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INVESTIGATION ON ENVIRONMENTAL CARE TOWARDS SUSTAINABLE SOLID WASTE MANAGEMENT USING EXPLORATORY FACTOR ANALYSIS AT UiTM TAPAH CAMPUS

F. Zulkipli[1*], N.H. Jamian[2], I.Z. Zulkifli[3] and Z.M. Nopiah[4]

[1,2,3]Faculty of Computer and Mathematical Sciences,
Universiti Teknologi MARA, Perak Branch, Tapah Campus,
35400 Tapah Road, Perak, Malaysia
[4]Faculty of Engineering and Built Environment
Universiti Kebangsaan Malaysia
39000 UKM Bangi, Selangor, Malaysia
Author Correspondence e-mail: faridah7368@perak.uitm.edu.my

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ABSTRACT

The objective of this research is to study the environmental care among UiTM Tapah Campus towards sustainable solid waste management. A set of questionnaire comprised of two parts, which are background of respondent and environmental care components and were distributed among 185 students. The statistical technique exploratory factor analysis (EFA) was implemented to classify the components. As a result, the research revealed that there are five main components which are knowledge, practice, attitude, perception and awareness can be classified by 21 questions. The result led to formulate a new set of questionnaire. This new set of questionnaire will be distributed for further research which to investigate the level of environmental care among the UiTM Tapah Campus student.

Keywords: Environmental Care; Exploratory Factor Analysis; Solid Waste Management; UiTM Tapah Campus.

1. INTRODUCTION

Growing solid waste generation in Malaysia has reached an alarming level. Abundant of solid waste generation from our daily activities has risked for our communities [1;2]. The solid

waste generation rate rises up to 3% annually in line with the increase in population rate [3]. This is also due to the rapid economic development, the urbanization process to achieve the status of developing countries, lifestyle changes and rising income levels as a result of education improvement. However, this increase in solids generation will lead to some adverse effects on the environment. Health level will be affected by poor waste management. In addition, pollution of water and air occurs without control causing a loss of ecosystem balance. This is the result of less awareness from all parties about the importance of environmental care that is perfect in order to ensure sustainability in the future.

This socio-economic development is growing rapidly and has been recognized by the international community. This is the result of the commitment and effort of various parties to implement development projects including new urban construction planning, infrastructure facilities and so on. Unfortunately, these developments and the attitude of the less-caring and responsible society have brought some negative effects on ecosystems, the environment and the quality of life [4]. Global environmental issues such as biodiversity threats, natural resource depletion, global warming, and various environmental pollution make this issue a nuisance and a worrying future challenge for environmental protection [5]. Given that the problem of environmental preservation is increasing, the need to create a more responsible society towards the environment is also urgent. The young generation is seen as the heir of the state should be provided with knowledge to raise awareness about the impact of action that will take place around environmental care is declining. This preparation is crucial to create caring human capital and to have a more positive attitude toward the environment in order to achieve a sustainable environmental environment.

Therefore, the objective of this research is to study the environmental care among UiTM Tapah Campus towards sustainable solid waste management using exploratory factor analysis (EFA) to classify the factors. In order to achieve this objective, this research has done the following:

- Identified background of the respondents;
- Developed constructed factors that demonstrate the student's respond and feedback on environmental care on solid waste management;
- Classified the questionnaire question by each component through exploratory factor analysis method.

2. LITERATURE REVIEW

A study by [6] was carried out to look at the level of knowledge on environmental issues

among university students with the general public in the United States. The study found that there was a positive correlation between the level of education, the field of study and the level of environmental knowledge. In 2009, Solid Waste and Public Cleansing Management Corporation (SWCorp) conducted a public awareness recycling study on peninsular Malaysia. The results showed that 71.8% of respondents understood and were able to identify 3R related activities and only 63.7% were practicing 3R practices in their daily lives. Increasing solid waste every year makes environmental care less diminished because of the less responsive attitude of the various parties who are always looking into the issue [2]. This situation has caused difficulties in solid waste management to develop more effective planning for the environment. Hence, there is a need to study the practice, the level of awareness, knowledge, attitudes and perceptions among the community, especially the younger generation towards environmental protection. The outcome of this study is expected to assist responsible parties in designing the best strategies and approaches in increasing the importance of environmental care for the future. To study this problem, an exploratory factor analysis method was used to classify the set of questionnaires according to the appropriate factors or components, such as knowledge, practice, attitude, perception and awareness. Determining the right components or factors can improve the accuracy of the respondents.

3. METHODOLOGY

The research process began with observations among UiTM Tapah Campus students related to their behavior of waste management practices. A sample of 185 students from Faculty of Computer Sciences and Mathematics in Universiti Teknologi Mara (UiTM), Perak Branch, Tapah Campus are included in this study. The sample selected using convenience non-probability sampling technique. This is a sampling techniques where the samples are gathered in a process that does not give all the individuals in the population equal chances of being selected. The questionnaire items were designed based on adopted in [5] and [7]. Based on Figure 1 the questionnaire was comprised of two parts. The first part was background information about the respondents, including gender, age, program and part of study. The second part contains the items regarding the environmental care. The first part was measured according to the descriptive statistics (frequency and percentage) of the respondents while the second part employed five-point Likert scale direct questionnaire, as an instrument adopted from [4], [5] and [7]. This questionnaire consists of 21 items (Q1-Q21) to be responded. Respondents could attend and available at the right time, without pressure, from any program and part [9].

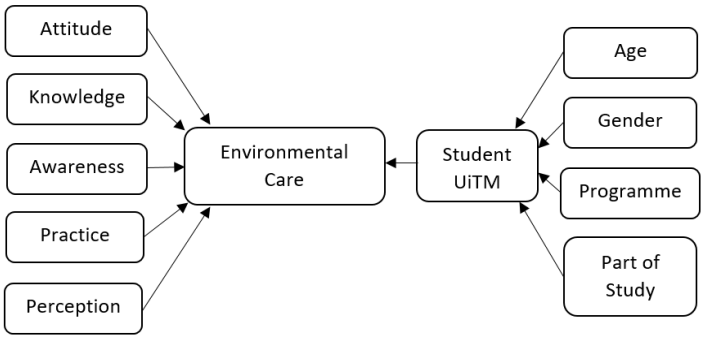

Fig.1. Conceptual Framework on Environmental Care

This study performed two main analyses that are Descriptive Analysis and Exploratory Factor Analysis (EFA) using IBM SPSS Statistics 22 package. Descriptive Analysis is an essential for every study to describe the data into informative way where the demography data is presented graphically in terms of percentage [10;11]. Then it followed by Exploratory Factor Analysis (EFA) where the normality assumption should be initially determined. A Normality Test is executing to identify whether the data follow normal assumption or not that measured using the skewness values. A common threshold for normality is the value of skewness should lie between -1 and 1. This test is vital to know whether the data acceptable to proceed with parametric analysis (factor analysis) or not [10;11].

In Exploratory Factor Analysis (EFA), firstly is looking at the Kaiser-Meyer-Oikin (KMO) value that measure of sampling adequacy for the variables is close to 1.0. This KMO is acceptable when exceed the recommended values 0.6, [10,11;12]. It indicates that data is suitable for Principal Component Analysis [13]. Similarly, the Bartlett's Test of Sphericity to see the sufficiency correlation items to proceed in the analysis when it is significant at $p<0.001$. It means that if $p<0.001$, the original correlation matrix is not an identity matrix or another word there are some relationship between the items. Since both of the tests were significance, it is suggesting that the data is appropriate to proceed with data reduction procedure to group the items into manageable components if both test are fulfilled [13]. Then, all 21 items are load on its respective factor at minimum factor loading, 0.4 [13,14].

Lastly, a reliability Test is carry out that ensure all factors are accepted as being reliable for the research in order to enhance the accuracy of the assessment and evaluations [13]. The Cronbach's Alpha is used to provide a measure of the internal consistency of a test or scale that is expressed as a number between 0 and 1 [11]. The values more than 0.6 consider reliable as recommended by [15].

4. RESULTS AND DISCUSSION

4.1 Descriptive Analysis on Respondent's Background

Table 1 shows the respondents' background consisted 51 males and 134 females. The respondents were comprised between age of 18 years old to 25 years old. The respondents were from Diploma in Mathematical Sciences (CS143) with 30.3% (56 respondents), 21.1% (39 respondents) of them were from Diploma in Computer Science (CS110). 19.5% (36 respondents) were from Diploma in Statistics (CS111) while another 15.7% (29 respondents) and 13.5% (25 respondents) were come from Bachelor of Computer Science (CS230) and Diploma in Actuarial Science (CS112) respectively. Majority of the respondents were come from part 5 with 43.2% (80 respondents) followed by 11.9% (22 respondents) and 15.1% (28 respondents) for part 1 and part 2 respectively. Others 14.6% (27 respondents) and 13.5% (25 respondents) for part 3 and part 4 respectively. Only 1.6% (3 respondents) were from part 6.

Table 1. Respondents' Background

Background	Items	Frequency	Percentage (%)
Gender	Male	51	27.6
	Female	134	72.4
Age	18	1	0.5
	19	68	36.8
	20	100	54.1
	21	11	5.9
	22	4	2.2
	25	1	0.5
Program	CS110	39	21.1
	CS111	36	19.5
	CS112	25	13.5
	CS143	56	30.3
	CS230	29	15.7
Part of Study	1	22	11.9
	2	28	15.1
	3	27	14.6
	4	25	13.5
	5	80	43.2
	6	3	1.6

4.2 NORMALITY TEST

Table 2 shows the skewness statistics for 21 items based on 185 students' responses. Based on the skewness statistic of each item, it found that all values were fall within the range 1 and -1. It indicated that the data follows normal assumption and acceptable to proceed with EFA.

Table 2. Skewness statistics of items

Item	Skewness statistic	Item	Skewness statistic
Q1	-0.663	Q12	-0.317
Q2	-0.818	Q13	-0.511
Q3	-0.266	Q14	-0.078
Q4	-0.790	Q15	-0.200
Q5	-0.926	Q16	-0.477
Q6	-0.952	Q17	-0.690
Q7	-0.965	Q18	-0.702
Q8	-0.894	Q19	-0.334
Q9	-0.238	Q20	-0.295
Q10	0.501	Q21	0.088
Q11	0.537		

4.3 EXPLORATORY FACTOR ANALYSIS

Exploratory factor analysis (EFA) is a statistical method used to uncover the underlying structure of a relatively large set of variables [16]. EFA is used to reduce the number of variables to a smaller set of underlying summary variables called a factor or component. The important coefficients of the EFA were presented to show the accuracy of the analysis such as Kaiser-Meyer-Olkin (KMO). A Varimax rotation of factor analysis was performed for all 21 items. Based on Table 3, it found that value was 0.729 and above 0.6. While, the Bartlett's Test of Sphericity was significant since the Chi-square value was 1056.774 with p-value less than 0.001 indicating sufficiency correlation between all pairs of items. Therefore, this data is appropriate in this analysis.

Table 3. Result of KMO and Barlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	**0.729**
Bartlett's Test of Sphericity	
Approximation Chi-Square	1056.774
Degree of freedom	210
p-value	0.000

At a minimum 0.4 loading, there are 5 items loaded into Component 1 (C1) assigned as Knowledge, 5 items loaded into Component 2 (C2) assigned as Practice and 3 items loaded into Component 3 (C3) assigned as Attitude, 3 items loaded into component 4 (C4) assigned as Perception, 3 items loaded into component 5 (C5) assigned as Awareness respectively as

shown in Table 4.

Table 4. Component Extraction

C1	Factor loading	C2	Factor loading	C3	Factor loading	C4	Factor loading	C5	Factor loading
Q4	0.407	Q13	0.618	Q9	0.542	Q1	0.843	Q10	0.729
Q5	0.541	Q14	0.756	Q17	0.666	Q2	0.881	Q11	0.794
Q6	0.824	Q15	0.619	Q20	0.699	Q3	0.692	Q21	0.562
Q7	0.828	Q18	0.535						
Q8	0.673	Q19	0.576						

**Note: C1 is Component 1*

4.5 RELIABILITY TEST

Cronbach's Alpha was used to evaluate the reliability of the questionnaire and the result is shown in the Table 5. The Cronbach's Alpha coefficients for the component of Knowledge (C1), Practice (C2), Attitude (C3), Perception (C4) and Awareness (C5) were 0.69, 0.62, 0.64, 0.76 and 0.61 respectively. It found that, all the Cronbach Alpha value were more than 0.6, demonstrating that the questionnaire was reliable. It indicated that those particular components extracted have a reliable measure of consistency perception among 185 students.

Table 5. Result of Reliability Test

Component	Cronbach's Alpha
1	0.69
2	0.62
3	0.64
4	0.76
5	0.61

5. CONCLUSION

This research studied the factors related to environmental care among UiTM Tapah Campus Student towards sustainable solid waste management. Based on the factor analysis findings above, the set of questionnaire (Q1 to Q21) could be classify according to the relevance component (C1 = level of knowledge; C2 = level of practice; C3 = level of attitude; C4 = level of perception and C5 = level of awareness). This new set of questionnaire will be distributed for further research which to investigate the level of environmental care among the UiTM Tapah Campus student.

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