Knowledge, attitude and practice of environmental sustainability among Sustainable Science students in Universiti Malaysia Kelantan

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Abstract. This study was conducted on the Sustainable Science (SEL) students to reveal their knowledge, attitude, and practice towards the environment sustainability according to year of study. Besides, the relationship between the knowledge, attitude and practice of SEL students towards environment were also examined. The survey was conducted using a quantitative approach involving 128 respondents (n = 128). The data from this study were analysed using Kruskal-Wallis and Spearman’s Rho testing SPSS version 20.0 software. Based on the Kruskal-Wallis results, the knowledge, attitude and practice were statistically significant with p value below 0.05 for all cases. The results showed that SEL students including the Alumni have a high level of knowledge while satisfactory level for attitude and practice on the environment. The study also found that there was a correlation between knowledge, attitude and practice of environmental sustainability. However, this correlation was different between year of study. It was found that the Alumni and Year Four has a higher knowledge, attitude and practice of the environment sustainability. Thus, SEL program is important in order to build environmental concern among the students and also to encourage their attitude and practice towards more environmentally friendly behaviour.

1. Introduction
Sustainable development has become an important part of Agenda 21 at the Rio de Janeiro in 1992. It is a global development priority to the satisfaction of human needs, while respecting environmental limits [1]. According to the International Union for the Conservation of Nature (IUCN) [2], sustainable development is defined as the capacity to maintain a certain process concept giving overriding or state to improve the quality of human life while living within the carrying capacity of supporting ecosystems. The goal of sustainable development is the long-term stability of the economy and environment. This is only achievable through the integration and acknowledgement of economic, environmental, and social concerns throughout the decision-making process.

To achieve the concept of sustainable development, elements such as social, economic, and environmental must support each other to ensure the long-term sustainability of the country [3]. Among the strategies for achieving sustainable development is implementing environmental policies and stringent enforcement so that the environmental management system is well managed without affecting the environment [4,5]. However, environmental policies and legislation alone will not succeed if people are lack of knowledge and awareness on the environment. Therefore, the government emphasises environmental education as one of the ways to educate and raise awareness about the environment in the early stages of schooling. This is because education is a continuous process for training human resources for development purposes. A successful learning process produces individuals and societies
sensitive, intellectual, active, understanding, and capable of identifying anything good or bad. Thus, education is the most potent agent of change in society and life as it can transform society from backward to an advanced and civilised society [6].

Environmental education has developed since the early 1960s to educate people about the biophysical environment and its problem. At that time, people faced environmental degradation due to population growth, pollutions, and natural resource depletion. It aims to create a human population with the knowledge, skills, attitude, motivation, and commitment to work individually and collectively to solve current environmental problems and prevent new problems from emerging [7]. Through environmental education, one can upgrade their understanding and increase awareness towards conserving and preserving the environment. According to Dienno and Hilton [8], environmental education is the foundation for creating an environmentally conscious society and a more ethical community.

In Malaysia, the environmental education aspect has been integrated into all subjects at primary and secondary levels across the curriculum [9]. At a higher education level, there are many universities offering programs related to environment including Sustainable Science (SEL) program offered at Universiti Malaysia Kelantan (UMK) since 2012 under the Faculty of Earth Science. Therefore, this study was conducted to analyse the knowledge, attitude and practice of the SEL students on environmental sustainability. The analysis from this study is valuable to improve this program in the future.

2. Methodology
This is a quantitative study that uses a questionnaire method for data collection. The population target was UMK students from SEL program from Year One to Year Four and the Alumni. A total sample of 128 respondents which comprised 30 students from Alumni, 30 students from each year of study except for Year Two and three with 20 and 18 respondents because the total number of students are less than 30.

There were four sections in the questionnaire. The first section is socio-demographic which is the close ended question such as gender, year of study and races. The other three sections are related to knowledge, attitude and practice on environmental sustainability. For each of this part, there were ten questions based on the Likert scale ranging from strongly disagree (1), disagree (2), intermediate (3), agree (4) and strongly agree (5). The questionnaire was validated by an expert in this field to ensure that the contents are necessary and consistent.

Meanwhile, the reliability of the questionnaire for knowledge, attitude and practice was determined and the result are statistically acceptable as shown in Table 1. According to Rosnah and Mohd Nazri [10], the acceptable internal consistency is between 0.7 and 0.8. Later, the distribution of collected data from answered questionnaire were analysed with normality test. The data is normally distributed if the significant value ($p$) of Shapiro-Wilk is greater than 0.05. However, value of $p$ for Shapiro-Wilk in this study was less than 0.05. Thus, a non-parametric analysis using Kruskal-Wallis and Spearman’s Rho was used [11]. To observe the relationship between knowledge, attitude and practice, the Spearman’s Rho test was used with level of $p \leq 0.05$ [12].

Table 1. The results of pilot test.

| Section                              | Cronbach’s Alpha ($\alpha$) |
|--------------------------------------|-----------------------------|
| Knowledge on environmental sustainability | 0.80                       |
| Attitude on environmental sustainability | 0.72                       |
| Practice on environmental sustainability | 0.75                       |
3. Results and discussion

3.1. Socio-demographic of respondents

Table 2 presents the demographic information of the respondents which consist of gender, age and ethnicity. Overall, the majority of respondents are female (78.9%). Moreover, most respondents are from age 21-22 years (46.8%). Besides, the majority of respondents are Malay (89.1%) followed by Indian (5.5%), Chinese (3.1%) and others (2.3%). For each year of study, the numbers of respondents are the same (30 respondents) except for Year Three and Year Four which have total students of 20 and 18, respectively.

Table 2. Distribution of socio-demographic.

| Factors | Frequency (N) | Percentage (%) | Year One | Year Two | Year Three | Year Four | Alumni |
|---------|---------------|----------------|----------|----------|------------|-----------|--------|
| Gender  |               |                |          |          |            |           |        |
| Male    | 27            | 21.1           | 8        | 9        | 1          | 4         | 5       |
| Female  | 101           | 78.9           | 22       | 21       | 19         | 14        | 25      |
| Age     |               |                |          |          |            |           |        |
| 19-20   | 32            | 25.0           | 28       | 4        | -          | -         | -       |
| 21-22   | 60            | 46.8           | 2        | 26       | 17         | 15        | -       |
| 23-24   | 18            | 14.1           | -        | -        | 3          | 3         | 12      |
| ≥25     | 18            | 14.1           | -        | -        | -          | -         | 18      |
| Ethnicity|               |                |          |          |            |           |        |
| Malay   | 114           | 89.1           | 29       | 27       | 18         | 18        | 24      |
| Chinese | 4             | 3.1            | -        | -        | -          | -         | 4       |
| Indian  | 7             | 5.5            | -        | 1        | 2          | -         | 2       |
| Others  | 3             | 2.3            | 1        | 2        | -          | -         | -       |

3.2. Knowledge of students on environmental sustainability

The results revealed that the student’s level of knowledge is at a high level with a mean of 4.51. According to Moidunny [13], the mean value in the range 1 to 2.5 is low, 2.6 to 3.9 is satisfactory or moderate while 4 to 5 is considered as high. Ten items were used to test the student’s knowledge of environmental sustainability, as shown in Table 3.

The variations in the overall knowledge based on the year of study were examined using a Kruskal-Wallis, as shown in Table 4. The Kruskal-Wallis test showed that there was a statistically significant difference in knowledge on the environment score between different years of study with H=6.411, p=0.000, with the highest mean rank knowledge score (93.30) is from the Alumni group, and the lowest mean rank (40.85) is from Year One.

Overall, the Alumni group has better knowledge of the environment compared to another year of study. This result is supported by Kaplowitz and Levine [14], who conducted a study on the level of knowledge on environmental issues among university students in the United States. Their study found that students at the doctoral degree level have higher knowledge than students at the master’s degree. Thus, higher levels of education can affect the knowledge of environmental issues.

Table 3. Agreement of students on statement related to environmental sustainability’s knowledge.

| Item No | Knowledge on The Environment | Mean | Std Dev. |
|---------|------------------------------|------|----------|
| 1.      | I know the Malaysian government has enacted laws under the Environmental Quality Act 1974 to protect the environment. | 4.43 | 0.739    |
| 2.      | I know the main function of the 1974 Department of Environment (DOE) is to prevent, eliminate, control pollution and improve the environment, consistent with the purposes of the Environmental Quality Act 1974. | 4.55 | 0.625    |
3. I know Local Agenda 21 is a program for the community, the private sector and local authorities to work together to manage the surrounding areas for sustainable development. 4.16 0.846

4. I know that the Solid Waste Management and Public Cleaning Act 2007 is an act to regulate the management of solid waste and public cleanup. 4.20 0.794

5. I know the decline in air quality will have a devastating effect on the human race. 4.81 0.498

6. I know motor vehicles emitted carbon dioxide which is a greenhouse gas that contributes to climate change. 4.67 0.641

7. I know that the recycle orange bin is reserved for disposing of items made of aluminium and plastic. 4.55 0.708

8. I know that global warming will raise sea levels that lead to coastal flooding on the Eastern Seaboard, especially in Florida and in other areas such as the Gulf of Mexico. 4.39 0.806

9. I know how to reduce environmental pollution. 4.61 0.564

10. I know that the uncontrolled use of natural resources can cause deterioration and destruction of the environment. 4.70 0.541

Table 4. Kruskal–Wallis Test of knowledge on the environment based on year of study.

| Year of Study | N  | Mean Rank | Chi-Square, H | Sig. |
|--------------|----|-----------|---------------|------|
| Year One     | 30 | 40.85     |               |      |
| Year Two     | 30 | 44.32     |               |      |
| Year Three   | 20 | 67.18     | 6.411         | 0.000|
| Year Four    | 18 | 83.25     |               |      |
| Alumni       | 30 | 93.30     |               |      |

3.3. Attitude of students on environmental sustainability

According to Table 5, the mean level of attitude on environmental sustainability shows a satisfactory level only with a mean value of 3.14. This is because five statements from the questionnaire are negatively constructed. These are statements no. 2 (I think the issue of river water pollution in Selangor is deliberately exaggerated), no. 3 (Threats to the environment are not my responsibility), no. 6 (Only the government and the experts should solve the environmental problems), no. 7 (Environmental problems can be solved without big changes to our way of life) and no. 10 (I think the recycling program doesn't give any impact on the environment). Thus, if these items are excluded, the mean value increased to 4.97, which shows a high level of attitude.

The variations in the overall attitude based on the year of study were examined using a Kruskal–Wallis, as shown in Table 6. Based on the result, the highest mean rank (74.10) is from Alumni group, and the lowest mean (61.98) is from Year One. Based on the result in Table 6, the significant value is less than 0.05. The Kruskal–Wallis test showed that there was a statistically significant difference in attitude on the environment score between different years of study with H=4.861 and p=0.032.

The results show that the Alumni group has more good attitude than other groups. This is because the Alumni group has graduated and gained more knowledge and experience. Thus, they are more aware and are likely to have better attitude towards the environment. This finding is identical with Aminrad et al. [15] where increasing in age and level of education has increased the level of environmental awareness and attitude among Iranian students in Malaysian universities. Besides, result from this study is similar to the study conducted by Bord and O’connor [16], who showed that senior has more good attitude than junior to a specific environmental risk study. A positive environmental attitude is important especially to the future generation because they will need to solve environmental problems that arise because of today actions.
Table 5. Agreement of respondent on statement related with environmental sustainability’s attitude.

| Item No. | Attitude in environment                                                                 | Mean  | Std Dev. |
|----------|-----------------------------------------------------------------------------------------|-------|----------|
| 1.       | I realise that caring for the environment is my responsibility.                         | 4.83  | 0.437    |
| 2.       | I think the issue of river water pollution in Selangor is deliberately exaggerated.    | 1.129 | 1.129    |
| 3.       | Threats to the environment are not my responsibility.                                   | 1.63  | 1.019    |
| 4.       | I'm willing to contribute a little of my income to the environment.                     | 4.10  | 0.751    |
| 5.       | I'm willing to pay more to buy eco-friendly products.                                   | 4.22  | 0.709    |
| 6.       | Only the government and the experts should solve the environmental problems.            | 1.80  | 0.999    |
| 7.       | Environmental problems can be solved without big changes to our way of life.           | 3.43  | 1.099    |
| 8.       | Before I buy any product, I will first think about its impact on the environment.      | 4.00  | 0.753    |
| 9.       | I am aware of current issues related to the environment in Malaysia and abroad.        | 4.26  | 0.643    |
| 10.      | I think the recycling program doesn't give any impact on the environment.              | 1.98  | 1.038    |

Table 6. Kruskal –Wallis Test of attitude on the environment based on year of study.

| Year of Study | N   | Mean Rank | Chi-Square, H | Sig.  |
|---------------|-----|-----------|---------------|-------|
| Year One      | 30  | 61.98     |               |       |
| Year Two      | 30  | 68.45     |               |       |
| Year Three    | 20  | 53.10     | 4.861         | 0.032 |
| Year Four     | 18  | 58.78     |               |       |
| Alumni        | 30  | 74.10     |               |       |

3.4. Practice of students on environmental sustainability

The level of environmental sustainability practice among SEL students is only satisfactory (3.88). The highest mean (4.73) belongs to statement no. 2 (I always turn off electrical appliances when not in use) (Table 7). Meanwhile, the lowest mean is for items no. 8, 3 and 7, with a mean of 2.63, 3.20 and 3.46, respectively. This shows that recycling practice in Malaysia are still low and ineffective. As for items 3 and 7, the practice are low, probably because they live in the hostel, which means they usually do not cook and has no chance to do composting.

Kruskal-Wallis, was conducted to compare students’ practice in the environment based on the year of study. Based on Table 8, the Alumni group shows more practice towards the environment with a mean rank of 75.40 followed by Year Four, Year Three, Year Two and Year One. Year One revealed the lowest mean rank of practice (51.32). Nordin et al.[17] stated that lack of exposure to the environment could reduce interest and practice towards environmental care. Thus, environmental practice can be developed if the students are exposed to the facts and figures in many environmental activities such as beach and river clean up.

Meanwhile, the Alumni group has better conceptualised the environment than other years of study. This is probably because they have completed their study and started to expose to a working environment where it is much related to the environment. Thus, the Alumni has a better understanding of the environment and sustainability. The significant value is less than 0.05. Thus, it can be concluded that there was a statistically significant difference in practice on the environment score between different years of study with, $H=6.881$, and $p=0.014$. 
Table 7. Agreement of respondent on statement related with environmental sustainability’s practices.

| No. | Practice on The Environment                                                                 | Mean  | Std Dev. |
|-----|---------------------------------------------------------------------------------------------|-------|----------|
| 1.  | I bring my own reusable bag and do not take plastic bags when shopping.                      | 4.16  | 0.962    |
| 2.  | I always turn off electrical appliances when not in use.                                     | 4.73  | 0.510    |
| 3.  | I collect used oil and send it to the recycling center.                                       | 3.20  | 1.004    |
| 4.  | I will notify the authorities if I see any incidents that will harm the environment.        | 4.01  | 0.865    |
| 5.  | I will make sure my waste is sorted according to the type of waste.                          | 4.08  | 0.738    |
| 6.  | I usually turn off the water when brushing my teeth.                                         | 4.50  | 0.774    |
| 7.  | I process the left-over of food to make fertilizer.                                          | 3.46  | 1.011    |
| 8.  | I rarely practice recycling while at home and on campus.                                     | 2.63  | 1.072    |
| 9.  | I do not throw used batteries into the bin.                                                   | 3.89  | 1.052    |
| 10. | I prefer to buy used items that are still good.                                              | 4.13  | 0.991    |

Table 8. Kruskal –Wallis Test of practices on the environment based on year of study.

| Year of Study | N  | Mean Rank | Chi-Square, H | Sig. |
|---------------|----|-----------|---------------|------|
| Year One      | 30 | 51.32     |               |      |
| Year Two      | 30 | 52.63     |               |      |
| Year Three    | 20 | 66.03     | 6.881         | 0.014|
| Year Four     | 18 | 69.72     |               |      |
| Alumni        | 30 | 75.40     |               |      |

3.5 Relationship Between Knowledge, Attitude and Practice Towards Environment

Based on Table 9, the correlation between knowledge by the year of study and attitude for Year One, Year Two and Year Three was moderate with \( r = 0.495 \), \( r = 0.459 \) and \( r = 0.485 \), respectively. While, the correlation between knowledge and attitude for Year Four and Alumni were strongly correlated with \( r = 0.567 \) and \( r = 0.653 \). This study shows that the SEL students, including Alumni have good knowledge of sustainability. As a result, they also show a good attitude towards the environment. The results of this study were similar to [18] who assessed the risk perception of microplastic where the variables attitude and knowledge were correlated significantly and that the knowledge influenced the attitude.

Meanwhile, the correlation between attitude by the year of study and practice shows a moderate correlation. Attitude is the individual's readiness to perform a given good practice [18]. This study shows a moderate relationship between both variables, showing that SEL students and Alumni still lack in attitude to engage with the environmental practice. A similar finding has been identified by the researcher of University of Twente, where the respondents in their study also showed a moderate relationship between attitude and practice [18].

On the other hand, the correlation between practice by the year of study and knowledge shows a strong correlation for Alumni while the moderate correlation for Year One, Year Two, Year Three and Year Four. Correlation coefficient for Alumni was \( r = 0.743 \) with \( p < 0.05 \), that revealed the highest correlation between attitude of Alumni and knowledge towards the environment. The value correlation coefficient for Year One, Year Two and Year Three were \( r = 0.422 \), \( r = 0.485 \) and \( r = 0.581 \), respectively, which showed moderate correlation.

Overall, it can be concluded that the environmental behaviour of students was influenced by knowledge, attitude and practice. This proved that the infusion of the knowledge, attitude and practice elements were important in changing the student’s behaviour.
Table 9. Relationship between knowledge, attitude and practice of environmental sustainability based on year of study.

| Factor   | Knowledge     | Attitude     | Practice    |
|----------|---------------|--------------|-------------|
| Year One | 0.495*        | 0.422*       |             |
| Year Two | 0.459*        | 0.485*       |             |
| Year Three | 0.485*     | 0.581**      | 0.638**     |
| Year Four | 0.567**      | 0.653**      | 0.743**     |
| Alumni   | 0.653**       | 0.485*       |             |

Year One; N=30, Year Two; N=30, Year Three; N=20, Year Four; N=18, Alumni; N=30
*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

4. Conclusion
From this study, it can be concluded that the SEL students, including the Alumni have a high level of knowledge while satisfactory level for attitude and practice on the environment. Based on the year of study, the Alumni group has good knowledge, attitude and practice in environmental sustainability.

The study also found that there was a correlation between knowledge, attitude and practice towards environment. However, this correlation was different between years of study. The Alumni group revealed the highest correlation for knowledge, attitude and practice towards the environment compared to other year of study. Thus, it can be concluded that the SEL program is a good course that can influence students to have good knowledge, attitude and practice of environmental sustainability which can be developed as early as in Year One of study.

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