. Classification Campus Cafeteria Solid Wastes

Trashes	Rubbish	Garbage
plastic bottles	paper plates	wooden sticks
snack wrappers	paper cups	left-over foods
plastic cups	aluminum cans	
plastic utensils		
plastic straw		

Table 1 presents that the majority of the solid wastes consumed in the campus cafeteria were characterized as trashes. Among the lists of the solid wastes only plastic bottles are subject for recycling, others are regular trashes that directly dispose off. Tin cans on the other hand, which classify as rubbish can also be recycle and sell, while the paper plates and paper cup can use as mixture in fertilizer (Schultz, 2011). Left-over foods in the cafeteria were collected and distributed to some hog growers and some are also collected as dog and cat foods. Wooden sticks are directly included in the disposing off schedule.

Classifying cafeteria solid wastes will be helpful in identifying some action to minimize the wastes. Academic agencies will use this idea to include solid wastes minimization in teaching environmental science or related field of study. Craig, 2008 classify trashes, rubbishes and garbages as the common solid wastes in the cafeteria. Improving wastes disposal can be easily impose in the cafeteria if the management is really serious with the implementation of solid waste management program. Using conventional wares or utensils instead of disposable materials can decrease the number of solid wastes the cafeteria consumes. However, Hyde (2001) stated that washing conventional wares and utensils can add to water pollution, if the establiment have no proper drainage system.

Table 2 Color Coding Bins for Solid Wastes Disposal of Campus Cafeteria

Cans and Plastic Bottles (Yellow)	Paper (Blue)	Other Plastics (Red)	Organic Wastes (Green)
Plastic bottles	Paper plates	Snack wrappers	Wooden sticks
Aluminum Cans	Paper cups	Plastic cups	Left-over foods
		Plastic utencils	
		Plastic straw	

Table 2 shows the proper disposal bins for the classified solid wastes from the campus cafeteria. Four color coding solid waste bins (Figure 2) are useful to separate wastes for recycling and reusing. This color code were used worldwide, specially those agencies or institutions that support solid waste management. Institutions like Lyceum of the Philippines Uiversity-Laguna can install color code bins placed in the two corners of the campus cafeteria, as well as in each corner of the campus corridors.

Figure 2. Color Coding Bins for Solid Wastes

Coding system for the classified wastes was the first step in implementing solid waste management (Schultz, 2011). The system of disposal was easy because segregation was already done. The organic wastes collected from the green bins can be used as fertilizers or if fresh, can be mixed with hog feeds. Wastes from the red and blue bins can be transformed into other things through reusing and recycling techniques. Plastic bottles and tin cans from the yellow bin can be sold and/or recycled.

Average Daily Wastes Generation of the Campus Cafeteria

In generating the average daily wastes consumption of the campus cafeteria, a three- trial measurement of solid wastes was conducted. Solid wastes collected from the cafeteria were segregated and weighed. An average of 16.3 kg per day wastes generation were gathered. Figure 3 below shows the distribution of wastes generation by the campus cafeteria.

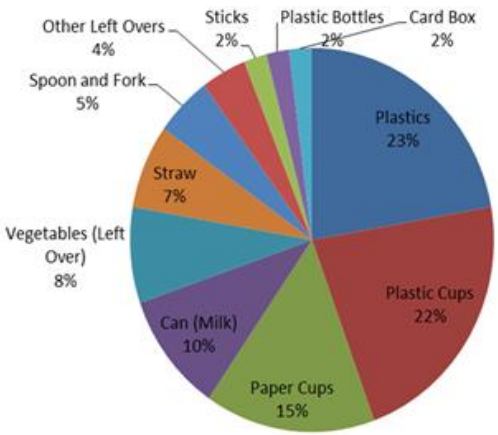

Figure 3. Distribution of solid wastes available in campus cafeteria

Majority of the wastes generated are plastics (23%), particularly, those used by the food stalls and snacks from the main counter. Plastic cups (22%) and paper cups (15%) were generated mostly from Intensitea, ETC 1 and 2 and IFC. Tin cans (10%) and plastic bottles (2%) were collected by the maintenance and some students for their NSTP projects. Left-over food, particularly vegetables (12%) were collected by cafeteria consessionaire as scrap food for pets and pigs. Other solid wastes, particularly the three major

solid wastes generated by the caferia were collected and dump at the land fill space located at back of the campus.

Most of the wastes that the stalls produce is non-biodegradable. According to Innocent et.al (2015), non-biodegradable items are stronger materials that are being synthesized which can withstand extreme temperatures and harsh conditions. Plastic bags and wrappers can take 10 to 20 years to get to decompose. This is followed by cans or the aluminium cans that will take more than 100 years to decompose. All of the stalls in cafeteria use plastic bags and wrappers which considered as the major solid wastes generated in the Phillipines today (Randa, 2015).

On the other hand, paper cups which were identified as third major solid wastes in the cafeteria pose some risk in the environment. According to the Boston Globe (2014), twenty three millions of trees are cut down annually to make a paper cups. For disposal, some of the paper cups can be recycled but it will take more than 20 years to decompose.

As part of the corporate social responsibily of any agencies, it is necessary to prioritize effective solid wastes management program, especially if the agency was in the field of education. Moreover, it is a great responsibility to teach students on how to be involved in solid waste management. Steven, 2011 found out that the education sector in the North Carolina lead on the ranking of the most supportive agencies on solid wastes management.

Campus cafeteria patron's perception on the solid waste management

A modified solid wastes management indicators will be distributed to 67 respondents'. Researchers spend two hours in three consequetive days to gather the data. Table 3 shows the perception on the solid wastes management of the respondents'

Table 3 Perception on the Solid Waste Management

Modified Solid Waste Management Indicators	Weighted Mean	Interpretation
1. I am aware of proper waste disposal.	4.37	Agree
2. I am willing to segregate waste, if the cafeteria provides labelled trash cans.	4.77	Strongly Agree
3. I am using reusable packaging for my meals.	3.90	Agree
4. I am willing to adjust the portion size of my food, to avoid left overs.	3.93	Agree

5. I am willing to take home the excess food to reduce food waste.	3.12	Agree
6. I am using the conventional utensils provided by the cafeteria.	3.90	Moderately Agree
7. I am willing to recycle my water plastic bottles for a day.	3.83	Moderately Agree
8. I am willing to not use a plastic straw to reduce plastic wastes.	3.05	Agree
9. I am willing to use the drinking fountain, guaranteed that it is safe to drink.	2.35	Disagree
10. I am willing to cooperate with the self-service schemes of "cleaning as you go"	3.65	Moderately Agree

(1=strongly disagree; 2=disagree; 3=agree; 4=moderately agree; 5=strongly disagree)
Craig 2008

Results show that the respondents are aware of proper waste disposal inside the campus cafeteria (WM= 4.37). Moreover, they are willing to do waste segration, if the cafeteria provides labelled solid wastes bins. Respondents were all agree in using resusable plastics for their meals, willingness to adjust the portion size of the food they eat, taking home excess food and not to use plastic straw respectively. Although, they have some reservations in using plastic straws, since it is the packaging style of their favorite milk teas. The indicators willingness to recycle their plastic water bottles for a day, using the conventional utensils and plates provided by the campus cafeteria and willingness to cooperate with the self-service scheme "clean as you go" had a weighted mean of 4 or strongly agree. The respondents,however, stated that they are not willing to use the drinking fountain. In fact, based on interviews, respondents perceived that the drinking fountains are unhygienic, filters are full of green fungi, some are spitting on it and the permit of sanitation was not updated.

Craig (2015) mentioned that eventhough the cafeteria patron's agree on the solid wastes manangement indicators, it is not a guarantee that solid wastes manangement will be successful if there is no monitoring of the practices inside the cafeteria. In another study, Schultz (2011) claimed that people's littering practices are cultural and are difficult to control if there is no

standard set to follow specific rules. Given this, the campus cafeteria is a perfect area to set a standard for solid waste management, since it belongs to educational institution where moulding discipline of students is considered as one of the priorities.

CONCLUSION AND RECOMMENDATION

The study found that trashes, rubbishes, and garbages were the classified solid wastes generated in the campus cafeteria. Color coding bins will be applicable to improve solid wastes management. The estimated average daily wastes generation of the campus cafeteria was 16.3 kg per day. The top three major wastes generated were plastic wrappers plastic cups and paper cups. Among the modified solid management indicator respondents were generally agree in the solid wastes management practices. The respondents are willing to segregate solid wastes, if the cafeteria will provide color coding bins but they are not willing to use the drinking fountain, even if the latter is guaranteed safe to drink.

This study therefore recommendeds that the color coding bins for solid wastes is needed in order to implement solid waste management. It is also necessary to make some plans in minimizing solid wastes since the study identified the average daily wastes generation of the campus cafeteria. Linking solid wastes management in the curriculum or in the syllabi, installation of color coding bins throughout the campus, improving solid wastes collection and planning a campaign to launch the project of solid wastes management are also suggested. Aside from the provided color coding bins for solid wastes in the cafeteria, the maintenance of hygienic drinking fountain is also recommended.

REFERENCES

Anne W, Ryan G, Camilo C. 2015. “Food Waste Auditing at Three Florida Schools”. Sustainability Science. USA

Alave K. 2011. Metro Manila Produces a Fourth of Philippine Garbage” Inquirer Article June 2011.

Bloom J. 2010. How America Throws Away Nearly Half of Its Food. End Food Waste Now Journal on Environment. USA.

Comstock EM, St Pierre RG, Mackiernan Y. 2004. “Measuring individual plate waste in school lunches. Visual estimation and children's ratings vs.

actual weighing of plate waste". Journal of the American Dietetic Association. 2005; Vol. 79(3); 290-296.USA.

Craig, M., Hammish, T. 2008. Improving Cafeteria Patrons' Waste Disposal. Journal of Organizational Behavior. London.

Gehrman E. 2014. Why Paper Cups Just Aren't Greener. Boston Globe. USA

Harnish C, Loius L. 2008 "Improving cafeteria patrons' waste disposal". Organizational Behavior Management. USA

Henry H. 2014. Biodegradable and Non-biodegradable Materials. Earth Untouched Better Ways of Living. USA

Herron W. Benfits of Proper Waste Segregation and Disposal. Rapid Waste and Disposal Portal. USA

Hodges R, Buzby J, Bennett A. 2011 "Postharvest losses and waste in developed and less developed countries: opportunities to improve resource use". The Journal of Agricultural Science. 2011; Vol. 149; 37-45 USA

Hyde, S. 2001. The Challenge of Waste Minimization in Food and Drink Industries: A Demonstrration Project in East Anglia U.K.

Innocent S., Alisa C, Ewuzie U. 2015. "Survey of waste disposal methods in Awka metropolis". J. Appl. Sci. Environ. Manage. USA

Jeung YH, Jung SJ, Kim SR, Cha YS. 2008. "A study on food waste management of school service in Jeonbuk Province". J. Korean Diet Association. South Korea.

Juul S. 2016. How to Control Portion and Reduce Food Waste. Huffington Post. USA

Marlette M, Templeton S, Panemangalore M. 2010. "Food Type, Food Preparation, and Competitive Food Purchases Impact School Lunch Plate Waste". Journal of the American Dietetic Association. 2005; Vol.105 (11); 1779-1782.

Nepomuceno, B., Covar R. 2002. Solid Waste Segregation and Recycling in Metro Manila: Household Attitudes and behavior" Economy and Environment Program for Southeast Asia(EEPSAEA)

Randa P. 2015. Why PH is World's 3rd Biggest Dumper of Plastics in the Ocean" Rappler Article 2015.

Rinkesh F. 2009. What is Land Pollution? Conserve Energy Future. Ecology Journal. USA

Rhyner C., Schwartz L. Wenger R. Kohrell M. 1995. "Waste Management and Resource Recovery". Lewis Publisher. USA

Rushton L. 2003. Introduction to Benefits of Waste Reduction. British Medical Bulletin. Oxford Journals PP 183-197 UK

Schultz, P., Bator R., Large, L. 2011. Littering in Context: Personal and Environmental Predictors of Littering Behavior. Sage Journal of Environment and Behavior. USA.

Steven F. 2011. "A public – private initiative to reduce food waste; A framework for local communities".Graduate Studies Journal of Organizational Dinamics. USA

Taher C. 2015. School Lunch Study Finds Longer Lunch are Healthier for Students. Journal of the Academy of Nutrition and Diabetics. USA

Tarah W. 2007. "The Average Amount of Solid Food Waste Produced as Waste at the Cafeteria". Environmental problem solving Dalhouse University. UK

Vadar S. 2010. "Improving Efficiency and redusing waste in our food system". Environmental Science. USA

Wan W, Ghani K , Rusli IF, Biak D, Idris A. 2013. "An application of the theory of planned behavior to study the influencing factors of participation in source separation of food waste". Waste Management. Vol. 33(5); 1276-1281.