THE INFLUENCES OF SUSTAINABLE SCIENCE STUDENT BEHAVIOUR ON THE ENVIRONMENT BASED ON YEAR OF STUDY

by

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A report submitted in fulfilment of the requirements for the degree of Bachelor of Applied Science (Sustainable Science) with Honours

FACULTY OF EARTH SCIENCE UNIVERSITI MALAYSIA KELANTAN

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THESIS DECLARATION

I hereby declare that the work embodies in this Report is the result of the original research and has not been submitted for a higher degree to any universities or institutions.

.....

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I certify that the Report of this final year project entitle Influences of Sustainable Science Student Behaviour On the Environment Based On Year of Study by Nur Shahirah Binti Ruslan, matric number E17A0046 has been examined and all correction recommended by examiners have been done for the degree of Bachelor of Applied Science (Sustainable Science) with Honours Faculty of Earth Science, University Malaysia of Kelantan.

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The Influences of Sustainable Science Student Behaviour on the Environment Based On Year of Study

ABSTRACT

Environmental education is essential to ensure the quality of the environment for sustainable development. By providing knowledge to students, it is hoped to promote awareness and develop a positive attitude towards the environment which result in good student behaviour. This study was conducted on the Sustainable Science students to reveal their knowledge, attitudes, and practices towards the environment 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 Analysis using SPSS version 20.0 software. Based on the Kruskal-Wallis One-Way ANOVA results, the knowledge, attitude and practice were statistically significant with *P* value below than 0.05 for all cases. The results show that SEL students including the alumni have a high level of knowledge while satisfactory level for attitude and practices on the environment. The study also found that there was a correlation between knowledge, attitude and practice towards environment. However, this correlation was different between year of study. It was found that the Alumni and Year Four has a higher knowledge, attitude and practices towards the environment. Thus, environmental education subject is important in order to build environmental concern among the students and also to encourage their attitude and practices towards more environmental friendly behaviour.

Pengaruh Tingkah Laku Pelajar Sains Kelestarian Terhadap Alam Sekitar Mengikut Tahun Pengajian

ABSTRAK

Pendidikan alam sekitar sangat penting untuk memastikan kualiti persekitaran untuk pembangunan lestari. Dengan memberikan pengetahuan kepada pelajar, diharapkan dapat meningkatkan kesedaran dan mengembangkan sikap positif terhadap persekitaran yang menghasilkan tingkah laku pelajar yang baik. Kajian ini dilakukan terhadap pelajar Sainskelestarian (SEL) untuk mengkaji pengetahuan, sikap, dan amalan mereka terhadap alam sekitar mengikut tahun pengajian. Selain itu, hubungan antara pengetahuan, sikap dan amalan pelajar SEL terhadap persekitaran juga dikaji. Tinjauan dilakukan dengan menggunakan pendekatan kuantitatif yang melibatkan 128 responden (n = 128). Data dari kajian ini dianalisis menggunakan Kruskal-Wallis dan Spearman's Rho Analysis menggunakan perisian SPSS versi 20.0. Berdasarkan hasil Kruskal-Wallis One-Way ANOVA, pengetahuan, sikap dan amalan signifikan secara statistik dengan nilai P di bawah daripada 0.05 untuk semua kes. Hasil kajian menunjukkan bahawa pelajar SEL termasuk alumni mempunyai tahap pengetahuan yang tinggi sementara tahap kepuasan dan amalan terhadap persekitaran yang memuaskan. Kajian ini juga mendapati bahawa terdapat hubungan antara pengetahuan, sikap dan amalan terhadap persekitaran. Walau bagaimanapun, hubungan ini berbeza antara tahun pengajian. Didapati bahawa Alumni dan Tahun Empat mempunyai pengetahuan, sikap dan amalan yang lebih tinggi terhadap alam sekitar. Oleh itu, subjek pendidikan alam sekitar adalah penting untuk membina keprihatinan terhadap alam sekitar di kalangan pelajar dan juga untuk mendorong sikap dan amalan mereka terhadap tingkah laku yang lebih mesra alam

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
UMK	Universiti Malaysia Kelantan
SEL	Sustainable Science

LIST OF SYMBOL

α	Alpha
>	Greater than
<	Less than
≥	Equal and more than
≤	Equal and less than
%	Percentage
N	Frequency
N	Population size
p	Significant value
S	Sample size
n	Number of pairs data
r	Correlation coefficient

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Education is seen as an investment because it 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 civilized society (Hotinli, 2012).

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. As agreed at the UNESCO Conference in the Declaration of Tbilisi 1977, environmental education encompassing all activities, including mass communications, community engagement, and other activities aimed at shaping the human population of environmental concern and related matters (Moseley,2017). Besides, environmental education aims to create a human population with the knowledge, skills, attitudes,

motivation, and commitment to work individually and collectively to solve current environmental problems and prevent new problems from emerging.

The emerging environmental education has contributed to environmental sustainability by disseminating skills-building information (Crohn and Birbaum, 2010). Through environmental education, people can understand the interactions between the human environment and the physical environment and how they can impact the human environment. Liu and Guo (2018) are among the authors who have paid more attention to environmental education or environmental issues in management education. They expected people to enrich their environmental and ecological value through ecological education, thus changing people's attitudes. Tibury (2015) stated that environmental education is in line with citizenship education whose purpose is to build social commitment and responsibility based on a holistic view of human relationships and their experiences.

The importance and role of education in the environment have been widely discussed and highlighted at national and international conferences such as United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, the United Nations Conference on Human Environment (UNCHE) in Stockholm, Sweden 1972, UNESCO and more (Reid, 2005). This conference's focus is to emphasize the need for environmental protection, conservation, and preservation from the deterioration of human development. Besides, environmental education around the curriculum was pioneered in 305 primary schools and implemented in all primary schools in 1983 (Aini et al., 2011). In 1986, environmental education across the science-based curriculum had been introduced throughout primary and secondary schools in Malaysia (Aini et al., 2011). The subjects related to the environment were introduced to students from years four to year six. The syllabus combines five subjects,

namely, Geography, Science, History, Moral Education, and Physical Education and Health. This lesson is designed to provide knowledge and environmental awareness to students to appreciate and aware of any environmental changes (Aini et al., 2011).

In addition, higher education in environmental education has established in many universities in Malaysia, offering programs related to the environment, including Sustainability Science (SEL) program at Universiti Malaysia Kelantan (UMK). The SEL program offered broad and practical exposure to preserving and protecting the environment for future generations' well-being. Among the subjects offered in this four-year program is Introduction to Environmental Science, Environmental Planning and Management, Environmental Education, Education for Sustainable Development, Global Environmental Sustainability, Sociology and Sustainable Development, and many others. Therefore, this study aims to analyse SEL students' knowledge, attitude, and practices towards the environment based on their study year.

1.2 Problem Statement

Environmental education is seen as a part of the solution to the environmental issues (Ballantyne, Connell and Fien, 2006). Through environmental education, one can upgrade their understanding and increase awareness towards conserving and preserving the environment. Moreover, Dienno & Hilton (2015) stated that environmental education is the foundation for creating an environmentally conscious society and a more ethical community.

Environmental education must come up with knowledge and techniques that address the demands of a constantly evolving social and technology landscape, while ensuring that environmental education stays relevant to the needs and interest of the

community. Environmental education provides the capability and skill overtime to analyse environmental issues, engage in problem solving and take action to sustain and improve the environment. Common issues in environmental education include knowledge and understanding of the environment and environmental challenges. Then, the attitude of concern for the environment and motivation to improve or maintain environmental quality. Others that that, participation or practice in activities that lead to the resolution of environmental challenges.

In Malaysia, the environmental education aspect has been integrated into all subjects at primary and secondary levels across the curriculum (Aini et al., 2011). In addition, UMK has created a program called Sustainable Science was establishing since 2012 by Faculty of Earth Science which focuses on environmental education. However, there is no study on the influence of this program towards environmental behaviour of the students. Therefore, this study was conducted to analyse of this program on student's knowledge, attitudes and practices towards the environment. The analysis from this study was valuable to improve this program in the future.

1.3 Objectives

The objectives of this study are as following:

i. to analyse the knowledge, attitude and practices towards environment among the Sustainable Science students based on the year of study.

ii. to examine the relationship between knowledge, attitude and practices of Sustainable Science student's behaviour towards environment based on year of study.

1.4 Scope of Study

The study is based on the influence of environmental education learning in developing students' behaviour towards conserving and preserving the environment. This study focuses on the Sustainable Science (SEL) program in the Faculty of Earth Science of Universiti Malaysia Kelantan (UMK). This survey involved 128 students from Year One to Year Four and the also SEL's alumni. The study involved questionnaires on the respondent's demographic and three sections related to conserving and preserving the environment which are general knowledge on the environment, attitudes towards the environment, and the environmental practices.

1.5 Significance of Study

Environmental education is an essential medium in raising awareness among people towards sustainable development. This research evaluated the influence of the Sustainable Science program on students' behaviour in the environment based on the year of study. The relationship between the year of study and student's knowledge, attitudes, and practices is identified from this research. Results of this research can provide useful input in improving the SEL program in the future. This ensures that the SEL program provides a comprehensive environmental education that produces future generations with environmental knowledge and shows the right attitude and practices towards the environment.

CHAPTER 2

LITERATURE REVIEW

2.1 Sustainable Development

In the late 1980s, the world saw a radical re-evaluation of human concerns over natural resource development and its relationship to environmental degradation, quality of life, poverty and economic change. This radical assessment has opened a new approach to issues related to natural resources and the environment called sustainable development (Reid, 2005). This approach aims to balance human demand and environmental sustainability as a result of the economic system's operation. According to the Brundtland Commission report (1987), sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their needs.

Sustainable development is a global development concept giving overriding priority to the satisfaction of human needs, in particular of the global poor while respecting environmental limits (WCED, 1987). According to the International Union for the Conservation of Nature (IUCN) (1991), sustainable development is defined as the capacity to maintain a certain process 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, the people who live in the area must make an effort to maintain the well-being of their physical environment, and strive to ensure that the physical environment is in good working condition and able to survive (Clayton & Bass, 2002). To achieve sustainable development, elements such as social, economic, and environmental must support each other to ensure the long-term sustainability of the country (Munasinghe, 2008). 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 (Newman, 2005; Overton & Scheyvens, 2009).

However, environmental policies and legislation alone will not succeed if people are lack of knowledge and awareness on the environment. Therefore, the government emphasizes environmental education as one of the ways to educate and raise awareness about the environment beginning in the early stages of schooling in the hope that environmental education can move the country towards sustainable development.

2.2 Environmental Education

Sustainable development has become an important part of Agenda 21 at the Rio de Janeiro in 1992 (Meniesty, 2004). As a result of the conference, Malaysia has taken steps to introduce environmental education to help individuals value values, commitments, knowledge base and improve their skills and build a positive attitude towards the environment (Nevin, 2008). The concept of sustainable development has

thus been associated with environmental education to promote development models based on the wise use of resources, with concerns for equity and durability. Within the framework of its international environmental education program, the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 1980) even proposes sustainable development as the ultimate goal of "Man's" relation with the environment. It is therefore suggested to "reorient" environmental education and to "reshape" the entire educational process to meet this end. Education is of prime importance for promoting sustainable development and helping people to develop competencies in order to solve environmental and development problems. (UNESCO, 1980).

Environmental education refers to the efforts made to educate society either formally or informally for the sake of well-being and survival and, at the same time protecting the environment (Aziz, 2013). According to the Declaration of Tiblition, the purpose of environmental education is to create environmental awareness among the people while building the knowledge, attitude, motivation, commitment, and the skills to solve current and future environmental problems (UNESCO, 1997). In other words, environmental education is an educational process about the environment, through the environment and for the environment. The goal of environmental education is to create sensitivity towards environmental issues, enhance knowledge and skills, and solve environmental problems (Zohir & Nordin, 2007). Through environmental education, people are more responsible and willing to participate and contribute to public policy, decision-making, or any activities related to conserving and preserving the environment (UNESCO, 1980). Tilbury (2015) suggests that environmental education is providing awareness of the interdependence of economic, social, political, and ecological systems in urban and rural areas. It provides

individuals with the opportunity to gain knowledge and build on the values, attitudes, commitments, and skills required to maintain and improve the environment. Besides, it also establishes new attitudes in individuals, groups and societies in addressing environmental concerns.

2.2.1 Importance of Environmental Education

Environmental education is crucial for raising awareness of young people, especially in the care and preservation of the environmental quality. It is an effective instrument for helping future generations take control of their lives and prosper in the future (Perikleous, 2004). Also, environmental education is intent on shaping the population with the knowledge, skills, attitudes, motivation and commitment to work individually and collectively in solving current and future environmental problems and prevent new issues from appearing (Ponniah, 2016). Perikleous (2004) asserts that education is a natural neighbourhood that has something to do with citizenship education. Its purpose is to build commitment and social responsibility based on a holistic view of human relations and nature.

Environmental education not only increase people's knowledge but also build high awareness and pro-environmental behaviour towards the environment (Azmi, 2003). Therefore, environmental education should be implemented in every subject. It should begin from the kindly level and continue through a higher education level to create environmental awareness.

2.3 Environmental Education for Behaviour Change

There is disagreement about whether environmental education should encourage pro-environmental action or whether it should focus solely on knowledge

and attitudes (Heimlich & Ardoin, 2008). Arguably, one of the goals of environmental education is to provide opportunities for students to act in more sustainable ways (Jurin & Fortner, 2012).

The first model to drive environmental behaviour is known as the 'information deficit' (Burgess, Harrison, & Filius, 2008). It is based on the assumption that if people understand more about the environment and their consequences of actions towards it, they will be rational and adopt a sympathetic practice with the environment. In other words, it is believed that there is a relatively direct and positive relationship between understanding environmental issues and readiness to reduce its problem.

Other models suggest that actions are influenced by the intention to act and the circumstances of the situation (Hines, Hungerford, & Tomera, 2016). Some studies show that knowledge and behaviour are related (Yencken, 2000). In many other cases, it seems that the relationship between knowledge and action is not strong (Posch, 2013). There has been a known 'gap' between cognition and action (Kollmus & Agyeman, 2012). This gap is because of behaviour is influenced by a large number of factors, rather than just knowledge, such as beliefs, social pressures, physical facilitators, and inhibitors. These factors can synergistically affect whether a particular action is taken or not pursued (Corraliza & Berenguer, 2000).

2.3.1 Studies on Environmental Education

Several local researchers have conducted some studies on environmental education in Malaysia. Among them is Baud (2014), who conducted a study to determine the level of knowledge, perception and attitude of secondary science students in Malaysia. The results show that students' knowledge is still low on fact-based items mainly related to radiation & pollutants, energy and population growth. A

research conducted by Holdsworth et al., (2016) on environmental education in Malaysia found that awareness of environmental issues in the community was still at a low level. He suggested that more focus should be on ways to address environmental issues and that environmental awareness campaigns should be conducted immediately to raise awareness.

In addition, public studies on environmental issues have also been conducted in Malaysia. Barnett (2012) studied the knowledge, attitudes, and practices of Malaysian society on environmental issues. The survey data of 100 respondents in Penang and Kuala Lumpur showed that the level of public knowledge on ecological matters varies. Meanwhile, the public's attitude towards environmental issues and environmental conservation practices remains low. Environmental conservation practices are also low. This indicates that Knowledge of the environment is a prerequisite for attitude formation (Kaiser, Wolfing, & Fuhrer, 2009).

Overall, to ensure a positive attitude towards the environment each individual must have some knowledge of environmental issues to take action to address this problem. Barraza & Walford (2002) also state that knowledge of the environment is related to development. Positive attitudes toward the environment and education are said to play a very important role in shaping this attitude. Aini., et al., (2007) in their study found that Environmental Education formally and informally increased public and students' awareness of the environment but was less effective in changing their actions and attitudes.

2.4 Student Behaviour

Behaviour is the physical manifestation of any attitude based on certain values. According to Lewis (2001), any act performed either directly or indirectly, consciously

or subconsciously. Whereas, according to Garry Martin and Joseph Pear (2003), student behaviour also includes activity, action, performance, response, action, and reaction in terms of technique, activity involving muscles, glands (glandular) and electrical activity by each organ. Basically, student behaviour is anything that an individual says or does. Carl Rogers (1999), emphasizes that an individual behaves according to self-perception and circumstances. If the individual has a positive self-concept, then he is able to interact and act more confidently.

Hyman (1997), states that behavioural approaches can be shaped through experience. Therefore, to shape student behaviour is by immersing students' feelings and thoughts through the element's advice and discussion. Haliza (2007) argues that the important thing to be emphasized is the behaviour of individuals towards the environment to ensure sustainable survival. Thus, environmental education has been introduced to increase human knowledge and awareness of the environment and its environment, (Haryati & Seow, 2013). Hungerford and Volk (1990) argue that education causes the desired behaviour can be optimally shaped so as to produce a society that is responsible for the environment (environmental citizenship) or responsible behaviour to the environment (ERB).

2.5 Knowledge on the Environment

The factor that became main agenda for the implementation of environmental education is knowledge. Environmental knowledge refers to an individual's understanding of the things and objects in the environment (Lee, 2011) and the scope of its coverage is very extensive. The information on environmental are abundant as there are a lots of books, journals, short articles and online reading materials that discuss on the definition, and the effect environmental pollution.

The previous study on knowledge among students in Annamalai University, India found that less than half students have good knowledge on environment (Srinivasan et al., 2019). The level of its coverage was very extensive and people's basic necessities of life could not sustain without the environment. For this reason, any knowledge that is relevant to people's life and the environment could be called the environmental knowledge (Mantzicopoulos & Patrick, 2011).

2.6 Attitudes in The Environment

Attitude is a factor that needs to be taken seriously in today's society. Youth environmental pollution in Malaysia as well as the continuing natural disaster tradition proves the behaviour and commitment of the community in preserving the environment is at a low level (Hazura, 2009). An attitude is a type of complex psychological process which includes the tendency of perception, emotion, and behaviour and is provided with enduring and consistent characteristics. Study in one of the universities in India stated that only 27.6 % from 563 students have good attitudes in (Srinivasan et al., 2019). The factors that influence attitude in environment are based on their knowledge and justified belief (Norazah, 2016).

2.7 Practice on the Environment

Practices on the environment related to the good environmental practices that define as action that seek to reduce the negative environmental impact. Dauvergne (2018) stated on his research paper that the practices on the environment has been gaining global influence since 2012. This can be seen from the use air-conditioning device only when necessary and turning off air-conditioning or heating system in unoccupied spaces. The countries that already has the best environmental practices

include, Norway which ban on deforestation. However, in Malaysia the environmental pollution still in doubt. Malaysian only focus on reducing the single-use plastics that mostly being used for food packaging and groceries plastic bags. Some of the consumer are ignorant on the ingredients of their products. The consumers are unaware on the facts that plastic is one of that can harm environment and human health.

2.8 Application of Analysis for Student Behaviour

2.8.1 Kruskal-Wallis Test

Kruskal-Wallis test is a non-parametric test and used in various research to determine the differences of means between more than two groups (Kim, 2017). The past study used Kruskal-Wallis test to observed the significant difference between five different courses with knowledge and practice (Srinivasan et al., 2019). Using this statistical analysis method, the researcher found that medicine students has better practices (2.68 standard deviation) on reducing the use of plastic and agriculture students has more knowledge on plastics (2.79 standard deviation).

2.8.2 Correlation Analysis

Correlation analysis are used in scientific research data as correlation coefficient calculate the strength of the relationship between two or more variables. Strong relationship is shown by correlation coefficient that more than 0.90 (Statistic Solution, 2013).

CHAPTER 3

MATERIALS AND METHOD

3.1 Sampling Size

The formula in determining the sample size from a number of populations requires a deep understanding. Thus, in this study, the given sample size from the table provided by Krejcie & Morgan (1970) was used as a reference. The total population size of current students from Year One to Year Four of the SEL program was 170. Thus, the population size chosen to be involved in this study was 30 students for each year of study, which makes 150. However, based on Table 3.1, the sample size for 150 populations was 108. However, the total of students in Year Three and Year Four are 20 and 18, respectively. Thus, the respondents' overall number was changed to 128 respondents due to SEL students' total population size.

Table 3.1: Table for determining sample size from a given population.

N	***S***	***N***	***S***	***N***	***S***	***N***	***S***	***N***	***S***	***N***	***S***
10	10	85	70	220	140	440	205	1200	291	4000	351
15	14	90	73	230	144	460	210	1300	297	45000	354
20	19	95	76	240	148	480	214	1400	302	5000	357
25	24	100	80	250	152	500	217	1500	306	6000	361
30	28	110	86	260	155	550	226	1600	310	7000	364

Table 3.1: (Continued)

35	32	120	92	270	159	600	234	1700	313	8000	367
40	36	130	97	280	162	650	242	1800	317	9000	368
45	40	140	103	290	165	700	248	1900	320	10000	370
50	44	150	108	300	169	750	254	2000	322	15000	375
55	48	160	113	320	175	800	260	2200	327	20000	377
60	52	170	118	340	181	850	265	2400	331	30000	379
65	56	180	123	360	186	900	269	2600	335	40000	380
70	59	190	127	380	191	950	274	2800	338	50000	381
75	63	200	132	400	196	1000	278	3000	341	75000	382
80	66	210	136	420	201	1100	285	3500	346	1000000	384

Note: *N* is for population size, *S* is sample size

(Source: Krejcie & Morgan, 1970).

3.2 Sampling Method

This study used a survey method by using a questionnaire to obtain students' knowledge of the environment, attitudes toward the environment, and environmental practices towards the environment among SEL program students. The target respondents were the current SEL students and alumni. The stratified sampling was used where the population was divided into several groups (Neyman, 1934). The respondents were divided into five strata: Year One, Year Two, Year Three, Year Four, and Alumni.

3.3 Questionnaire Design

The survey was conducted from July to August 2020. A questionnaire was used in collecting the data. The questionnaire consists of 4 sections (section A to section D) that the respondent needs to answer. Section A is the respondent's demographic profile, which includes gender, age, and year of study. The next three sections are related to students' knowledge, attitudes, and practices towards the environment. For each section, there were ten questions based on the Likert scale from 1 to 5. The data

were collected by disseminating the questionnaire via google form and were completed within two weeks.

3.4 Content Validation

The purpose of the questionnaire validation is to determine whether the questionnaire measures the objective and addresses the overall topic (Verial, 2019). In this study, the questionnaire was validated by an expert in this field which is my final year report supervisor and also the coordinator of final year project. Later, the validated questionnaire was used for the pilot study.

3.5 Pilot Test

The purposes of conducting a pilot study are to determine whether the respondents can understand the questions and whether the question complies with the objective. Every research has flawed and reassessing the instruments and participants is required (Hassan et.al, 2006). A pilot study is crucial as it helps in identifying the problem and imperfection. A pilot test was carried out in October 2020 before distributing the actual questionnaire. The sample size for the pilot study was 10 % of the sample size (Connelly, 2008). In this study, 13 questionnaires were distributed for the pilot test. The reliability or internal consistency of the questionnaire were tested by Cronbach' Alpha. Cronbach 'Alpha shows the internal consistency by a number between 0 to 1 (Tavakol & Dennick, 2011). The acceptable internal consistency for Cronbach's Alpha is between 0.7 and 0.8 (Rosnah & Mohd Nazri, 1986). Questions that below acceptable internal consistency were removed. The finalized questionnaire was then used for data collection.

Table 3.2: The result of Pilot Test

Section	Cronbach's Alpha (α)	Internal Consistency
Students' Knowledge on The Environment	.801	Good
Students' Attitude in The Environment	.716	Acceptable
Students' Practice on The Environment	.748	Acceptable

3.6 Normality Test

The distribution of collected data from answered questionnaire were analysed with normality test. The data is normally distributed if the significant value of Shapiro-Wilk is greater than 0.05. The result for Shapiro-Wilk in this study was below than 0.05 means the data was not normal distributed so, in this study, non-parametric analysis was run Ghasemi & Zahediasi (2012).

Table 3.3: The result of Normality Test

Item	Year of Study	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Knowledge	Alumni	.517	30	.000	.404	30	.000
	Year One	.503	30	.000	.452	30	.000
	Year Two	.457	30	.000	.554	30	.000
	Year Three	.413	20	.000	.608	20	.000
	Year Four	.523	18	.000	.373	18	.000
Attitude	Alumni	.457	30	.000	.554	30	.000
	Year One	.423	30	.000	.597	30	.000
	Year Two	.457	30	.000	.554	30	.000
	Year Three	.361	20	.000	.637	20	.000
	Year Four	.421	18	.000	.601	18	.000
Practice	Alumni	.503	30	.000	.452	30	.000
	Year One	.423	30	.000	.597	30	.000
	Year Two	.473	30	.000	.526	30	.000
	Year Three	.538	20	.000	.236	20	.000
	Year Four	.449	18	.000	.566	18	.000

a. Lilliefors Significance Correction

3.7 Data Analysis

In this study, non-parametric analysis was run due to the data was not normal distributed, Ghasemi & Zahediasi (2012). The data from the questionnaire in this study were analysed using Kruskal-Wallis and Spearman's Rho Analysis using SPSS version 20.0 software.

3.7.1 Kruskal-Wallis

Kruskal-Wallis is a rank-based non-parametric test that used in various study to determine if there are statistically significant differences between two or more group of an independent variable on a continuous or ordinal dependent variable (Kim, 2014). Kruskal-Wallis One Way ANOVA is used for one categorical independent variable (Statistic Solution, 2013). In this study, one-way Kruskal-Wallis One Way ANOVA was used to compare the mean differences in knowledge, attitude and practice among the student of SEL program based on year of study.

3.7.2 Spearman's Rho Analysis

The relationship between knowledge, attitude and practice toward environment was observed using Spearman's Rho test (Aminrad et al., 2013). In this study, this test was about the strength of the relationship and identifying a significant correlation between the variable components towards the environment. The considerable level used in this study was the confidence level of $P \leq 0.05$ (Aminrad et al., 2013). The relationship between knowledge, attitude and practice toward environment was determined successfully from the results.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Demographic Information

Parameters used for demographic data are gender, ethnicity, age, and year of study. A random stratified sampling method was used. The population was divided into groups based on the year of study and alumni group. According to Johanson and Brooks (2010), the minimum number of respondents of 30 people is enough to be analysed in the study. Thus, each group has 30 respondents except for Year Three and Year Four with less than 30 correspondents. This is because the total population for Year Three and Year Four were 20 and 18, respectively. According to Hair et al. (2010) and Pallant (2007), the minimum sample for a group analysis is 20 people, whilst Chua (2009) stated that 15 people for a group is enough. Although the number of respondents for a group is not the same, analysis can still be conducted because what is more critical in statistical tests is that the findings are normally distributed (Fraenkel and Wallen, 2007).

Table 4.1 showed the distribution of respondents based on the year of study. Based on the table, out of 128 respondents, 78.9 % are female and 21.1 % are male. The majority of females were from alumni with 25 respondents, while most males were from Year Two with 9 participants. Based on the age factor, most of the

respondents (46.8 %) aged between 21 to 22 years old, 25.0 % are 19 to 20 years old, and 14.1 % are 24 to 25 years old and above 25 years old. Overall, most of the respondents are Malay (89.1 %) followed by Indian (5.5 %), Chinese (3.1 %) and other ethnics (2.3 %). The result in Table 4.1, showed that the questionnaire was thoroughly distributed to all year of study including alumni.

Table 4.1: Distribution of respondents

Factors		Frequency (N)	Percentage (%)	Year 1	Year 2	Year 3	Year 4	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	13	18	24
	Chinese	4	3.1	-	-	-	-	4
	Indian	7	5.5	-	1	2	-	4
	Others	3	2.3	1	2	-	-	-

4.2 Knowledge on The Environment

Table 4.2 and 4.3 show the summary data and the data of knowledge on the environment respectively. Based on the mean value in Table 4.2, the results revealed that student's level knowledge is at a high level with a mean of 4.51. According to Moidunny (2009), mean value in range 1 to 2.5 is low, 2.6 to 3.9 is satisfactory or moderate while 4 to 5 is consider to high interpretation. Based to Table 4.3, ten items were used to test the student's knowledge. About 108 respondents (84.4 %) were strongly agreed with item no 5, which has the highest mean value of 4.81 compared to other items. Thus, this showed that most SEL students have high knowledge of that item. However, knowledge through item no 3 has recorded the lowest mean value

(4.16) with one respondent (8.0 %) answering strongly disagree, two respondents (1.6 %) answering disagree, and 25 respondents (19.5 %) answering not sure.

Table 4.2: Summary data of the knowledge on the environment

N	Mean	Std. Dev
128	4.51	0.448

Table 4.3: The data of knowledge on the environment.

Item No	Knowledge on The Environment	Strongly Disagree		Disagree		Not Sure		Agree		Strongly Agree		Mean	Std Dev.
		N	%	N	%	N	%	N	%	N	%		
1.	I know the Malaysian government has enacted laws under the Environmental Quality Act 1974 to protect the environment.	-	-	-	-	19	14.8	35	27.3	74	57.8	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.	-	-	2	1.6	3	2.3	76	28.1	39	14.4	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.	1	8.0	2	1.6	25	19.5	48	37.5	52	40.6	4.16	0.846

Table 4.3: (Continued)

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.	-	-	3	2.3	21	16.4	52	40.6	52	40.6	4.20	0.794
5.	I know the decline in air quality will have a devastating effect on the human race.	-	-	2	1.6	18	14.1	-	-	108	84.4	4.81	0.498
6.	I know motor vehicles emitted carbon dioxide which is a greenhouse gas that contribute to climate change.	1	8.0	1	8.0	3	2.3	29	22.7	94	73.4	4.67	0.641
7.	I know that the recycle orange bin is reserved for disposing of items made of aluminum and plastic.	-	-	3	2.3	7	5.5	34	26.6	84	65.6	4.55	0.708
8.	I know that global warming will rising sea levels that lead to coastal flooding on the Eastern Seaboard, especially in Florida, and in other areas such as the Gulf of Mexico.	-	-	2	1.6	20	15.6	32	25.0	74	57.8	4.39	0.806
9.	I know how to reduce environmental pollution.	-	-	1	8.0	2	1.6	43	33.6	82	64.1	4.61	0.564
10.	I know that the uncontrolled use of natural resources can cause deterioration and destruction of the environment.	-	-	-	-	5	3.9	29	22.7	94	73.7	4.70	0.541

The variations in the overall knowledge based on the year of study were examined using a Kruskal-Wallis One-Way ANOVA, as shown in Table 4.4. Based on the result, the highest mean rank (93.30) is from the Alumni group, and the lowest mean rank (40.85) is from Year One. Based on the result in Table 4.4, the significant

value is below than 0.05. Thus, it can be concluded that the Kruskal-Wallis One-Way ANOVA was statistically significant to knowledge on the environment between different year of study with, $H = 6.411, df = 4, N = 128, p = 0.000, Cohen'sf = 0.229$. Overall, the Alumni group has better knowledge of the environment compared to other year of study. This result is supported by Kaplowitz and Levine (2005), 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. In conclusion, higher levels of education affect the knowledge of environmental issues.

Table 4.4: 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	6.411	0.000
Year Two	30	44.32		
Year Three	20	67.18		
Year Four	18	83.25		
Alumni	30	93.30		

4.3 Attitude on The Environment

Table 4.5 is a summary data of the attitude on the environment. According to Moidunny (2009), mean value in range 1 to 2.5 is low, 2.6 to 3.9 is satisfactory or moderate while 4 to 5 is consider high interpretation. The mean value of 3.25 shows the satisfactory level of attitude on the environment. This is because five items from the questionnaire are negatively constructed and need respondents to answer strongly disagree or disagree. These items are "*I think the issue of river water pollution in*

Selangor is deliberately exaggerated" (Item 2), "*Threats to the environment are not my responsibility*" (Item 3), "*Only the government and the experts should solve the environmental problems*" (Item 6), "*Environmental problems can be solved without big changes to our way of life"* (Item 7)" and "*I think the recycling program doesn't give any impact on the environment*" (Item 10). Thus, if these items are excluded, the mean value increased to 4.14 (Table 4.6), which shows a positive attitude towards the environment.

Data from Table 4.7 revealed that most students answered strongly disagree and disagree for these items except for item no 7 where most students answered agree (39 %) and 27 % not sure. Besides, data from the table shows the highest mean (4.83) for Item 1 with 108 respondents (84.4 %) answered strongly agree, 19 respondents (14.8 %) agree and only 1 respondent (8.0 %) disagree. This result revealed that the majority of students have a good attitude. This result is also in accordance with Item 3 which is negatively constructed. It means that 78 respondents (60.9 %) strongly agree that threats to the environment are their responsibility.

Table 4.5: Summary data of the attitude on the environment.

N	Mean	Std. Dev
128	3.25	0.413

Table 4.6: Summary data of the attitude on the environment (exclude the negative questionnaire).

N	Mean	Std. Dev
128	4.14	0.473

Table 4.7: The data of attitude on the environment

Item No.	Attitude in environment	Strongly Disagree		Disagree		Not Sure		Agree		Strongly Agree		Mean	Std Dev.
		N	%	N	%	N	%	N	%	N	%		
1.	I realize that caring for the environment is my responsibility	-	-	1	8.0	-	-	19	14.8	108	84.4	4.83	0.437
2.	I think the issue of river water pollution in Selangor is deliberately exaggerated.	55	43.0	-	-	12	9.4	14	30.5	8	6.3	1.129	1.129
3.	Threats to the environment are not my responsibility.	78	60.9	35	27.3	6	4.7	3	2.3	6	4.7	1.63	1.019
4.	I'm willing to contribute a little of my income to the environment.	1	8	3	2.3	15	11.7	72	58.4	37	28.9	4.10	0.751
5.	I'm willing to pay more to buy eco-friendly products.	-	-	2	1.6	15	11.7	64	50.0	47	36.7	4.22	0.709
6.	Only the government and the experts should solve the environmental problems.	58	45.3	54	42.2	5	3.9	6	4.7	5	3.9	1.80	0.999
7.	Environmental problems can be solved without big changes to our way of life.	9	7.0	15	11.7	35	27.3	50	39.1	19	14.8	3.43	1.099
8.	Before I buy any product, I will first think about its impact on the environment.	-	-	5	3.9	21	16.4	71	55.5	31	24.2	4.00	0.753
9.	I am aware of current issues related to the environment in Malaysia and abroad.	-	-	1	8.0	11	8.6	70	54.7	46	35.9	4.26	0.643
10.	I think the recycling program doesn't give any impact on the environment.	48	37.5	52	40.6	16	12.5	7	5.5	5	3.9	1.98	1.038

The variations in the overall attitude based on the year of study were examined using a Kruskal-Wallis One-Way ANOVA, as shown in Table 4.8. 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 4.8, the significant value is below than 0.05. Thus, it can be concluded that the Kruskal-Wallis One-Way ANOVA was statistically significant for attitude on the environment between different year of study with, $H = 4.861, df = 4, N = 128, p = 0.032, Cohen'sf = 0.199$. The results show that the Alumni group has more good attitudes 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 attitudes toward the environment. This finding is in line with the study by Jekayinga and Yusuf (2004) where people have a positive attitude towards the environment when they have more awareness on the environment. Besides, result from this study is similar to the study conducted by Bord and O'Connor (1977), who showed that senior has more good attitudes than junior to a specific environmental risk study.

Table 4.8: 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	4.861	0.032
Year Two	30	68.45		
Year Three	20	53.10		
Year Four	18	58.78		
Alumni	30	74.10		

4.4 Practice on The Environment

Table 4.9 revealed the summary of the data of the practice on the environment. The mean value (3.88) shows that the student's practice in the environment is satisfactory based to Moidunny (2009) that consider 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 consider high interpretation.

Based on Table 4.10, the highest mean (4.73) belongs to Item 2 (*I always turn off electrical appliances when not in use*) with 95 respondents (75.8 %) answered strongly agree and 29 respondents agree. Only one respondent is not sure and also disagree with the item. Meanwhile, the lowest mean is for item no 8, 3 and 7 with mean of 2.63, 3.20 and 3.46 respectively. This shows that recycling practices in Malaysia is still low and ineffective. As for item 3 and 7, the practices are low probably because they live in hostel which mean they normally didn't cook and has no chance to do composting.

Kruskal-Wallis One-Way ANOVA, was conducted to compare students' practices on the environment based on the year of study. Based on Table 4.11, the Alumni group shows more practices towards the environment with a mean rank of 75.40 followed by Year Four, Year Three, Year Two and Year One. There is obvious gap between Year One and Year Two. Year One revealed the lowest mean rank (51.32) of practices maybe due to low exposure toward the environment. This is supported by the study of Mohamad Zin (2003) who stated that lack of exposure to the environment can reduce interest and practice towards environmental care.

Based on the result, the Alumni group has better conceptualized of the environment than other years of study. This is due to their exposure to a working situation that related more to the environment. Thus, the Alumni have a better understanding of the environment and sustainability. The significant value is below

than 0.05. Thus, it can be concluded that the Kruskal-Wallis One-Way ANOVA was statistically significant to practice on the environment between different year of study with, $H = 6.881, df = 4, N = 128, p = 0.014, Cohen'sf = 0.239$.

Table 4.9: Summary of data on the practice on the environment.

N	Mean	Std. Dev
128	3.88	0.501

Table 4.10: The data of practice on the environment.

No.	Practice on The Environment	Strongly Disagree		Disagree		Not Sure		Agree		Strongly Agree		Mean	Std Dev.
		N	%	N	%	N	%	N	%	N	%		
1.	I bring my own reusable bag and do not take plastic bags when shopping	2	1.6	7	5.5	17	13.3	44	33.4	58	45.3	4.16	0.962
2.	I always turn off electrical appliances when not in use.	-	-	1	8.0	1	8.0	29	22.7	97	75.8	4.73	0.510
3.	I collect used oil and send it to the recycling center.	10	7.8	14	10.9	55	43.0	39	30.5	10	7.8	3.20	1.004
4.	I will notify the authorities if I see any incidents that will harm the environment.	2	1.6	3	2.3	26	20.3	58	45.3	39	30.5	4.01	0.865
5.	I will make sure my waste is sorted according to the type of waste.	-	-	3	2.3	21	16.4	67	52.3	37	28.9	4.08	0.738
6.	I usually turn off the water when brushing my teeth.	-	-	5	3.9	7	5.5	35	27.3	81	63.3	4.50	0.774
7.	I process the left-over of food to make fertilizer	7	5.5	10	7.8	46	35.9	47	36.7	18	14.1	3.46	1.011
8.	I rarely practice recycling while at home and on campus.	9	7.0	70	54.7	18	14.5	22	17.2	9	7.0	2.63	1.072

Table 4.10: (Continued)

9.	I do not throw used batteries into the bin.	6	4.7	6	4.7	24	18.8	52	40.6	40	31.3	3.89	1.052
10.	I prefer to buy used items that are still good.	2	1.6	7	5.5	22	17.2	38	29.7	59	46.1	4.13	0.991

Table 4.11: Kruskal –Wallis Test of practice on the environment based on year of study

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

4.5 Relationship Between Knowledge, Attitudes and Practices Toward Environment

The correlation between knowledge, attitude and practice toward environment was examined. The overall correlation between knowledge, attitude and practice toward environment was moderately and strongly correlated with each other. The correlation coefficient was between $r = 0.422$ to $r = 0.743$ (Table 4.12).

Based on the table, the correlation between knowledge 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 was strongly correlate with $r = 0.567$ and $r = 0.653$. This study shows that the Sustainable Science student including alumni have good knowledge of the environmental issue. As a result, they also show a good attitude toward the environment. The results of this study were acceptable and similar to the study conducted by the University of Twente, where they measured the knowledge, psychological distance, attitude, and practice towards the environment. From the

study, they identified that the variable attitude and knowledge were correlated significantly. Based on the findings, the researcher stated that the attitude was influenced by the knowledge of the environment (Floer & Gutteling, 2019).

Meanwhile, the correlation between attitude and practice show moderate correlation with correlation coefficient was between $r = 0.460$ and $r = 0.485$. Year One revealed, $r = 0.484$, N = 128, $p < 0.05$. As for Alumni group, the correlation coefficient was $r = 0.485$, N = 128, $p < 0.05$ that created the highest correlation for attitude and practice toward environment compared to other year of study. Year Two, Year Three and Year Four revealed r =0.469, r =473, r =0.460 respectively. Attitude are the individual's readiness to perform a given good practice (Floer & Gutteling, 2019). In this study, the results show a moderate relationship between both variables and it can be said that the Sustainable Science's student including alumni are lack attitude to engage with the environmental practice. A similar finding have been identified by the researcher of University of Twente, where the respondents in their study also show a moderate relationship between attitude and practice (Floer & Gutteling, 2019).

On the other hand, the correlation between attitude and knowledge shows strong correlation for Year Four and Alumni while moderate correlation for Year One, Year Two and Year Three. Correlation coefficient for Year Four was $r = 0.638$, N = 128, $p < 0.05$ while for Alumni was $r = 0.743$, N = 128, $p < 0.05$, that revealed the highest correlation between attitude and knowledge toward environment based on year of study. The value correlation coefficient for Year One, Year Two and Year Three were $r = 0.495$, N = 128, $p < 0.05$, $r = 0.459$, N = 128, $p < 0.05$ and $r = 0.485$, N = 128, $p < 0.05$ respectively. It showed that the variable of knowledge has a strong correlation with the attitude variable.

Overall, different year of study revealed the different correlation between knowledge, attitude and practice toward environment. Research findings showed there was a significant relation between knowledge, attitudes and practices toward environment. Thus, it can be concluded that the environmental behaviour of students was influenced by knowledge, attitudes and practices. This proofed that the infusion of the knowledge, attitudes and practices elements were important in changing the student's behaviour. However, Cottrell and Graefe (1997) stated that the prediction of behaviour in terms of environmental practices was a complex task and influenced by many other factors. One of the factors is emotions because emotions is an importance factor influencing environmental behaviour as it derives tangible behaviour. For instance, Kals and Ittner (2003) found that positive emotions like live for nature and negative emotions like anger are related to people's willingness to commit to the environmental behaviours like installing water saving devices in their homes.

Table 4.12: Relationship between knowledge, attitudes and practices towards Environment based on year of study.

Factor		Knowledge	Attitude	Practice
Knowledge	Year One	1	0.495*	0.422*
	Year Two	1	0.459*	0.485*
	Year Three	1	0.485*	0.581**
	Year Four	1	0.567**	0.638**
	Alumni	1	0.653**	0.743**
Attitude	Year One	0.495*	1	0.484*
	Year Two	0.459*	1	0.469*
	Year Three	0.485*	1	0.473*
	Year Four	0.567**	1	0.460*
	Alumni	0.653**	1	0.485*
Practice	Year One	0.422**	0.484*	1
	Year Two	0.485*	0.469*	1
	Year Three	0.581**	0.473*	1
	Year Four	0.638**	0.460*	1
	Alumni	0.743**	0.485*	1

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).

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study investigates the environmental behaviour of Sustainable Science (SEL) students based on the year of study. The environmental behaviour was access based on their knowledge, attitude and practices. 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 practices on the environment. However, there was a gap between Sustainable Science student behaviour on the environment based on year of study. Overall, alumni group have a good behaviour on the environment based on knowledge, attitudes and practices.

The study also found that there was a correlation between knowledge, attitude and practice towards environment. However, this correlation was different between year of study. Alumni group revealed the highest correlation for knowledge, attitude and practice toward environment compared to other year of study.

Thus, it can be concluded that Sustainable Science Program is a good course that can influences students to have a good behaviour towards the environment. In

order to increase student's behaviour towards the environment is by improving the students' knowledge, attitudes and practices as early as in Year One of study.

5.2 Recommendations

Based on the findings in this study, a few recommendations are suggested to improve the Sustainable Science student behaviour. First, the knowledge of the environment should be exposed to the student as early as in first year of study in this course. This is because the result showed that Year One students have lack of understanding in the environment. The field activity that can be included in the course program such as an awareness campaign will help students to practice the theory they learned in the classroom. Secondly, the attitude of the student can be improved by increasing their concern and awareness of the environment through case study of environmental destruction and pollutions.

Other than that, this survey should involve all the student in UMK to determine their behaviour toward environment. Environmental subject such as environmental education subject should be included in all courses in the UMK. This is one of the way to initiate a good environmental behaviour to all the student regardless of their study background.

Besides, stakeholders such as government agencies, non-governmental organizations and the mass media also play an important role in improving student practice towards the environment. Students must also change their way of life by prioritizing the environment and actively participate in natural society. Through this association, they can actively participate more in solving environmental problems collectively. This further, will indirectly overcome problems in solving environmental problems individually.

REFERENCES

Aini M. S., Nurizan.Y., & Fakhru (2011). Environmental comprehension and participation of Malaysian secondary school students. Environmental Education Research, 13(1), 17–31.

Aminrad, Z., Sayed Zakariya, S. Z. B., Samad Hadi, A., & Sakari, M. (2013). Relationship between awareness, knowledge and attitudes towards environmental education among secondary school students in Malaysia. *World Applied Sciences Journal*, *22*(9), 1326–1333. https://doi.org/10.5829/idosi.wasj.2013.22.09.275

Aziz. S., 2013. Conceptual environmental understanding among form 4 geography students. Faculty of Education, University of Malaya.

Azmi 2013. Knowledge level of the teachers regarding the surrounding environmental issues at one of the School in Perak State (Master of Education Project Paper). Faculty of Education, University of Malaya.

Ballantyne, R., Connell, S., & Fien, J. (2006). Students as catalysts of environmental change: a framework for researching intergenerational influence through environmental education. Environmental Education Research. 12(3–4), 413–427.

Barnett, R. (2012) Improving Higher Education. Buckingham: SRHE & Open University Press.

Barraza, L., & Walford, R. A. (2002). Environmental education: a comparison between English and Mexican school children. Environmental Education Research, 8(2), 171–186.

Baud, R. (2004) YES – Student Education in Sustainability – public education in a knowledge society: creativity, content, and delivery mechanisms. Delhi Sustainable Development Summit, New Delhi, India, February.

Bord & O' Connor. (1977). The Gender Gap in Environmental Attitudes: The Case of Perceived Vulnerability to Risk. Social Science Quarterly, 78(4), 830- 840. Retrieved from www.jstor.org/stable/42863734

Brundtland, G (ed.) (1987) Our Common Future: The World Commission on Environment and Development, Oxford: Oxford University Press.

Burgess, J., Harrison, C., & Filius, P. (2008). Environmental communication and the cultural politics of environmental citizenship. Environment and Planning A, 30, 1445–1460.

Carl Gogers (1999). “Value Orientations to Explain Beliefs Related to Environmental Significant Behaviour How to Measure Egoistic, Altruistic, and Biospheric Value Orientations.” Environment and Behaviour 40 (3): 330–354.

Clayton, B. D., & Bass S. (2002). Sustainable development strategy. Organisation for economic co-operation and development. London: Earthscan Holdsworth.

Connelly, L. M. (2008). Pilot studies. Medsurg Nursing, 17(6), 411-2.

Corraliza, J.A., & Berenguer, J. (2000). Environmental values, beliefs and actions, a situational approach. Environment and Behaviour, 32(6), 832–848.

Cottrell & Graeye (1997). Speech perception, metalinguistic awareness, reading, and vocabulary in Chinese–English bilingual children. Journal of Educational Psychology, 102(2), 367–380. doi.org/10.1037/a0017850

Crohn, K.; Birbaum, M. Environmental education evaluation: Time to reflect, time for change. Eval. Program Plan. 2010, 33, 155–158.

Davison, L., Littleford, C., Ryley, T. (2018): Air travel attitudes and behaviours: The development of environment-based segments. – Journal of Air Transport Management 36: 13-22.

Dienno, C. M., & Hilton, S. C. (2015). High school students' knowledge, attitudes, and levels of enjoyment of an environmental education unit on nonnative plants. Journal of Environmental Education, 37(1), 13–25 doi:10.5812/ijem.3505

Frankel & Wallen, 2007. “College Students’ Perceptions of Campus Sustainability.” International Journal of Sustainability in Higher Education 12 (1): 79–92

Garry Matin and Joseph Pear, 2006. “Exploring Consumer Adoption of a High-involvement Ecoinnovation Using Value-Belief-Norm Theory.” Journal of Consumer Behaviour 10 (1): 51–60

Ghasemi A., Zghediasl S. (2012). Normality Tests for Statistical Analysis: A Guide for Non-Statisticians. Int J Endocrinol Metab. 2012;10(2):486–489. doi:10.5812/ijem.3505

Ghasemi A., Zghediasl S. (2012). Normality Tests for Statistical Analysis : A Guide

Hassan, Z. A., Schattner, P., & Mazza, D. (2006). Doing A Pilot Study: Why Is It Essential. Malaysian family physician: the official journal of the Academy of Family Physicians of Malaysia, 1(2-3), 70–73.

Hayman, 2007. “Environmental Values.” Annual Review of Environment and Resources 30 (1): 335–372.

Heimlich, J., & Ardoin, N. (2008). Understanding behaviour to understand behaviour change: A literature review. Environmental Education Research, 14, 215–237.

Heimlich, Joe E., and Nicole M. Ardoin. 2008. "Understanding Behavior to Understand Behavior Change: A Literature Review." Environmental Education Research 14 (3): 215–237

Hines, J.M., Hungerford, H.R., & Tomera, A.N. (2016). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. Journal of Environmental Education, 18, 1–8.

Holdsworth, S., Bekessy, S., Hayles, C., Mnguni, P. and Thomas, I. (2016) Beyond leather patches: project for sustainability education at RMIT. In University Sustainability in the Australasian University Context (eds. W.L. Filho and D. Carpenter). Frankfurt: Peter Lang Scientific Publishers.

Hotinli, G. 2012. Environmental education in Turkey. Sustainable Mediterranean (newsletter) 34: 8- 10.

Hungerford & Volk, 1990. "Dissonance in Students' Perceptions of Sustainable Development and Sustainability: Implications for Curriculum Change." International Journal of Sustainability in Higher Education 8 (3): 317–338.

IUCN.IUCN/UNEP/WWF (1991). Caring for the Earth. A Strategy for Sustainable Living. Gland, Switzerland:IUCN.

Jakayinga & Yusuf. (2004). Understanding What We Mean By The Generic Attributes Of Graduates. Understanding Generic Graduate Attributes, (2), 29. https://doi.org/10.1007/s10734-004- 6384-7

Johanson, G. A., & Brooks, G. P. (2010). Initial Scale Development: Sample Size for Pilot Studies. Educational and Psychological Measurement, 70(3), 394–400.

Jurin, R.R., & Fortner, R.W. (2012). Symbolic beliefs as barriers to responsible environmental behavior. Environmental Education Research, 8(4), 373–394.

Kaiser, F. G., Wolfing, S., & Fuhrer, U. (2009). Environmental attitude and ecological behaviour. Journal of Environmental Psychology, 19(1), 1–19.

Kals, E., & Ittner, H. (2003). Children's environmental identity: Indicators and behavioral impacts. In S. Clayton & S. Opotow (Eds.), Identity and the natural environment (pp. 135–157). Cambridge, MA: MIT Press.

Kaplowitz, M. D. & Levine, R. 2005. How Environmental Knowledge Measure Up t A Big Ten University. Environmental Education Research 11(2): 143-160.

Kim, H. (2014). Analysis of Variance (ANOVA) Comparing Means of More Than Two Groups. Restorative Dentistry and Endodontics. ISSN 2234-7658

Kim, T. K. (2017). Understanding One-Way Anova Using Conceptual Figures. Korean Journal of Anesthesiology, 70(1), 22–26. https://doi.org/10.4097/kjae.2017.70.1.22

Kollmus, A., & Agyeman, J. (2012). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behaviour? Environmental Education Research, 8(3), 239–260.

Krejcie, R. V, & Morgan, D. W. (1970). Determining and Psychological Measurement.

Lee, K. (2011): The Green Purchase Behavior of Hong Kong Young Consumers: The Role of Peer Influence, Local Environmental Involvement, and Concrete Environmental Knowledge. – Journal of International Consumer Marketing 23: 21-44.

Lewis, 2001"Value Orientations and Environmental Beliefs in Five Countries Validity of an Instrument to Measure Egoistic, Altruistic and Biospheric Value Orientations." Journal of Cross-Cultural Psychology 38 (3): 318–332

Liu, S.; Guo, L. (2018). Based on Environmental Education to Study the Correlation between Environmental Knowledge and Environmental Value. Eurasia J. Math. Sci. Technol. Educ, 14, 3311–3319.

Mantzicopaulos and Patric. 2011 "Values, Beliefs and Norms That Foster Chilean and German Pupils' Commitment to Protect Biodiversity." International Journal of Environmental & Science Education 5 (1): 31–49.

Mantzicopoulos, P., Patrick, H. (2011): Reading picture books and learning science: engage young children with informational text. – Theory into Practice 50: 269-276.

Miniesty (2004) Learning for Sustainable Development: From the Margins to the Mainstream, The Netherlands.

Mohammad ZinNordin, Shanti Batraj, Nor Azilah Ngah & Irfan Naufal Umar (2003). Malaysian Society and evironment focusing on knowledge, attitude and practice Proceeding of Natural Conference on Society and Environment in Globalised World.

Moidunny, S. (2009). Likert Scale Likert Scale Examples How can you analyse data from a Likert Scale ? *Simply Psychology*, 1–3. Retrieved from https://www.simplypsychology.org/likert-scale.html

Moseley, M. (2017). Teaching for environment literacy. Clearing House 74(1): 23-24. Journal of Diagnostic Medical Sonography. 6. 35-39. 10.1177/875647939000600106.

Munasinghe, M. (2008). The sustainomics trans_diciplinary metaframework for making development more sustainable: Application to energy issues. International Journal of Sustainable Development, 4, 6–54.

Nevin, E (2008) 'Education and sustainable development', Policy & Practice: A Development Education Review, Vol. 6, Spring, pp. 49-62.

Newman, L. (2005). Uncertainty, innovation, and dynamic sustainable development. Sustainability: Science, Practice, & Policy, 1, 25–31.

Neyman, J. (2006). On the Two Different Aspects of the Representative Method: The Method of Stratified Sampling and the Method of Purposive Selection. Journal of the Royal Statistical Society, 97(4), 558. doi.org/10.2307/2342192

Overton, J., & Scheyvens, R. (Eds.), (2009). Strategies for sustainable development: Experience from the Pacific. London: Zed Books

Perikleous, E. 2004. The status of environmental education in Cyprus today. Dlm. MIO-ECSDE. The status of environmental education in the mediterranean countries within the formal & non-formal educational systems. Dec, Issue No. 34.

Ponniah AJ. 2016. Environmental pollution: Knowledge and attitude of Malaysian Secondary School Students. Kuala Lumpur: University Malaya.

Posch, P. (2013). Research issues in environmental education. Studies in Science Education, 21, 21–48.

Reid, D. (2005). Sustainable Development: An Introductory Guide. London: Earthscan.Sabine, G.H. (1952). “The Two Democratic Traditions.” Philosophical Review, 61: 451–474.Sachs, W. (1993). “Global Ecology and the Shadow of ‘Development’.” In Global Ecology. A New Arena of Political Conflict (W. Sachs, ed.). London: Zed Books.

Rosnah, M. ., & Mohd Nazri, L. . (1986). The Reliability of Foreign Language Anxiety Scale in Malay Version Based on Cronbach’s Alpha, 37–47. doi.org/10.30743/consists

Rosnah, M. ., & Mohd Nazri, L. . (1986). The Reliability of Foreign Language Anxiety Scale in Malay Version Based on Cronbach’s Alpha, 37–47. doi.org/10.30743/consists

Sabrina, B., Anders, G., Bastian H., Dierking J., Nielsen, T.G. (2018). No Increase in Marine Microplastic Concentration Over The Last Three Decades – A Case Study From The Baltic Sea, Science of The Total Environment, Volume 621, 2018, Pages 1272-1279, ISSN 0048-9697, doi.org/10.1016/j.scitotenv.2017.10.101.

Schober, P., Boer, C., & Schwarte, L. A. (2018). Scatterplots and Correlation Diana. In *The Basic Practice of Statistics* (6th ed., Vol. 126, pp. 1763-1768(6)). Wolters Kluwer. https://doi.org/https://doi.org/10.1213/ANE.0000000000002864

Srinivasan, N., Swarnapriya, V., Felix, A. J. W., & Pravin, T. (2019). Assessment of Knowledge and Practice on Plastics Among The Professional Course Students of Annamalai University, Tamil Nadu. International Journal Of Community Medicine And Public Health. doi.org/10.18203/2394-6040.ijcmph20190099

Statistics Solutions (2014). ANOVA. Retrieved March 3 2019 from http://www.statisticssolutions.com/academic-solutions/resources/directory-ofstatistical-analyses/anova/

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's Alpha. International Journal of Medical Education, 2, 53–55. doi.org/10.5116/ijme.4dfb.8dfd

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's Alpha. International Journal of Medical Education, 2, 53–55. doi.org/10.5116/ijme.4dfb.8dfd

Taylor, R. (1990). Interpretation of the Correlation Coefficient: A Basic Review. Pakistan Journal of Medical Sciences, 31(6), 1558–1559. doi.org/10.12669/pjms.316.8984

Tilbury, D. (2015). Environmental education for sustainability: defining the new focus on environmental education in the 1990's. Environmental Education Research 1 (2): 195-213

UNESCO. 1980. Environmental Education in The Light of Tiblisi Conference. Paris: UNESCO.

UNESCO. 1997. United Nation Decade of Education for Sustainable Development: International

Verial, D. (2019). Questionnaire Validation Method. The Classroom. Retrieved from https://www.theclassroom.com/questionnaire-validation-methods-8421878.html Accessed on December 21, 2019

WCED (The World Commission on Environment and Development) (1987). Our Common Future.Oxford: Oxford University

Yencken, D. (2000). Young people and the environment: The implications for environmentalism. In D. Yencken, J. Fien, & H. Sykes (Eds.), Environment, education and society in the Asia-Pacific: Local traditions and global discourses (pp. 212–250). London: Routledge.

Zohir Ahmad & Nordin Abdul Razak. 2007. Environmental education in schools: Teacher commitment. Sustainable Education. Volume 7, Num. 2/2007: 74-81.

APPENDIX A

Serial No.

QUESTIONNAIRE

BORANG SOAL SELIDIK

THE INFLUENCE OF SUSTAINABLE SCIENCE STUDENT BAHAVIOR ON THE ENVIRONMENT BASED ON YEAR OF STUDY

PENGARUH TINGKAH LAKU PELAJAR SAINS KELESTARIAN TERHADAP ALAM SEKITAR MENGIKUT TAHUN PENGAJIAN

This is a study to analyze the level of knowledge, attitudes, practices and the engagement towards the environment. The results of this survey will be used for academic use of the title "Influence of the Sustainable Science Program on Student Behavior Towards the Environment"

Ini adalah satu kajian untuk menganalisi tahap pengetahuan, sikap, amalan dan penglibatan terhadap alam sekitar. Hasil daripada kaji selidik ini akan digunakan untuk kegunaan akademik bagi tajuk "Pengaruh Program Sains Kelestarian Terhadap Tingkah Laku Pelajar Terhadap Alam Sekitar"

Thank you in advance. For any inquiry, directly contact Nur Shahirah Binti Ruslan at 0175576394 or shahirah.e17a0046@siswa.umk.edu.my.

Terima kasih terlebih dahulu. Untuk sebarang pertanyaan, terus hubungi NUR SHAHIRAH BINTI RUSLAN di talian 0175576394 atau shahirah.e17a0046@siswa.umk.edu.my.

SECTION A: DEMOGRAPHIC INFORMATION

BAHAGIAN A: MAKLUMAT DEMOGRAFI

Please put a tick √ in the box for your answer.

Sila masukkan tanda √ ke dalam kotak untuk jawapan anda.

Gender *Jantina*	:	Male *Lelaki*	☐	Female *Perempuan*	☐
Age Umur	:	19 - 20 years' old *19 - 20 tahun*	☐	23 - 24 years' old *23 - 24 tahun*	☐
		21 - 22 years' old *21 - 22 tahun*	☐	25 years' old and above *25 tahun dan ke atas*	☐
Year of study *Tahun pengajian*	:	Year 1 *Tahun 1*	☐	Year 3 *Tahun 3*	☐
		Year 2 *Tahun 2*	☐	Year 4 *Tahun 4*	☐
		Alumni	☐	Alumni	☐
		Year of graduation	———	*Tahun tamat pengajian*	———

Please put a tick √ in the box for your answer.

Sila masukkan tanda √ ke dalam kotak untuk jawapan anda.

Assessment description:

Deskripsi penilaian :

1 - Strongly Disagree
Sangat tidak bersetuju

2 – Disagree
Tidak bersetuju

3 – Not Sure
Tidak Pasti

4 – Agree
Bersetuju

5 – Strongly agree
Sangat bersetuju

SECTION B: KNOWLEDGE ON THE ENVIRONMENT

BAHAGIAN B: PENGETAHUAN MENGENAI ALAM SEKITAR

QUESTIONS	1	2	3	4	5
1. I know the Malaysian government has enacted laws under the Environmental Quality Act 1974 to protect the environment. *Saya tahu kerajaan Malaysia menjalankan undang-undang berdasarkan Akta Kualiti Alam Sekeliling 1974 untuk melindungi alam sekitar.*					
2. 2.I know the main function of the Department of Environment (DOE) is to prevent, eliminate, control pollution and improve the environment, consistent with the purposes of the Environmental Quality Act 1974. *Saya tahu fungsi utama Jabatan Alam Sekitar (JAS) adalah untuk mencegah, menghapus, mengawal pencemaran dan memperbaiki alam sekitar, selaras dengan tujuan Akta Kualiti Alam Sekeliling 1974.*					
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. *Saya tahu Local Agenda 21 adalah program kepada masyarakat, sektor swasta dan pihak berkuasa tempatandalam bekerjasama menguruskan kawasan sekitarnya ke arah pembangunan lestari.*					
4. I know that the Solid Waste Management and Public Cleansing Act 2007 is an act to regulate the management and controlled solid waste and public cleansing for the purpose of maintaining proper sanitation and for matters incidental. *Saya tahu bahawa Akta Perbadanan Pengurusan Sisa Pepejal dan Pembersihan Awam 2007 adalah akta yang digubal untuk mengatur pengurusan dan membersihkan sisa pepejal dan pembersihan awam untuk tujuan menjaga sanitasi yang betul dan untuk perkara-perkara yang berkaitan dengannya.*					

5.	I know the decline in air quality will have a devastating effect on the human. *Saya tahu kemerosotan kualiti udara akan memberikan kesan buruk kepada manusia.*					
6.	I know motor vehicles emitted carbon dioxide which is a greenhouse gas that contribute to climate change. *Saya tahu kenderaan bermotor mengeluarkan karbon dioksida yang merupakan gas rumah hijau yang menyumbang kepada perubahan iklim.*					
7.	I know that the orange recycle bin is for disposing items made of aluminum and plastic. *Saya tahu bahawa tong kitar semula yang berwarna oren adalah untuk membuang barangan yang diperbuat daripada aluminium dan plastik.*					
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. *Saya tahu bahawa pemanasan global akan meningkatnya aras laut yang menyebabkan banjir di pesisir timur, terutama di Florida, dan di kawasan lain seperti Teluk Mexico.*					
9.	I know how to reduce environmental pollution. *Saya tahu cara untuk mengurangkan pencemaran alam sekitar.*					
10.	I know that the uncontrolled use of natural resources can cause deterioration and destruction of the environment. *Saya tahu penggunaan sumber asli yang tidak terkawal boleh menyebabkan kemerosotan dan kemusnahan kepada alam sekitar.*					

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SECTION C: ATTITUDE ON THE ENVIRONMENT

BAHAGIAN C: SIKAP TERHADAP ALAM SEKITAR

QUESTIONS	1	2	3	4	5
1. I realize that caring for the environment is my responsibility. *Saya sedar bahawa menjaga alam sekitar adalah tanggungjawab saya.*					
2. I think the issue of river water pollution in Selangor is deliberately exaggerated. *Saya rasa isu pencemaran air sungai di Selangor sengaja diperbesar-besarkan.*					
3. Threats to the environment are not my responsibility. *Ancaman terhadap alam sekitar adalah bukan tanggungjawab saya.*					
4. I'm willing to contribute a little of my income to the environment. *Saya bersedia menyumbang sedikit pendapatan saya kepada alam sekitar.*					
5. I'm willing to pay more to buy eco-friendly products. *Saya bersedia membayar lebih untuk membeli produk mesra alam.*					
6. Only the government and the experts should solve the environmental problems. *Hanya kerajaan dan pakar sahaja yang harus menyelesaikan masalah alam sekitar.*					
7. Environmental problems can be solved without big changes to our way of life. *Masalah alam sekitar boleh diselesaikan tanpa memberikan perubahan besar terhadap cara hidup kita.*					
8. Before I buy any product, I will first think about its impact on the environment. *Sebelum membeli apa-apa produk, saya akan berfikir dahulu kesannya terhadap alam sekitar.*					

9. I am aware of current issues related to the environment in Malaysia and abroad. *Saya menyedari isu-isu semasa yang berkaitan dengan alam sekitar di Malaysia dan di luar negara.*					
10. I think the recycling program doesn't give any impact on the environment. *Saya fikir program kitar semula tidak memberi sebarang kesan ke atas alam sekitar.*					

SECTION D: PRACTICE ON THE ENIRONMENT
BAHAGIAN D: AMALAN TERHADAP ALAM SEKITAR

QUESTIONS	1	2	3	4	5
1. I bring my own reusable bag and do not accept plastic bags when shopping. *Saya membawa beg yang boleh digunakan semula dan tidak menerima beg plastik semasa membeli-belah.*					
2. I always turn off electrical appliances when not in use. *Saya sentiasa menutup suis perkakasan elektrik apabila tidak digunakan.*					
3. I collect used cooking oil and send it to the recycling center. *Saya mengumpul minyak masak terpakai dan menghantarnya ke pusat kitar semula.*					
4. I will notify the authorities if I see any incidents that will harm the environment. *Saya akan memberitahu pihak berkuasa sekiranya saya melihat sebarang kejadian yang boleh membahayakan alam sekitar.*					
5. I will make sure my waste is sorted according to the type of waste. *Saya akan memastikan semua sisa saya diasingkan mengikut jenis sisa.*					

6. I usually turn off the water when brushing my teeth. *Saya biasanya menutup air apabila memberus gigi.*					
7. I process the left-over of food to make fertilizer. *Saya memproses sisa makanan untuk dibuat baja.*					
8. I rarely practice recycling while at home and on campus. *Saya jarang mengamalkan kitar semula semasa di rumah dan di kampus.*					
9. I do not throw used batteries into the bin. *Saya tidak membuang bateri terpakai ke dalam tong sampah.*					
10. I prefer to buy used items that are still good. *Saya lebih gemar membeli barangan terpakai yang masih elok.*					

Thank You
Terima Kasih