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# Awareness and practices on Municipal solid waste management among students at University Malaysia Kelantan Jeli Campus

S A Nawawi<sup>1\*</sup>, I Muniandy, N M Fauzi<sup>1</sup>, A N M Nor<sup>1</sup>, N Ibrahim<sup>2</sup>, R M Jamil<sup>1</sup>, H A Aziz<sup>1</sup>, R Nawawi<sup>3</sup>, S H Ya'acob<sup>1</sup> and W N F W M Nazarie<sup>4</sup>

<sup>1</sup>Faculty of Earth Science, Universiti Malaysia Kelantan, 17600 Jeli, Malaysia

<sup>2</sup>Faculty of Bioengineering and Technology, Universiti Malaysia Kelantan, 17600 Jeli, Malaysia

<sup>3</sup>UiTM Cawangan Kota Bharu, Kota Bharu Kelantan.

<sup>4</sup>Faculty of Economics & Muamalat, USIM.

\*E-mail: aisyah.n@umk.edu.my

**Abstract.** In a world that rapidly rushes towards an urban future, the amount of municipal solid waste (MSW) is increasing drastically compared to the rate of urbanisation. During the early 2000s, around 2.9 billion people produced 0.64 kg of municipal solid waste (MSW) per person per day, but now the amount has increased to 3 billion people generating 1.2 kg per person per day. The waste products produced in higher educational institutions such as colleges and universities equal the operation of large-scale industries and healthcare facilities. Thus, this study was conducted to determine the level of practices and awareness of municipal solid waste management (MSWM) among students in UMK Campus Jeli. Besides, the association between the practices and awareness of municipal solid waste management among students in Universiti Malaysia Kelantan (UMK) Jeli Campus were measured. This study utilised a questionnaire concerning the students' awareness and practices of MSW. The data were analysed using descriptive and chi-square tests. The results showed that the practices of students on MSW in terms of segregation were average, 'reduce' and 'reuse' practices were both high. While 'recycling' and 'disposal' practices were average and low, respectively. However, their awareness of MSWM was high. There was a significant association between awareness and practices regarding segregation, reduce, reuse, recycle and disposal of MSWM. In conclusion, UMK Jeli students have good practice and awareness of Municipal solid waste management. The students should be more persistent in the practices of MSW to live a more sustainable lifestyle.

## 1. Introduction

The higher educational institution (HEI) is one of the dominant sources of generating Municipal solid waste (MSW). A sustainable university is one of the initiatives that involve-combating at the issues that arise against the environment. MSWM is one of the crucial issues that have been concerned and discussed. Although many programs have been initiated and implemented to increase the awareness among students on MSW, the practices of the university community are not satisfying [1]. Arora et al.



[2] found that almost half of the students show poor waste management practices, although they are aware of solid waste management.

Moving from straight disposal to waste management can reduce the risk of environmental issues. Integrated solid waste management is one of the important tools that can reduce this issue from worsening daily. Segregation, reuse, reduce, recycle (3R) and disposal are the practices in integrated MSWM. The government took several initiatives to instil the proper waste management practices among the public such as by implementing solid waste separation. Municipal solid waste (MSW) production has dramatically increased due to current global trends in lifestyle change, economic development, and human civilisation growth, which has renewed interest in studies and inventions in this study area [3].

However, there is a lack of awareness and knowledge among the Malaysian community about the MSW issues and ignorance about the effect of improper MSW. Therefore, this research is conducted to determine the practices and awareness of MSW management among UMK Jeli Campus students.

## 2. Materials and Methods

This section shows the methodology used in this study.

### 2.1 Sample and Data Collection

The respondents of this study were 320 students from three faculties, the Faculty of Earth Science (FSB), Faculty Of Agro-Based Industry (FIAT) And Faculty Of Bioengineering And Technology (FBKT) at University Malaysia Kelantan Campus Jeli. This study area was chosen since the area is one of the rural areas with higher institutions in Kelantan. The primary data were collected by surveying a questionnaire by distributing a google form to students through an online platform. The questionnaire is divided into three sections. Section A is about demographic information, where the students were asked about their demographic characteristics such as age, gender, faculty, and family background. Section B had 24 statements that are related to practices in terms of segregation, reuse, reduce, recycle (3R) and disposal. Lastly, section C consists of 20 statements about the level of awareness where they were asked if they were not aware, not so aware, neutral, and fully aware of Municipal solid waste management. The questionnaire of the survey was obtained from [4] and modified according to this survey on Municipal solid waste. Then, the research advisor consulted on the questionnaire to provide feedback and ideas. After the correction, the questionnaires were sent to the respondents.

### 2.2 Data Analysis

The data for this study were analysed using the following methods:

2.2.1. *Weighted Average (GWA)*. The weighted average  $\bar{x}$  was used in this study to measure the level of awareness and practices of the students on MSWM. The formula is given by:

$$\bar{x} = \frac{\sum_{i=1}^n f_i x_i}{\sum_{i=1}^n f_i}, \quad (1)$$

where  $f$  is the frequency and  $x$  is the allocated weight value for the  $n$  level of the Likert scale. The scale used to interpret the level of awareness and practices on solid Municipal solid waste management of the students was given in Table 1.

**Table 1.** Scale for the Level of Awareness

Scale	Interpretation
4.20-5.00	Very High
3.40-4.19	High
2.60-3.39	Average
1.80-2.59	Low
1.00-1.79	Very Low

2.2.2. *Chi-square test* ( $\chi^2$ ). This test is used to determine the significant association between the practices (reuse, reduce, recycle, segregation and disposal) and awareness (not aware, not so aware, neutral, aware and fully aware) of MSW. The formula of  $\chi^2$  is given by:

$$\chi^2 = \sum_{j=1}^k \frac{(O_j - E_j)^2}{E_j}, (2)$$

whereby  $k$  is the number of attribute categories,  $O_j$  is the observed absolute frequency in attribute category  $j$  and  $E_j$  is the expected absolute frequency in attribute category  $j$ .

### 3. Results and Discussion

This section presents the results of the study. Firstly, the results show the summary of the weighted mean of practices on solid waste management of the students in terms of segregation, reduce, reuse, recycle and disposal followed by the summary of the weighted mean for awareness of MSWM. Lastly, the results show the association between the practices with awareness of Municipal solid waste management among the students.

The results of GWA for practices (reuse, reduce, recycle, segregation and disposal) and awareness of MSWM among UMK Jeli students were shown in table 2. The average GWA for segregation was 3.26, implying that students in UMK Jeli have average practices of MSWM in terms of segregation. The students managed to segregate the biodegradable, non-biodegradable, recyclable and non-recyclable items well. In terms of reduce, the average GWA was 3.67 which is interpreted as high. Students used their own water bottles to bring water and used a reusable lunchbox to class. In every waste they made, the students practised caution and responsibility. The results also show that the average GWA for reuse was high, with an average GWA was 3.99. The students reuse well on the materials such as blank and scrap papers, old clothes, grocery bags and washable food containers. In terms of recycle, the average GWA is 2.88 which was interpreted as average. The students relatively converted the waste materials into new materials, although they had information about recycling. For the disposal, the weighted average is 2.09 which was poor. This implies that students in UMK Jeli have low practices in the disposal. Lastly, the student's awareness of MSWM was high with an average GWA value of 3.75. They have a high level of awareness about the importance of MSWM.

The association between practices and awareness of MSW are shown in table 3. The chi-square value for practices regarding segregation with the level of awareness was 46.94, with a significant value of less than 0.05. Hence, there was a significant association between practices in terms of segregation with the level of awareness of the students on municipal waste. For practices in terms of reduce with the level of awareness, the computed chi-square was 119.63 and the significance value was less than 0.05. Therefore there was a significant association between their practices in terms of reduce with the students' level of awareness. Meanwhile, there was a significant association between the level of awareness of the students with practices in terms of reuse of Municipal waste as the chi-square value of 54.51 with a significance value is less than 0.05. Besides, the chi-square obtained by practices in terms of recycle with the level of awareness is 84.91, and its significant value is less than 0.05. This implies

that there was a significant relationship between the level of awareness among students with practices in terms of recycle. Lastly, there was a significant association between awareness with practices in terms of disposal with the chi-square value was 72.14, and its significance value of less than 0.05.

According to Desa et al. [5], increasing the level of awareness on the campus will increase the behaviour and practice level concerning solid waste management. Another study by Ifegbesan [6] found that although the students were aware of the waste problems in their study areas, they still have poor waste management practices. This might be the result of inadequate infrastructures in the universities, such as a lack of recycle bin facilities.

**Table 2.** Practices and Awareness on Municipal Solid Waste Management of the Students

Variable	Average GWA	Interpretation
Practice		
Segregation	3.26	Average
Reduce	3.67	High
Reuse	3.99	High
Recycle	2.88	Average
Disposal	2.09	Low
Awareness	3.75	High

**Table 3** Association Between the Practices and Level of Awareness of the Students on MSW

Practices	$\chi^2$	df	Significant value
Segregation	46.94	12	0.00
Reduce	119.63	12	0.00
Reuse	54.51	12	0.00
Recycle	84.91	16	0.00
Disposal	72.14	16	0.00

#### 4. Conclusion

In conclusion, UMK Jeli Campus students have good practice and awareness of municipal solid waste management. The increase in awareness programs on campus can improve the practice of segregation, disposal and 3R (Reuse, Reduce and Recycle). The students should be more persistent in the practices of MSW in order to live a more sustainable lifestyle. Campaigns on the importance of municipal solid waste management should be conducted monthly in order to instil awareness in the mind of students. Besides, according to Debrah et al. [7], environmental education plays a significant role in creating and implementing awareness and understanding about environmental-related issues such as waste management and more. This study set out to develop sustainable ways to maximise waste recycling, decrease waste production, and identify chances to improve the university campus' waste management system. The potential advantages of MSW management in all colleges underline the requirement for efficient procedures to maximise the available opportunities in terms of the economy and environment.

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