Journal of Environment and Earth Science
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)
Vol.6, No.6, 2016

Knowledge, Attitudes, and Practices on Solid Waste Management among Undergraduate Students in a Philippine State University

Eveth P. Barloa[1], Lustina P. Lapie[2], and Christian Paul P. de la Cruz[2*]
1. Los Baños National High School, Los Baños 4031, Laguna, Philippines
2. Graduate Studies and Applied Research, College of Teacher Education, Laguna State Polytechnic University – Los Baños Campus, Los Baños 4030, Laguna, Philippines

Abstract

This cross-sectional survey was conducted to capture the knowledge, attitude, and practices (KAPs) on solid waste management (SWM) from a total of 2,528 undergraduate students enrolled in the Laguna State Polytechnic University – Los Baños Campus (LSPU-LBC) during the 2nd Semester, A.Y. 2015-16. While most students had satisfactory levels for knowledge (73.4%) and attitude (71.0%) on SWM-related matters, less than half (43.1%), showed satisfactory practice level. Similarly, the relatively higher average rating for knowledge (87.8%) and attitude (87.0%) of the students were both inconsistent with the lower average practice rating (72.5%). The average KAP rating was 82.3%, with merely half (55%) had satisfactory KAP ratings. The interaction effect between knowledge and attitude ratings significantly predicted the students' practice rating (r^2=0.11; P<0.005). The students' average KAP ratings were also somehow also linked to their social status, whereby, satisfactory KAP rating was significantly associated with students from medium-sized families (5-9 members), having parents with moderate academic backgrounds and held permanent jobs. The students' perceived abundance-ranking for some common household solid wastes, as well as household solid waste-stocking preference and disposal systems are also presented. Inclusion of relevant topics–with emphasis on proper SWM and other solid waste-issues–in the undergraduate curriculum of LSPU-LBC is recommended to promote awareness on environmental issues and improve attitude of college students towards environmentally-sustainable practices.

Keywords: Environment, KAP, Philippines, Solid waste management, Students

1. Introduction

The persistent increase in human population and rapid industrialization has caused the continuing global problems on improper wastes disposal (Atienza, 2008). The major drawbacks concerning wastes management, especially in the developing countries are the ineffective waste collection strategies and the lack of disposal sites (Reyes *et al.,* 2013). It has been suggested, likewise, that practices of basic solid waste management (SWM) are often neglected at the individual level (Licy *et al.,* 2013). While most people are aware of the negative impacts of mismanaged wastes on the environment, their negative attitude coupled with insufficient environmental knowledge among individuals usually corresponds to poor practices towards maintaining good environmental conditions (Licy *et al.,* 2013). Enactment of certain policies relevant to improving environmental sanitation and community-perception on waste management is a matter of national urgency to minimize imminent outbreaks of diseases and adverse impacts on the economy due to loss of workdays, treatment cost, and clean-up activities (Joseph, 2006). Thus, the Ecological Solid Waste Management or Republic Act 9003 in the Philippines mandates the Local Government Units (LGUs) to implement programs on proper solid waste management at the municipal level (Reyes et al., 2013).

The Municipality of Los Baños in the Province of Laguna, Philippines is a first class town, subdivided into 14 barangays and with an estimated 101, 884 human population as of 2010 census (NSO, 2013). Several important research agencies and institutions are located within the area, including the premier national university, the University of the Philippines Los Baños (UPLB), the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD) of the Department of Science and Technology (DOST), and the International Rice Research Institute (IRRI), among others. In recognition of its role as a center for research, development, and environmental preservation, Los Baños was declared as a Special Science and Nature City of the Philippines through Presidential Proclamation No. 349. Therefore, Los Baños is expected to maintain good environmental standing and should serve as model community of the environment in the entire country.

The "Anti-littering and Waste Segregation Program" has been implemented in Los Baños through a municipal ordinance. The ordinance enforces strict waste segregation schemes, collection schedule of

biodegradable and non-biodegradable wastes, and execution of corresponding penalties for non-compliance. The town's open dumpsite was converted into an Ecological Waste Processing Center (EWPC) in June 2004. The EWPC was declared as an MRF by the Department of Environment and Natural Resources (DENR), with the following operational procedures: segregation at source, unloading of bio-wastes, final sorting of bio-waste, composting, and shredding of residual waste specifically plastics. Unfortunately, problems linked to solid wastes continue to persist in the town. To possibly achieve good environmental status, genuine concern to preserve the environment plus improvement in practice level should initially emanate from the members of the community. According to Arora and Agarwal (2011), the problems of waste management are predominant in developing countries without substantial environmental awareness programs for the community.

Several community surveys have sought to capture the level of knowledge, attitude, practices (KAP) among students regarding the environment. Students are particularly targeted since they are regarded as the future of the nation and schools are expected to develop their potential as advocates of sustainable environment (Ahmad et al., 2015). Studies have also shown that students exhibit moderate to unsatisfactory practice level on waste management (Desa *et al.,* 2011; Adeolu *et al.,* 2014; Ahmad *et al.,* 2015). Therefore, this study was conducted to capture the level of knowledge, attitude, and practices of college students on solid waste management. This is to elucidate the roots of continuing problems on solid wastes towards improved environmental integrity, especially in the Municipality of Los Baños.

2. Methodology

2.1 Research Design

The cross-sectional study design was adopted in conducting the KAP survey as a form educational diagnosis for targeted communities (Kaliyaperumal *et al.,* 2004). This study involved college students enrolled in different degree programs under several College Units in Laguna State Polytechnic University Los Baños Campus during the Second Semester, A.Y. 2015-2016. The minimum sample size of 385 was taken based on Cochran's formula to estimate the proportion of a dichotomous-response. In using the formula, the maximum variability of the attribute (50%) was assumed, along with the desired 95% confidence level and 5% level of precision (Israel, 2013).

The cluster sampling technique was utilized to facilitate the selection process. Briefly, the total list of all on-going classes was initially obtained from the University Registrar's office. Each class was considered as primary sampling unit and the minimum sample size was adjusted using the finite population correction formula (Israel, 2013). Thus, a total of 86 classes (out of 106) across different degree programs were randomly selected and all students present at the time of the survey were requested to join. Involvement was purely voluntary and student-subjects were allowed to withdraw at any stage. The final number of students included in this study was 2,528 based on completeness and validity of their responses.

2.2 Research Instrument

Data were gathered using a three-part structured questionnaire prepared in English language and subjected to pilot testing to ensure feasibility and content validity. The computed Cronbach's Alpha was 0.794 and was deemed acceptable according to a standard scale (George and Mallery, 2003). The first part aimed to collect the socio-demographic profiles of the student-respondents. The second part comprised several statement-indicators to assess the students' knowledge, attitude, and practices using the Ruler and Option Scale (ROS) as an ideal tool to generate interval metrics. In using the ROS, students with "agree" response on certain KAP statements were further asked to rate their answer from one as the minimum rating up to 100% as the maximum rating. Other options such as "disagree", "no opinion", and "not applicable to me" did not qualify for any amount of ratings (Yusoff and Janor, 2014). The third portion of the test-form was focused on the students' perceived relative abundance of some common household solid wastes, solid waste-stocking preference, and waste disposal systems as practiced in their homes. Prior to the actual survey, all involved faculty members were trained on the proper administration of the survey questionnaire.

2.3 Statistical Analysis

All data were organized in a spread sheet and subsequent separate cross-checking was done by two different individuals. All categorical measurements were coded numerically to facilitate data transfer and analyses. All statistical procedures were performed in SPSS Statistics version 20.0. Actual counts, relative frequencies, and

mean scores were used in the descriptive analysis to describe the characteristics of the sample population under study. Significant associations between continuous variables were examined in linear regression; whereas, dependence of variables with dichotomous-response was statistically determined using the binary logit model. The non-parametric Friedman test was used in comparing related measures. All inferential statistics were performed at 95% confidence level.

3. Results

3.1 Respondents' Profiles

Majority were residents of Los Baños (67%); females (51.2%); within the age bracket of 15-20 years old (68.7%) with mean age of 20.2 (±3.21); and single (95.1%) at the time of the survey. In terms of their parents' employment status, 51.7% and 66.7% of the student-respondents had fathers and mothers held non-permanent jobs, respectively; regarding the parents' highest educational attainment, most student-respondents had fathers (38.7%) and mothers (31.4%), who were high school graduates; finally, more than half or 57.5% of the came from small families (i.e., 1-4 members); and most of them (48.5%) belonged to families with an average monthly income ranging from five thousand to ten thousand pesos.

3.2 Students' KAP Ratings on SWM

Individual ratings for knowledge, attitude, and practices were computed to describe the average KAP level on SWM. Comparable average ratings were obtained for knowledge (87.8%) and attitude (87.0%); whereas; remarkably low average rating was obtained for practice (72.5%). The average general KAP rating was 82.5% and deemed unsatisfactory or needs improvement. This indicates that the lower scores in practice might have pulled the KAP scores off the satisfactory rating. The average KAP ratings were subsequently converted into a dichotomous-response. Thus, an average score of 85 and above was considered "satisfactory", otherwise, the student rating was deemed as "needs improvement" (Table 1).

Results on dichotomized-response rate on average KAP showed that most students had satisfactory knowledge (73.4%) and attitude (71.0%) ratings. Interestingly, the number of students with satisfactory practice rating was only 43.1%, suggesting that having high knowledge and good attitude did not translate into exemplary practice level. Detailed inspection of specific practice statements showed that almost half of the student-respondents did not show satisfactory ratings. Hence, of the total respondents, only 55% were shown to have satisfactory general KAP on SWM.

Table 1. Average KAP Ratings of the Student-Respondents Regarding Solid Waste Management.

Measure	Mean ±Std. deviation	Assessment	
		Satisfactory (%)	*Needs improvement (%)*
Average knowledge	87.84 ±16.8	73.4	26.6
Average attitude	87.04 ±11.5	71.0	29.0
Average practices	72.50 ±24.7	43.1	56.9
Average general KAP	82.46 ±12.8	55.0	45.0

3.3 KAP Associations

The univariate and interaction effects of average knowledge and attitude scores to the average practice score of student-respondents on waste management and recycling were analysed using simple linear regression (Table 2). The univariate models suggested knowledge and attitude as significant predictor variables ($P<0.005$), and contributed to the total variability of practice average score by as much as 8.5% and 4.8%, respectively. Consequently, significant interaction was shown when these variables were entered simultaneously into the linear regression model ($P<0.005$). Both knowledge and attitude were confirmed as unique predictors of practice, and their interaction contributed to about 11% of the total variance of practice average score. The results indicate the positive influence of increasing knowledge and attitude on the average practice score. Thus, compared to students with lower average knowledge and attitude scores, those with higher knowledge and attitude averages showed better average practice scores.

Table 2. Association between the Average Knowledge and Attitude Ratings of Student-Respondents and their Average Practice Rating.

Assessment	Pearson's R	Adjusted R^2	B	95% CI for B	P- value
Knowledge	0.292	0.085	34.903	30.007 – 39.799	<0.005
Attitude	0.219	0.048	31.459	24.266 – 38.652	<0.005
*Knowledge*Attitude*	0.328	0.107	0.370	0.314 – 0.426	<0.005
Knowledge			0.335	0.253 – 0.417	<0.005
Attitude					<0.005

3.4 Link between KAP and Students' Profile

The link between student-respondents' profile and KAP outcome based on the average KAP scores was explored in binary logistic regression (Table 3). The dichotomous-response of the average KAP scores (i.e., satisfactory or needs improvement) was utilized for this purpose. The potential explanatory variables including sex, age, year level, civil status, parents' educational attainment and employment status, household size, and family income were entered into the logit model as categorical variables. The accuracy of the model was improved from 55.0% to 62.3% and found to be highly significant (X^2 = 226.32, df = 20, P<0.005) when the socio-demographic profiles were included. The logit model explained approximately 11% of the outcome's variation on the student-respondents' KAP rating.

Significant overall effects were shown for variables under parents and family attributes; while, none among the individual attributes examined was shown as unique predictor of the students' KAP outcome. The variables parents' highest educational attainment and parents' employment status had significant effects (P<0.005) on KAP outcome. Compared to those from less-educated parents, students from parents who are moderately to highly educated were 1.11 (P<0.005) to 2.14 (P=0.008) times more likely to have satisfactory KAP rating, respectively. Similarly, students from parents having very stable employment status had increased likelihood of having satisfactory KAP rating by 4.24 more (P<0.005) than those from parents with less stable employment status. Having parents with moderately stable jobs did not, however, increase the probability of having satisfactory KAP rating. These results indicate that the odds for students to have satisfactory KAP rating increases when both parents have good educational background and hold permanent jobs.

Table 3. Association of Socio-Demographic Measures as Potential Predictors of the Respondents' Dichotomous-Outcome of their Average KAP Rating.

Profile	B	P-value	Odds ratio	95% CI for OR
Sex				
Male			1.000	
Female	-0.063	0.454	0.939	0.795 – 1.108
Age bracket		0.464		
15-20 y.o.			1.000	
21-25 y.o.	0.016	0.878	1.016	0.828 – 1.247
More than 26 y.o.	0.247	0.216	1.280	0.866 – 1.892
Year level		0.963		
1st year			1.000	
2nd year	0.004	0.970	1.004	0.809 – 1.246
3rd year	-0.049	0.667	0.952	0.762 – 1.190
4th year	-0.330	0.773	0.962	0.739 – 1.252
Civil status				
Single			1.000	
Couple	0.330	0.104	0.104	0.935 – 2.069
Parent's education*		<0.005		
Least educated			1.000	
*Moderately educated**	1.056	<0.005	2.874	2.142 – 3.854
*Highly educated**	0.385	0.008	1.469	1.105 – 1.953
Parents' employment*		<0.005		
Least stable			1.000	
Moderately stable	0.077	0.380	1.081	0.909 – 1.285
*Very stable**	1.487	<0.005	4.424	3.208 – 6.101
Household size*		<0.005		
Small (1-4 members)			1.000	
*Medium (5-9 members)**	0.438	<0.005	1.549	1.306- - 1837
Large (>10 members)	-0.006	0.983	0.994	0.600 – 1.647
Family income*		<0.005		
<5k Php			1.000	
*5k-10k Php**	-0.458	<0.005	0.632	0.519 – 0.771
>10k Php	-0.139	0.249	0.870	0.687 – 1.102

Students coming from a medium-sized family were 55.0% (P<0.005) more likely to have satisfactory KAP ratings than those from small families. However, belonging to a large family did not increase the odds of having satisfactory KAP rating (P=0.983). Thus, satisfactory KAP was positively associated with students from medium-sized families. Students from families with monthly income of ₱5000.00 to ₱10, 000.00 were shown to be 37% less likely to have satisfactory KAP rating compared to students with family income of below ₱5, 000.00 (P<0.005) per month. Significant changes in the probability of having satisfactory KAP rating were not demonstrated among students from families with monthly income of more than ₱10, 000.00 and those earning below ₱5, 000.00 (P=0.249) per month. The results suggest that satisfactory KAP rating was negatively associated with students coming from families having a monthly income of five to ten thousand pesos per month.

These findings indicate that the students' KAP on waste management and recycling were somehow linked to their social status. Satisfactory KAP rating appears to be associated with students from medium-sized families having parents with good academic backgrounds and hold stable jobs that corresponds to a relatively steady financial source.

3.5 Perceived Abundance of Common Solid Wastes

Student-respondents were also asked to rank the common wastes in their homes in terms of their relative abundance. Plastic was perceived as the most abundant (MR=2.27) solid waste in the homes of the student-respondents, followed by papers with a corresponding mean rank of 3.59. The mean rank difference was found to be statistically significant (P<0.005). Meanwhile, cans (MR=4.90), glasses (MR=4.53), food scraps (MR=4.05), and yard trimmings (MR=4.86) tied in rank 3. Cloth and other types of waste such as diaper and cigarette butts ranked the least among the common solid waste in the homes of student-respondents (Table 4).

Table 4. Relative Ranking based on Perceived Abundance of Some Common Types of Solid Wastes in the Homes of the Student-Respondents.

Garbage type	Mean rank	Ranking
Plastic	2.27[a]	1
Papers	3.59[b]	2
Food scraps	4.05[b]	3
Glass	4.53[c]	3
Yard trimmings	4.86[d]	4
Cans	4.90[d]	4
Cloth	5.51[e]	5
Others	6.29[f]	6

3.6 Preferred storage systems

Inquiry into some of common ways on how to store solid waste in the homes of student-respondents was also covered in this study. Plastic bags were shown as the primary choice to stock solid wastes among the majority of the student-respondents (57.9%), followed by closed trash bin (32.5%) and open trash bin (24.2%). The remaining few respondents answered "pile in the yard" (4.8%) and "sack" (1.5%) as their choices for storing solid wastes in their homes.

Table 5. Preferred Solid Waste Storage in the Homes of the Student-Respondents.

Waste storage	1st Choice	2nd Choice	3rd Choice	Not a choice
Trash bin				
Covered	32.5	0.0	0.0	67.5
Just open	24.2	2.1	0.0	73.7
Plastic bags	57.9	0.0	0.1	42.0
Pile in yard	4.8	0.0	0.0	95.2
Others (i.e., sack)	1.5	0.0	0.0	98.5

3.7 Disposal systems

Students were also asked to disclose the type of disposal systems they practice at home for some common solid wastes. Majority of the student-respondents disclosed unselectively disposal of food scraps, yard trimmings, and plastics with other the types of household wastes. Meanwhile, papers, glass, and metal wastes were predominantly recycled/ reused or sold to junkshops.

4. Discussion

The use of KAP survey is an emerging popular method to assess community psychology and practices related to environmental issues. In this study, the KAP survey was implemented through a cross-sectional research design, to capture the knowledge, attitude, and practices of college students, specifically on solid waste management and recycling.

In general, the study found out that majority of undergraduate students from LSPU Los Baños Campus, during the 2nd Semester, A.Y. 2015-16, had satisfactory knowledge and attitude; however, less than half had satisfactory practice level on several items on material recycling and participation in environmental programs. This suggests that most undergraduate students, at the time of the survey were somehow aware of the importance as to proper solid wastes management and recycling and they also exhibit good attitude towards these matters; however, relatively few students had exemplary practice level.

Abdullah and Tuna (2014) also surveyed students from secondary schools, universities, and colleges in Nigeria. The study revealed unsatisfactory knowledge level on environmental issues among student-respondents, but they showed good perception ratings. The students were at least, conscious but they could not "explain on why" environmental problems continue to exist in their community (Abdullah and Tuna, 2014). Similarly, Rahmaddin et al. (2015) studied the KAP regarding waste management in communities near Martaputra River Bank in Indonesia. The community's attitude was deemed highly satisfactory, also their knowledge; however, the participants showed poor actions towards handling and management of river-dumped wastes by non-participation. The gap between knowledge and practices on household wastes was also indicated in the study done in Thrissur City in Kerala, India (Licy et al., 2013). Meanwhile, another study has explored the village KAP on solid waste management in Sta. Rosa City in Laguna Province, the Philippines. Results showed high awareness and favorable attitudes on waste-related issues and topics, among the surveyed members of the communities. Interestingly, the respondents also engaged in favorable practices on waste segregation (Tatlonghari and Jamias, 2010).

This study revealed that the students' knowledge and attitude were positively correlated with their level of practice. The tendency of the students to minimize the use of materials was highly associated with satisfactory knowledge and attitude ratings. Reuse of solid wastes including plastic/ glass bottles, cans, and paper and rainwater was also associated with satisfactory knowledge rating, but not with attitude; whereas, preference to use rechargeable batteries over the disposable types was significantly related to satisfactory attitude ratings. High positive correlations between knowledge and practice level were also reported by Tatlonghari and Jamias (2010). Similar to the findings of this study, respondents with higher knowledge scores were more likely to exhibit good practice on solid waste management. Similarly, a study involving adolescents showed that pro-environmental attitude positively predicts pro-environmental behavior (Meinhold and Malkus, 2005). On the other hand, somewhat contrasting findings were reported in an environmental-KAP survey that involved students from 16 higher learning institutions in Malaysia (Ahmad et al. (2015). It was found that both knowledge and attitude did not necessarily lead to sustainable environmental practices. The study highlighted that complexity of the relationships between students' KAP towards sustainable environment (Ahmad et al., 2015). The same findings were reported by Ifegbesan (2010) in a knowledge-practice level assessment done in Ogun State, Nigeria. It was revealed that secondary school students from the sampled zones were relatively aware of waste problems in their school compounds, but the same students possessed poor waste management practices (Ifegbesan, 2010).

The apparent break in the knowledge-attitude-practices continuum was also demonstrated in another community survey done in Angles City, Pampanga, Philippines. It was shown that high knowledge and favorable attitude toward the environmental issues did not necessarily result in favorable environmentally-sustainable practices (Ortiz, 2001). Also, Tatlonghari and Jamias (2010) did not found relational evidence between attitude and practice, despite their findings on the seeming connection between knowledge and practice levels.

This study also points-out the significant relationships between KAP level and certain socio-demographic aspects of the student-respondents. Findings show that students coming from medium-sized families with parents having good academic background and held stable jobs were more likely to exhibit satisfactory KAP ratings. However, students from families with monthly income ranging from ₱5, 000.00 to ₱10, 000.00 were less likely to have satisfactory KAP ratings as compared to the students from families with income below ₱5, 000.00 or above ₱10, 000.00. No similar published findings was encountered to support this result; although, it can be stated that most respondents with unsatisfactory KAP rating came from 5k-10k family-income range.

On the other hand, the individual attributes including sex, age, and civil status did not demonstrate any significant statistical connection to the students' KAP ratings. Similar results were also reported by Tatlonghari

and Jamias (2010), whereby KAP level did not vary between male and female respondents. Nonetheless, one study demonstrated that compared to men, women were more aware of the importance of good behavior towards the environment (Mapa, 1997). This highlights the importance of gender-fair campaigns and other-related programs relevant to addressing environmental issues and proposed conservation measures. Meanwhile, a weak negative relationship was observed between age and knowledge level (Tatlonghari and Jamias, 2010). Thus, younger respondents appeared to have better knowledge relative to the elderly as revealed in this study. The same positive correlation results between age and the respondents' knowledge and practice levels were obtained by Adeolu et al. (2014) in a study conducted in Oyo State Nigeria.

Similar to the obtained waste management data of this study, Tatlonghari and Jamias (2010) also reported selling or recycling as the usual practice for papers, bottles, plastic containers, and tin cans. As with this study, Tartiu (2011) also noted that many households discard solid waste with other types of wastes.

Similarly, indiscriminate solid waste disposal methods like open dumping and open burning was reported in Nigeria (Adeolu et al., 2014). According to Tartiu (2011), findings of community-based environmental KAP surveys, such as this study, are essential to attain significant improvement in waste management systems through recycling schemes or composting, as well on the development and proactive implementation of processes or programs that could address the declining community awareness on environmental deterioration and the much-needed conservation strategies.

5. Conclusion

Higher knowledge and attitude levels were shown to be inconsistent with the students' practice level, which was found relatively lower. Nonetheless, both knowledge and attitude ratings significantly explained the outcome for practice rating. Thus, it appeared that higher knowledge and attitude level had positive effect on practice level. It was also shown that satisfactory KAP rating is associated with students having parents with moderate academic backgrounds and held permanent jobs, coming from a medium-sized family. Environmental education is recommended, with emphasis on issues regarding solid waste management and recycling, should be included in the basic curriculum or certain course works of college students, to expand their knowledge and attitude towards improved practices on solid waste management. Relevant seminars and programs on environmental protection and waste management should be organized by LSPU and the Municipality of Los Baños to encourage students and the general public to becoming environmentally - responsible citizens.

6. Acknowledgement

The authors would like to extend their sincere gratitude to J. Barlao, N.L. Dandan, C. Ruin, and J. Ignacio for their assistance during the conduct of the survey.

References

Abdullah, I.K., Tuna, F. 2014. Nigerian Students' Knowledge and Perceptions about Environmental Problems and Management: A Case Study of Kano State. International Journal of Scientific Knowledge 4: 26-34.

Adeolu, A.T., Enesi, D.O., Adeolu, M.O. 2014. Assessment of Secondary School Students' Knowledge, Attitude and Practices toward Waste Management" in Ibadan, Oyo State, Nigeria. Journal of Research in Environmental Science and Toxicology 3: 187-194.

Ahmad, A. L., Rahim, S. A., Pawanteh, L., Ahmad, F. 2012. The understanding of environmental citizenship among Malaysian youths: A study on perception and participation. Asian Social Science 8: 85-92.

Ahmad, J., Noor, S.M., Ismail, N. 2015. Investigating Students' Environmental Knowledge, Attitude, Practice, and Communication. Asian Social Science 11: 284-293.

Arora, L., Agarwal, S. 2011. Knowledge, Attitude and Practices Regarding Waste Management in Selected Hostel Students of University of Rajasthan, Jaipur. International Journal of Chemical, Environmental, and Pharmaceutical Research 2: 40-43.

Atienza, V.A. 2008. A Breakthrough in Solid Waste Management through Participation and Community Mobilization: The Experience of Los Baños, Laguna, Philippines. Ritsumeikan Asia Pacific University.

Desa, A., Kadir, N., Yusooff, F. 2011. A Study on the Knowledge, Attitudes, Awareness Status and Behaviour Concerning Solid Waste Management. Procedia Social and Behavioral Sciences 18: 643-648.

George, D., Mallery, P. 2003. SPSS for Windows Step by Step: A Simple Guide and Reference. 11.0 update (4th ed.). Boston: Allyn & Bacon.

Ifegbesan, A. 2010. Exploring Secondary School Students' Understanding and Practices of Waste Management in Ogun State, Nigeria. International Journal of Environmental and Science Education 5: 201-243.

Israel, G.D. 2013. Determining Sample Size. PEOD6: Agricultural Education and Communication Department. Retrieved online at http://edis.ifas.ufl.edu/.

Joseph, K. 2006. Stakeholder Participation for Sustainable Waste Management. Habitat International 30: 863-871.

Kaliyaperumal, K. 2004. Guideline for Conducting a Knowledge, Attitude and Practice (KAP) Study. AECS Illumination 4: 7-9.

Licy, C.D., Vivek, R., Saritha, K., Anies, T.K., Josphina, C.T. 2013. Awareness, Attitude, and Practice of School Students towards Household Waste Management. Journal of Environment 2: 147-150.

Mapa, J. 1997. Effectiveness of Some Communication Channels on Environmental Conservation in Laguna de Bay, Philippines. Unpublished M.S. Thesis (Development Communication). University of the Philippines Los Baños, Laguna. 157 pp.

Ortiz, P. A. 2001. The Environmental Knowledge, Attitudes and Practices of Angeles City Residents. Unpublished M.S. Thesis (Development Communication). University of the Philippines Los Baños, Laguna. 102 pp.

Rahmaddin, M., Taufik, H., Bagyo, Y., Suyadi, K. 2015. Knowledge, Attitude, and Action of Community towards Waste Management in River Bank of Martapura. International Journal of Applied Psychology 5: 96-102.

Reyes, P.B., Furto, M.V. 2013. Greening of the Solid Waste Management in Batangas City. Journal of Energy Technologies and Policy 3: 187-194.

Tartiu, V. 2011. Evaluation of Attitudes and Knowledge Regarding Municipal Waste among Students. Case study: Bucharest Academy of Economic Studies. Economia. Seria Management 14: 263-267.

Tatlonghari, R.V., Jamias, S.B. 2010. Village Level Knowledge, Attitudes, and Practices on Solid Waste Management in Sta. Rosa City, Laguna, Philippines. Journal of Environmental Science and Management 13: 35-51.

Yusoff, R., Janor, R.M. 2014. Generation of an Interval Metric Scale to Measure Attitude. SAGE Open 4: 1-16. DOI: 10.1177/2158244013516768.