Malaysian Journal of Tropical Geography, 2022, 48(2): 1-15

KNOWLEDGE, ATTITUDE AND PRACTICE ON WASTE MANAGEMENT AMONG UNIVERSITY STUDENTS IN MALAYSIA

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ABSTRACT

Environmental issues are everyone's concern and effective waste management is essential for sustainable lifestyle. To find out how students view waste management in their everyday lives a study was conducted among students of the Universiti Malaya in Malaysia. A quantitative survey method was adopted and questionnaires were distributed in the main campus of the university. The questionnaires aimed at establishing students' knowledge, attitude and practice regarding waste management. The study used descriptive analysis and employed PLS SEM to test a few related hypotheses. Results show that the students who scored highly on knowledge and attitude toward waste management fared poorly on the sustainable waste management practice. Significant relationships were found between knowledge and attitude, between knowledge and practice, between attitude and practice as well as the mediating role of attitude on the relationship between knowledge and practice in waste management.

Keywords: *knowledge, attitude, practice, waste management, university students*

INTRODUCTION

Environmental issues have been attracting much attention all over the world. People are becoming more aware of the various environmental problems like global warming, air, water, land pollution and so forth. Human activities create waste, and the way these wastes are handled, stored, collected and disposed of can pose risks to the environment and public health (Zurbrugg, 2003; Addo & Acheampong, 2015). Waste disposal is an immediate and critical issue for the community and ineffective or irresponsible disposal of solid wastes pollutes the environment and pose health risk to the public. Moreover, Malaysia's outstanding economic growth over the last decades has negatively impacted its environment (Hasnul, 2015). Realising the needs to address these environmental issues, Malaysia embraces the sustainable development concept with the aim of promoting balanced development and preserving the environment and the ecology for the future (Hashim et.al, 2011).

Urban waste or municipal solid waste is one of the global environmental issues affecting the future growth of urban areas. Waste generation is a product of the urban lifestyle, growing faster than urbanization (Ugwuanyi & Isife, 2012; Haidy et.al, 2016). The World Bank (1992) identified solid waste as one of the three major environmental problems faced by most municipalities in Malaysia. Unsanitary disposal of waste is one of the biggest challenges faced by the country. This disposal of waste continues to increase due to growing population and

increasing consumption. The amount of solid waste generated went up from 17.000 tons per day in 2002 to 19,100 tons in 2005, an average of 0.8 kilogram per capita per day. The generation of solid waste is expected to reach 40,000 tons per day in 2020. In the capital city Kuala Lumpur waste generation is about 3,000 tons a day and forecasts show that this will increase further in coming years (Hassan et.al, 2002). This issue is recorded by all countries since the 1992 Conference on Environment and Development (UNCED) as the major barrier path toward sustainability. Thus, proper waste management is needed to ensure the protection of the environment and human health.

Malaysia's proactive effort in promoting sustainable development is evidenced in the environmental awareness programmes that were carried out at all levels including the younger generation (UN, 2014). The government's emphasis on youth's involvement in promoting sustainable development is evident in the inclusion of the concept in the country's education system at all education levels (Foo, 2013). Students in the universities were specifically targeted since they are regarded as the future of the nation and the universities are expected to develop their potential as advocate of sustainable environment (Ahmad et al., 2015). The universities are also seen as important institutions for educating and providing the country with leaders of tomorrow. However, the university's role in promoting sustainable waste management is still in its early stage to become a true advocate for sustainable education (Salvioni et.al, 2017). In line with the government's efforts to nurture the younger generations and to educate them on the importance of sustaining human needs and preserving the environment for the future, the students' view and understanding on these issues need to be further investigated. Therefore, the purpose of this study is to gauge the students' knowledge, attitude as well as their practice on solid waste management and how these affect their everyday lives.

WASTE MANAGEMENT IN MALAYSIAN UNIVERSITIES

One of the biggest challenges in major cities of developing countries is waste management. With a population of over 32 million, Malaysia generates about 38,000 metric tonnes of waste on a daily basis. From this amount, waste separation and recycle rate recorded only at 24 percent while the remaining 76 percent goes to the landfill. Food waste is a major component of generated waste (45 percent) and contains high organic compounds (STAR Online, 2018). According to the National Solid Waste Management Department (2019), 165 landfills were operating throughout Malaysia which covered 95 percent of the waste generated. On average the operating cost of the landfill is between RM28.80 to RM49.00 per tonne.

Universities in Malaysia contribute at least 5 to 10 percent of the total waste generated on a daily basis (Ng & Yusuf, 2016). Research shows that awareness among university students on waste management was quite low and most of the wastes generated were from colleges, cafeteria, faculty and administration departments (Desa et al, 2010). This shows that the majority of students did not fully understand the concept of recycling and only understood recycling generally. There were even students who never acknowledge the reuse and recycle concept in daily life (Philippsen, 2015).

The Malaysian government formulated the National Solid Waste Management policy which was aimed at reducing waste by establishing a waste management system that is holistic, integrated, cost effective, sustainable and acceptable to the community. This policy also emphasizes the conservation of the environment, selection of affordable technology and ensuring public health. The implementation of waste management would be based on the waste

hierarchy that emphasizes waste minimization through 3R, intermediate treatment and final disposal. Reduction of waste through the implementation of 3R namely Reduce, Reuse and Recycle would be the core of the policy and be advocated widely to increase efficiencies and to meet the targets of waste reduction (Amutenya et. Al, 2008). The government had also declared November 11 every year as a National Recycling Day (Che Osmi et.al, 2013).

One of the initiatives taken by Universiti Malaya (UM), a premier university in Malaysia for a more sustainable lifestyle is Zero Waste Campaign. It was aimed to spearhead the development of an integrated and sustainable waste management model. This Campaign served as a long term campaign to achieve integrated waste management model and ultimately a zero waste campus. The Campaign also initiated projects, research projects and schemes such as Green Bag Scheme, in-house composting centre, anaerobic digestion project, recycling collection system, waste characterization, composting emission study, and many more. Besides environmental benefits, the campaign provides research opportunities for teaching and learning, contributes to Low Carbon City Framework (LCCF) target and serves as a platform to improve students' soft and entrepreneur skills. Furthermore, this campaign has assisted several local communities to develop sustainable waste management system including communal composting project through various collaboration and partnership. Multi-stakeholders' participation, support from top management and industrial collaboration are key factors that drive the development of sustainable waste management model in the campus. This serves as an institutional sustainable and integrated waste management model and contributes to the national recycling target while bringing benefits to the environment and society at large.

KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) IN WASTE MANAGEMENT

Knowledge, Attitude and Practice or otherwise known as KAP is a theoretical framework for studying or researching about human behaviour and which focuses on specific topics. According to World Health Organization (WHO) KAP means knowledge, attitude and practice used for studying the behaviour of a community on a topic through what the respondents know about it (K), how the respondents respond to it (A) and what respondents do about it (P) (WHO, 2015). Knowledge, attitude and practice (KAP) surveys were first used in the 1950s to explore how the concept of family planning was received, understood and practiced by different populations across the globe (Launiala, 2009). The basic premises of the KAP surveys are that knowledge forms attitude, and that both knowledge and attitude are the building blocks for practice. KAP surveys are used for three general purposes: as a diagnostic tool to describe the population's current knowledge, attitude and practice; to provide insights on a current situation in designing specific interventions; and as a tool to evaluate the effectiveness of certain interventions or programmes (Vandamme, 2009). Even though KAP surveys have been criticised in the past for the reliability, validity and measurement that relates to the intensity of opinion or attitude (Vandamme, 2009), the surveys in general are well accepted as a framework to measure public's understanding, awareness, willingness and participation on a certain issue (Launiala, 2009; Vandamme, 2009).

Understanding the levels of knowledge, attitude and practice will enable a more efficient process of awareness creation as it will allow the program to be tailored more appropriately to the needs of the community. When assessing the KAP of a community, it is useful to divide that community into smaller sub-categories. In this case, these categories can be defined as the relationship on knowledge, attitude and practice on waste management among students. Based on WHO (2015), KAP survey can be used in planning, implementation, evaluation of advocacy work, communication and social mobility, and in this study in waste management. Some

studies have identified the potential of KAP as a theory in waste management specially to increase community participation (Desa et al, 2010; Ahmad et al, 2015; Babaei et. al, 2015). Thus this KAP survey can also be used to gather information on what the students know about waste management, their opinion on handling waste management, and what are they doing for recycling. Building on the aforementioned arguments, the following research questions were formulated:

Q1: What are the knowledge, attitude and practice levels on waste management among Universiti Malaya students?
Q2: Is there a significant relationship between knowledge and attitude in waste management?
Q3: Is there a significant relationship between knowledge and practice in waste management?
Q4: Is there a significant relationship between attitude and practice in waste management?
Q5: Does attitude mediate the relationship between knowledge and practice in waste management?

METHOD

Questionnaire Design

The survey questionnaire in this study was developed to assess the relationship on knowledge, attitudes and practices on waste management among students of Universiti Malaya (UM). There are four sections to the questionnaire and overall questions consist of 112 items. Section A are questions representing a demographic profile querying participants about their gender, ethnicity, academic level, and residential area. Section B represents about knowledge consisting of six (6) parts which are general am, recyclable material, separation at source and handling of waste management and 3R (Reduce, Reuse and Recycle). Section C covers on attitudes and consists of four (4) items which are managing, handling, practicing waste management and involvement in 3R, and Section D consists of two (2) parts on practice which are practicing 3R and separation at source.

The target respondents were from Universiti Malaya which has about 12 faculties, two academies and three academic centres as well as 12 residential colleges. When the study was undertaken there were 21,352 students and 3,701 staff at the university (QS Quacquarelli Symonds, 2017). The students' population constituted the sampling frame for the study. Based on the formula by Krejcie & Morgan (1970), with Confidence Level of 95% and Margin of Error at 5%, the sample size should be 378. Data collection occurred in the month of April 2017. The respondents were randomly selected within the university campus. Those who were willing to participate were asked to complete the questionnaire. The participations were informed that their voluntary participation in the study would have no detrimental effect on them, all information was confidential and data would be used for academic purposes only. It took an average of 20 minutes to complete the questionnaire. The survey received 384 completed questionnaires that were used for final analysis.

Data Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 22 and Partial Least Squares (PLS-SEM) version 3.0. Descriptive statistics were used to analyse frequencies, and means. For inferential analysis, Partial Least Squares (PLS) path modelling was employed. The Partial Least Squares-Structural Equation Modelling (PLS-SEM) is considered the most appropriate analysis technique for this study compared to SPSS regression

analysis because it conducts simultaneous tests on the relationship between indicators and latent variables (measurement model) and the relationship between the constructs (structural model) (Hair et al., 2012; Reinartz et al., 2009; Gefen, Straub & Boudreau, 2000). It is used to develop exploratory research theories by focusing on the variance in the dependent variables when examining the models. PLS-SEM is capable of estimating models of any size, including those with many constructs and hundreds of indicator variables (Hair et al., 2012).

RESULTS

Demographic Characteristics of Respondents

A total of 384 questionnaires were collected in the survey. There were 123 opmales (32%) and 261 females (68%) who participated in this study. The distribution of academic level shows the highest respondents came from Year 3 with 143 (37.2%), followed by Year 1 and Year 2 with 103 and 103 respondents (26.8%) respectively, and Year 4 with 35 respondents (9.1%). With regards to ethnicity, highest number of participants who responded to the survey came from the Malay group with 208 responses or 54.2 percent. The Chinese contributed 101 responses (26.3%) and 33 Indians (8.6%) responded to the survey, while others contributed 42 responses or 10.9 percent. In term of residence, most of the respondents stayed in the campus with 297 respondents or 77.3 percent, while another 87 (22.7%) stayed outside the campus. Respondents' characteristics are summarised in Table 1 below.

Table 1: Demographic Characteristics of Respondents

No	Item	Frequency	Percentages (%)
1.	**Gender**		
	Male	123	32.0
	Female	261	68.0
	Total	384	100.0
2.	**Academic Level**		
	Year 1	103	26.8
	Year 2	103	26.8
	Year 3	143	37.2
	Year 4	35	9.1
	Total	384	100.0
3.	**Ethnicity**		
	Malay	208	54.2
	Chinese	101	26.3
	Indian	33	8.6
	Others	42	10.9
	Total	384	100.0
4.	**Residence**		
	In campus	297	77.3
	Outside Campus	87	22.7
	Total	384	100.0

Students' Knowledge, Attitudes and Practice on Waste Management

The results are shown in three parts, namely Knowledge, Attitude and Practice. The questions asked the respondents for a 'yes' or 'no' answers, and the results of students who answered 'yes' are discussed below.

Knowledge

Table 2 shows the percentage of students' knowledge on waste management. It shows that the students have the highest knowledge on the issue and problem of solid waste management with 85.6%. Most of the students also agreed that the inefficiency of waste management will have great impact on the human health and unsystematic sanitary landfill will contaminate underground water. This shows that the students have high awareness on the issue and problem of improper solid waste management and the impact it has on the human health and environment. The students also showed high knowledge on 3Rs and general knowledge with 81% and 80.1% respectively. The results show that they have a better understanding on 'recycling' compared to 'reducing' and 'reusing' concepts as well as a good understanding on type of categories of controlled solid waste. Furthermore, the students also have very good knowledge on waste separation at source (79.9%) and recyclable materials (71.9%). The least knowledge is shown on solid waste disposal method with 64.7%. Most of the students only knew disposal methods such as sanitary landfill and open burning. This indicates that the students have little regards on the way their solid wastes are disposed of. Further analysis shows that the respondents gained their information on waste management from television (84.4%), social media (82.9%) and news article (80.2%).

Table 2: Students' Knowledge on Waste Management

No.	Item	Percentage (%)
K1	General knowledge on solid waste	80.1
K2	Knowledge on solid waste disposal methods	64.7
K3	Knowledge on solid waste management problems	85.6
K4	Knowledge on 3Rs	81.0
K5	Knowledge on recyclable materials	71.9
K6	Knowledge on waste separation at source	79.9

Attitude

Students' attitude towards waste management is shown in Table 3. Generally, the students have good attitude towards waste management; the highest being 3Rs practices with 86.2%, followed by implementing 3Rs and separate waste at source with 86% and willingness to join waste management activities or campaign with 82.4%. Most of the students stated that they bring reusable bag when buying stuff and bring their own food container when buying food. They also agreed that buying stuff wisely can reduce the amount of waste produced. The students also agreed that 3Rs practice and separating waste at source is the responsibility of everyone and should be taken seriously to prevent more harm in the future.

Table 3: Students' Attitude towards Waste Management

No	Item	Percentage (%)
A1	Attitude towards 3R Practices	86.2
A2	Attitude towards willingness to join waste management activities or campaign	82.4
A3	Attitude towards implementing 3Rs and separating waste at source	86.0

Practice

Table 4 shows students' practice on waste management. The results indicate that the students' practice on waste management is quite low with practicing 3Rs (44.4%) and separate waste at

source (43.9%). Most of the students only agreed on practicing giving leftover food to their pet and isolate food waste only before throwing out. Most of them did not practice separating recyclable waste into the recycle bin provided or make a list of things to buy to avoid wastage and sells recyclable solid waste to licensed buyers. This shows the students are only aware on the need to recycling and yet they are not practising it.

Table 4: Students' Practice on Waste Management

No	Item	Average of Percentage
P1	Practicing 3Rs	44.4
P2	Practicing separate waste at source	43.9

Comparing Students' Knowledge, Attitude and Practice on Waste Management

Table 5 compares the average percentage of the students' agreement on knowledge, attitude and practice on waste management. Attitude shows the highest average percentage with 84.9%, followed by knowledge 77.2% and the least average percentage is practice with 44.9%. This indicates the high level of attitude and knowledge on waste management among the students. Nevertheless, this has not been easily translated into practices. Similar finding was shown by Ifegbesan (2010) which explored the level of knowledge and practices of waste management among 650 secondary school students from Ogun State in Nigeria, and it showed that students were aware of the serious problem of waste management in their school, but had poor waste management practices. Likewise, a study by Timothy (2014) on the knowledge, attitude, and practices of 358 students in the secondary school towards waste management in Ibadan, Nigeria found that the students had a relatively moderate levels of knowledge, attitude, and practice of waste management. But the evidence of those who used indiscriminate solid waste disposal methods like open dumping and burning is still higher. The result implies that while knowledge and attitude can influence the course of person's practice, they must also be aligned with the satisfaction and benefit that a person can derive from being concerned and committed to the initiatives. Thus, being conscious and convinced of the need to dispose the solid wastes properly must come together with the person's passion and will to do it because of its benefit to human kind and the environment.

Table 5: Students' Knowledge, Attitudes and Practice on Waste Management

No	Item	Average of Percentage
1	Knowledge	77.2
2	Attitude	84.9
3	Practice	44.2

Assessment of PLS SEM Path Model

Assessment of Measurement Model

For assessing the KAP measurement model, an individual item reliability, internal consistency, convergent validity and discriminant validity were determined. The full measurement model is presented in Figure 1.

Individual Item Reliability

Based on Hair et al (2014)'s rule of thumb, an item with 0.70 outer loading is reliable and acceptable. However, they also suggested in retaining items between 0.40 and 0.70, and deletion is only done if its removal results in an increase in the Average Variance Extracted (AVE) and composite reliability (CR). The measurement model results in this study revealed

that out of 11 items, only 1 item was deleted due to the lower loadings than the suggested threshold. The remaining 10 items were retained for further analysis. The measurement result on the items loadings is shown in Table 6.

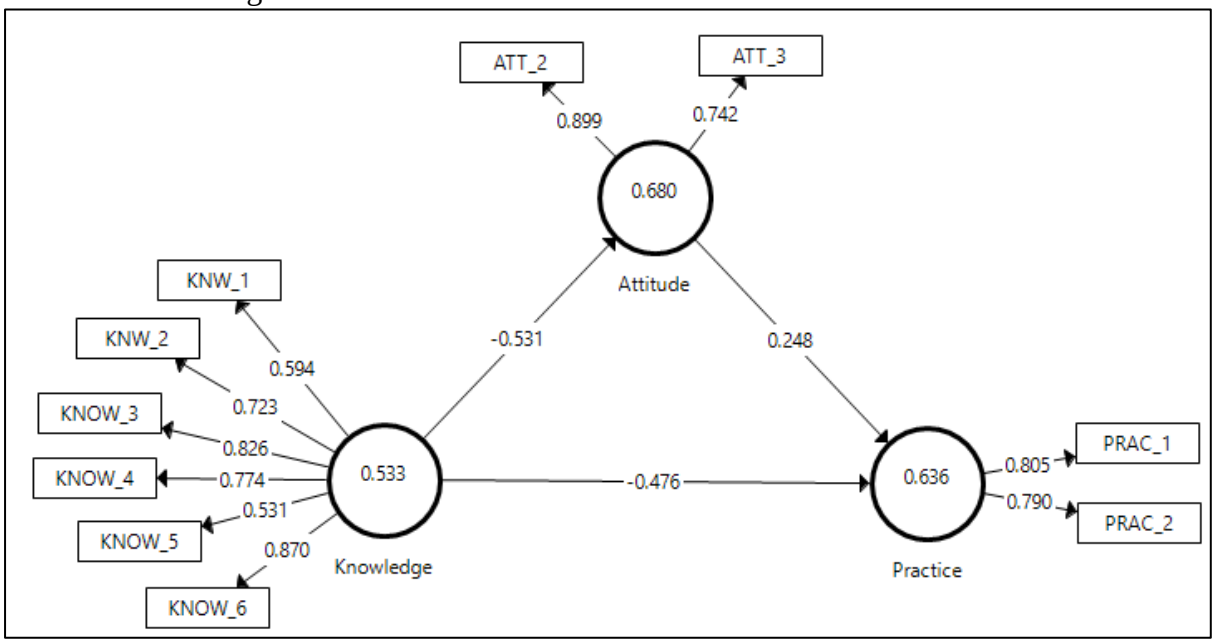

Figure 1: Full Measurement Model

ii. Internal Consistency Reliability

The rule of thumb for interpreting composite reliability coefficient value for a particular construct is 0.60 and above (Byrne, 2010). Table 6 shows that composite reliability (CR) coefficient for each of the construct ranged from 0.777 to 0.869. This indicates the adequate internal consistency reliability of the measures.

Table 6: Measurement Results on Items Loadings, AVE and Composite Reliability

Construct	Item	Loading	AVE	CR
Knowledge	KNOW_1	0.826	0.533	0.869
	KNOW_2	0.774		
	KNOW_3	0.531		
	KNOW_4	0.87		
	KNOW_5	0.594		
	KNOW_6	0.723		
Attitude	ATT_2	0.899	0.68	0.808
	ATT_3	0.742		
Practice	PRAC_1	0.805	0.636	0.777
	PRAC_2	0.79		

Convergent Validity

The AVE value of 0.50 and above indicates that the construct has a convergent validity. Table 6 also shows that all constructs have obtained between 0.533 to 0.68 of AVE which indicates that this study demonstrates adequate convergent validity (Chin, 1998; Hair et al., 2006).

Discriminant Validity

According to Hair et al., (2014) there are two methods for assessing discriminant validity. The first method is termed as Fornell-Larcker (1981) criterion. Under this criterion, a construct has discriminant validity when the square root of its AVE is higher than its correlation with other constructs in the same model. This indicates that the particular construct shares more variance with its associated indicators than with other constructs in the model, and thus is distinct from other constructs (Hair et al., 2014). The results are shown in Table 7.

Table 7: Measurement Model: Discriminant Validity (Fornell-Larcker)

	Knowledge	Attitude	Practice
Knowledge	**0.73**		
Attitude	-0.531	**0.824**	
Practice	-0.476	0.431	**0.797**

The second method of assessing discriminant validity is by examining the cross loadings of their respective indicators. For having discriminant validity using this method, all the indicator loadings should be greater than their corresponding loadings (cross-loadings) on other construct (Chin, 1998). If an indicator loading has a higher value than all other indicators in the construct, it is considered a strong representation of the latent variable it describes. Table 8 shows that the indicator loadings were found to be sufficiently higher than the cross-loadings, indicating the adequate discriminant validity was achieved in this study.

Table 8: Measurement Model: Discriminant Validity (Cross-Loading)

	Knowledge	Attitude	Practice
KNW_1	**0.594**	-0.272	-0.174
KNW_2	**0.723**	-0.369	-0.27
KNOW_3	**0.826**	-0.475	-0.434
KNOW_4	**0.774**	-0.375	-0.368
KNOW_5	**0.531**	-0.283	-0.281
KNOW_6	**0.87**	-0.486	-0.459
ATT_2	-0.517	**0.899**	0.416
ATT_3	-0.333	**0.742**	0.276
PRAC_1	-0.383	0.352	**0.805**
PRAC_2	-0.375	0.335	**0.79**

Assessment of Structural Model

The structural model in this study was evaluated based on five main criteria; algebraic sign, significance of the structural path coefficient, f^2 values, R^2 values, and assessment of PLS estimates at the construct level (Q2 values) (Chin, 2010; Calvo-Mora et. al, 2016). The structural models which analysed the direct and indirect relationships are shown in Figure 2. The results in Table 9 were analysed using Beta coefficients of the path relationship, the standard error (SE) and t-value (T statistics).

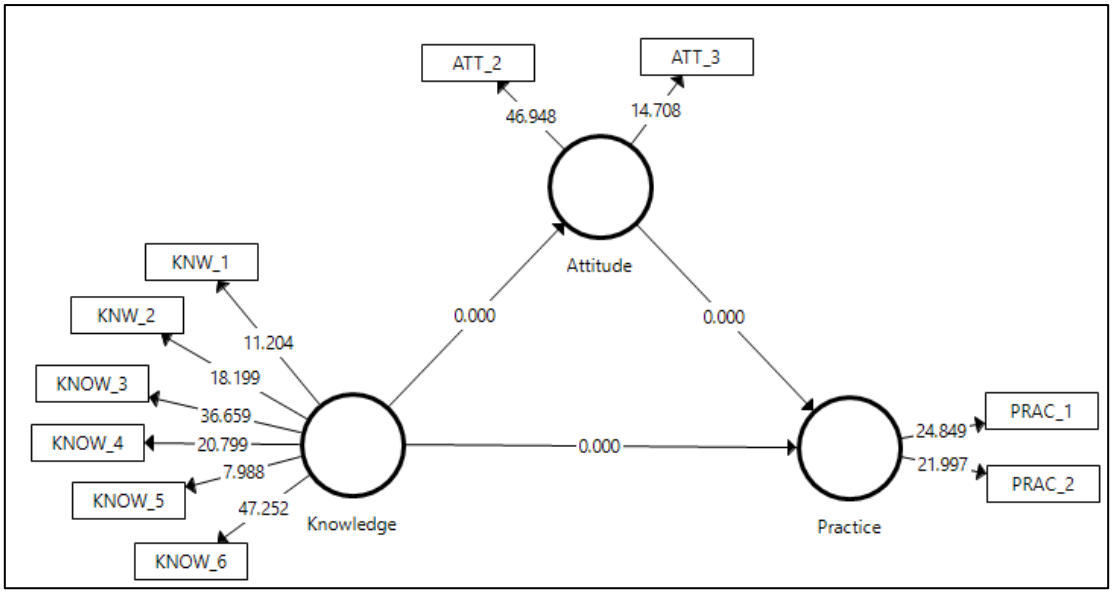

Figure 2: Structural Model

Table 9 shows that the path coefficient algebraic signs are all significant, which indicate that Hypothesis 1, 2 and 3 are all supported. The path coefficients (β) from Knowledge to Attitude are -0.531, and significant at p<0.01, while the path coefficients (β) from Knowledge and Attitude to the construct of Practice were -0.344 and 0.248, respectively, and they were statistically significant at p<0.01.

Table 9: Structural Model Direct Assessment

Hypothesis	Relationship	Beta β	Std Error	T value	P value	Result
H1	Knowledge -> Attitude	-0.531	0.055	9.62	0.000*	Sig.
H2	Knowledge -> Practice	-0.344	0.064	5.403	0.000*	Sig.
H3	Attitude -> Practice	0.248	0.068	3.672	0.000*	Sig.

*p<0.01

The effect size (f^2) of path coefficient in the model can also be used to assess the model fit. Effect size measures the strength of the relationship between two variables (Sullivan & Feinn, 2012). According to Cohen (1988), f^2 values of 0.02, 0.15 and 0.35 should be operationalized and interpreted as small, medium and large effect sizes, respectively. Table 10 shows the effect sizes of the path coefficient in the PLS model. Following Cohen's (1988) guideline, the effect sizes of all exogenous latent variables can be considered small.

Table 10: Effect Sizes in the main effect of PLS Path Model

Exogenous Latent Variable	Effect size (f^2)
Knowledge	0.122 (small)

Another criterion that can be used in assessing the structural model relationship in a PLS model is the coefficient of determination (R^2) of each endogenous latent variable (Hair et al., 2011; Henseler et al., 2009). Chin (1998) proposed the value of 0.67 as substantial, 0.33 as moderate, and 0.19 as weak. Table 11 presents the R squared values of two endogenous found in the model. The model explains 28.2 percent of the total variance in Attitude and 27.1 percent of the total variance in Practice.

Table 11: Latent Variable Coefficient R^2

Endogenous Variable	R-squared (R^2)
Attitude	0.282
Practice	0.271

Apart from R^2, Q^2 coefficients can also be used to show the model's predictive relevance (Urbach & Ahlemann, 2010). Q^2 indicates how well the observed values are constructed as the model as well as its parameter estimates (Chin, 1998). Q^2 coefficient larger than zero suggests an acceptable predictive validity, and the higher the Q^2 value the greater the predictive relevance (Duarte & Roposo, 2010; Kock, 2012). The analysis result in Table 12 shows that the Q coefficient for the endogenous latent variables significantly greater than zero (>0) indicating that the model has predictive relevance.

Table 12: Predictive Relevance for direct Relationship (Q^2)

Endogenous Variable	Q^2
Attitude	0.175
Practice	0.16

Testing the Mediating Effect

Mediating analysis determines the degree to which indirect effect through the mediating variable modifies the hypothesized direct path. In this study Attitude was hypothesized to mediate the relationship between Knowledge and Practice. The mediating analysis began with estimating the path model of a direct link between the independent variable and the dependent variable without the mediator variable. At this stage, the path models included the path coefficients and t values using PLS algorithm and bootstrapping procedure (Hair et al., 2013). The path model was then assessed with the mediator variable. The focus was on the mediator and independent variables relationship, and the mediator and dependent variables relationship were significant. Although this is essential, it is not adequate to conclude the mediation effect. Finally, the multiplication of the two significant path coefficients was divided by the standard deviation of the product to observe the significance of the indirect effect. Table 13 shows the result.

Table 13: Bootstrapping Results for Indirect Effect

Path A	Beta	Path β	Beta	Indirect Effect	Std Error	T value
Knowledge -> Attitude	-0.531	Attitude -> Practice	0.248	-0.132	0.034	3.911

Table 14 shows that the mediating effect of attitude and the relationship between knowledge and practice was significant, thus supports H4 where attitude was hypothesized to mediate the relationship between knowledge and practice in waste management. To test the degree of the mediating effect, the VAF value was calculated, and the result obtained was 0.499. With this result, it can be concluded that there is partial mediation between knowledge and practice by attitudes since it was found to be between 20 percent and 80 percent.

Table 14: Test of Significance for Mediating Effect

Relationship	Beta B	Std Error	T value	P value	Result
Knowledge -> Attitude -> Practice	-0.132	0.034	3.911	0.000*	Sig.

*p<0.01

DISCUSSION

The study findings were presented in two ways. First, the descriptive analysis such as demographic, descriptive variables, and relationship between knowledge, attitude and practice. Second, is to test the hypotheses by using PLS-SEM technique. From the demographic profile, it shows that there were more female respondents compared to male. Ismail (2015) stated that the universities from year to year have shown imbalance ratio between male and female students and there is still no indication to show that that this issue has been addressed. However, this study has provided sufficient data in term of its gender to provide a balance ratio for the database. On the other hand, the individual attributes including academic level and ethnicity did not demonstrate any significant statistical connection to the students' KAP ratings. Nonetheless, one study demonstrated that compared to men, women were more aware of the importance of good behaviour towards the environment (Barloa et.al, 2016). Furthermore, most of the respondents were students living in the campus, hence the data can give more accurate respond to the lifestyle in campus.

The study has also revealed that the students have a very high mean score on knowledge and attitudes, but showed low score on practice. This confirmed a study by Ahmad et al. (2015) which found that both knowledge and attitude did not necessarily lead to sustainable environmental practices. The study also highlighted the complexity of the relationships between students' KAP towards sustainable environment. However, the findings of this study contradicted with the results of other studies which 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 (Barloa et.al, 2016). 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. Another study involving adolescents also showed that pro-environmental attitude positively predicts pro-environmental behaviour and that students have high knowledge and awareness towards waste management (Meinhold and Malkus, 2005). In a way the findings of this study indicated that the efforts of the Malaysian government and the country's leading higher learning institutions to promote sustainable development to youth have proven to be fruitful. Further analyses showed that significant relationship exists between knowledge and attitude, knowledge and practice and attitude and practice. In addition, the mediating effect of attitudes on the relationship between knowledge and practice on waste management was also found to be significant, and this supports the mediating role of attitudes in this study. Overall four hypotheses were supported.

CONCLUSION

Knowledge about waste management is essential for every community (Jatau, 2013). Inadequate and inappropriate knowledge of handling of household waste may have serious health consequences and a significant impact on the environment as well. If people have good knowledge towards waste management they can prevent themselves from infectious diseases

and keep their environment clean (Adeyemo, 2013). People must have positive attitude towards waste management. The attitude of people towards waste management is affected by their level of knowledge. Lack of knowledge regarding waste management will have negative attitude towards waste management in their homes. People must have good practices regarding waste management in their homes. Moreover, poor waste management practices lead to contamination of environment by increasing the burden of infection and diseases among the peoples. Practices can be improved by providing knowledge regarding waste management.

This paper investigated the students' knowledge, attitude and practice on waste management in the Universiti Malaya Campus. Knowledge, attitude and practice were tested as independent variables. In addition, attitudes were also tested as a mediating variable on the relationship between knowledge and practice on waste management. Hence, this paper fulfilled the research gap with four hypotheses examined to answer the research questions and objectives. This study is significant in analysing the students in campus about their basic knowledge, attitude and practice on waste management. Still environmental education is recommended, with emphasis on issues regarding solid waste management and recycling. These 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.

ACKNOWLEDGEMENT

This research has partially been funded by RU Grant-Faculty Programme GPF003J-2018.

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