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MEASURING KEY DETERMINANT FACTORS OF RESPONSIBLE ENVIRONMENTAL BEHAVIOR AMONG SECONDARY PUBLIC SCHOOLS IN PUTRAJAYA, MALAYSIA

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Abstract:

The environment is very important to sustain the prosperity of the nation, society, and human beings. Negligence to protect the environment will result in great catastrophes by causing natural disasters to plague mankind. Environmental education has been regarded as a strategic solution to overcome challenging environmental issues. there is no specific subject on environmental education in the Malaysian school syllabus which led to poor public awareness, lack of understanding, and exposure to environmental issues and knowledge. Hence, this study is conducted to measure the level of environmental literacy among secondary school students in Putrajaya, Malaysia. Descriptive research design and correlation were used in this study. Instruments for Environmental Attitude Inventory (EAI) comprises a scale of 1-5 ranging from strongly agree to strongly disagree and was distributed to 120 from four students who were selected using simple random sampling. The finding shows that the value of the Adjusted R square is 0.260, which indicates that the factor-independent variables (knowledge, beliefs, and attitudes) only contributed to 26% of the influencing dependent variable (responsible environmental behavior). This value is more appropriate for determining the actual value in a population with a small sample size. Coefficients multiple linear regressions show that the value of t=0.358 shows knowledge does not influence responsible behavior while the most dominant is attitude. It is hoped that the findings from this research will contribute to environmental education in Malaysia.

Keywords:

Environmental Education (EE), Environmental Literacy (EL), Responsible Environmental Behavior (REB), Knowledge, Attitudes, Beliefs

Introduction

Environment played a significant role in the development of human civilization and modernization. However, the increasing number of human populations led to the increasing pace of depletion of natural resources as the global world population is expected to increase by 2 billion persons in the next 30 years, from 7.7 billion nowadays to 9.7 billion in 2050, according to (United Nations Department of Economic and Social Affairs, UN DESA, 2019).

Additionally, urbanization, industrialization, and modern agricultural practices contribute to the destruction of the environment and pollute water resources, air, and soil globally. Apparently, if the environmental issues are not addressed urgently, they will threaten the survival of future generations of human beings. Currently, Children need to be educated that natural resources are limited and they need to value common prosperity, sustainability, and well-being.

Hence, they need to be responsible and empowered and focus on sustainability to ensure global prosperity (The Organization for Economic Cooperation and Development, OECD, 2018). The importance of EE has been recognized since the 1970s after Tbilisi Conference in 1977. Since then, Environmental Education (EE) has been defined and refined in order to achieve the goal of a sustainable environment. According to (De Alvis & De Silva 2020), EE has been regarded as a strategic solution to overcome challenging environmental issues. The studies of (Cottrell,2003; Frisk & Larson, 2011) stated that education has a great impact on the behavior of young people towards the environment.

Studies conducted by (Kiarie, 2016) indicated the major outcome of environmental education is to develop environmentally literate citizens or also known as Environmental Literacy (EL). According to (North American Association for Environmental Education (NAAEE), 2011), an environmentally literate person is someone who, both individually and together with others, makes informed decisions concerning the environment, and is willing to act on these decisions to improve the well-being of other individuals, societies, and the global environment, and participates in civic life. Those who are environmentally literate possess varying degrees of knowledge and understanding of a wide range of environmental concepts, problems, and issues, a set of cognitive and affective dispositions, a set of cognitive skills and abilities, and the appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts.

Malaysia asserted it's committed to implementing EE to teachers and students formally and informally. The 11th Malaysia Development Plan (2016-2020) identified sustainability as a main focus through one of the six strategic focus areas, emphasizing "pursuing green growth for sustainability and resilience. The Ministry of Education also provided resources for integrating EE into existing K-12 primary and secondary curricula as well as developing partnerships with international bodies such as UNESCO and WWF which produced eco-school programs. However, Malaysia's education system does not have a specific EE subject but is embedded in multiple disciplines. EE in Malaysia is implemented through Geography, Moral Education, Life Skills, and Science subjects (Ibrahim, Durairaj, & Marlizah, 2016). In order to gauge the effectiveness of current environmental education in Malaysia, we need to assess EL among Malaysian secondary school students as well as the need for data about the EL of youth.

The objectives of the study are; i) to determine the level of EL among public secondary school students in Putrajaya, ii) to determine the relationship between knowledge, beliefs, and attitudes towards REB, & iii) to determine the significant influence of knowledge, beliefs, attitudes towards REB. The scope of the study focuses on the level of EL and the relationship between knowledge, beliefs, and attitudes towards REB among members of the Nature Club in a secondary public school in Putrajaya. The reason for segmented sampling as a research population is that they are expected to have a better understanding of environmental education and awareness. The research decided to be conducted in Putrajaya as Putrajaya has been heralded as a biodiversity and sustainable city.

Literature Review

There are five points that will be discussed in the literature review which are knowledge, beliefs, attitudes, and REB. The discussion on the theoretical and conceptual framework will be in this section.

Knowledge, Beliefs, Attitudes

Individual disposition and knowledge about environmental issues are key factors for environmentally significant behaviors (Campbell-Arvai,2015; Owusu, 2017). An individual's knowledge of environmental problems, their reasons, and concerns are important determinants of REB (Mobley, 2010). The previous studies identify two types of forms of environmental knowledge, i) declarative environmental knowledge refers to factual knowledge (natural sciences or how environmental systems work), and ii) procedural knowledge refers to action-related knowledge (Kaiser & Fuhrer, 2003). Hazelkorn (2015) identified the individual able to actively participate and be REB if they acquire the necessary knowledge of and about science.

Previous studies (Shanmuganathan & Karpudewan, 2015) claimed that possessing adequate knowledge about the environment provides a platform to practice a sustainable environmental lifestyle. According to Sharifah Intan (2011), biology subjects in the Malaysia curriculum syllabus emphasized more aspects of environmental knowledge than other sciences subjects. A study by Pan, Chou, Morrison, Huang & Lin (2018) found that increasing students' environmental knowledge will enhance their behavioral intentions. However, according to Stern (2000), knowledge itself is not enough to change individuals' attitudes or behavior. Beliefs were considered at the core of all human behavior (Fishbein &Ajzen, 2011). Other research by (Barber, 2011; Fietkau & Kessel, 1981; Stern 1993) stated that attitude, knowledge, and belief were considered as a psychological domain that explicitly influences the formation of behavior. Goodwin (2012) claimed that our values shape the way we form beliefs, while our beliefs form our values as well and both beliefs and values have the potential to influence one another. In this research, we focus on the forming of beliefs through systematic means such as curriculum and knowledge. According to (Poškus, 2017; Fishbein &Ajzen et,.al 2011), beliefs formation is mostly a function of the interaction of environmental factors and innate traits, which means it can be developed through a school setting as well as develop naturally through observing one's surroundings and increasing sensitivity.

Breckler (1984) stated an attitude is a latent mental construct towards an abstract or concrete object and the formation of attitude mostly through learning, though may arise partly from genetic sources (Baron & Byrne,1994). Research by Evan (2007) found there is no significant relationship between environmental attitude and environmental behavior in children aged 6-8 years from the United States, Austria, Mexico, and Spain. However, other studies support the

predictive role of environmental attitude when explaining environmental behavior (Cheng & Monroe, 2012; Collado & Corraliza, 2015; Grønhøj & Thøgersen, 2017). In the study (Cheng, et., al, 2012), children's previous experience in nature had a direct and indirect positive effect on their environmental behavior through environmental attitude. A study by (Shamuganathan, et,.al., 2015) found that REB is influenced by the student's attitude and belief toward performing REB and knowledge about environmental issues.

Responsible Environmental Behavior(REB)

REB is the outcome of environmental literacy in this study. REB of students is determined by several variables and their functional interactions (Stern et.,al., 2000). The oldest REB model, the Early US Linear Model, is based on the linear relationship of environmental knowledge leading to environmental attitudes and environmental attitudes leading to responsible environmental behavior (Burgess, Harrison, &Filius, 1998). This model deems obsolete now since much research shows that increases in knowledge and attitudes did not lead to pro-environmental behavior. Ajzen and Fishbein introduced the Theory of Reason Action and the Theory of Planned Behavior, where attitudes do not directly determine behavior but influence behavioral intentions. Behavioral intentions are affected by attitudes, subjective norms, and behavioral control (Fishbein and Ajzen,1980). Under this model, the ultimate determinants of behavior are behavioral beliefs concerning its consequences and normative beliefs concerning the prescriptions of others (Fishbein,et.,al, 1980).

Hines, Hungerford, and Tomera (1987) developed the Model of Responsible Environmental Behavior which is based on Ajzen and Fishbein's theory of planned behavior. In their model, REB is affected by the intention to act and situational factors and personality; attitude, locus of control and personal responsibility, skills, and knowledge influence the intention to act (Hines et. al., 1987). Modeling responsible environmental behavior is really complicated and cannot be illustrated through a single model or diagram. According to (Kollmus & Agyeman, 2002), the question of what shapes pro-environmental behavior is complex that it cannot be visualized through one single framework or diagram. However, according to these theories and models, REB appears to be influenced by affective and knowledge factors. Therefore, this study explores how knowledge and affective (attitudes and beliefs) influence behavioral intentions and behavioral intentions influence REB. The theoretical framework of this research is developed by combining the theory of Reason Action (Fishbein et.,al,1980) and the Model of Responsible Environmental Behavior (Hines, et., al 1987) as shown in Figure 1. The development of a theoretical framework is to understand key determinant factors that influenced REB.
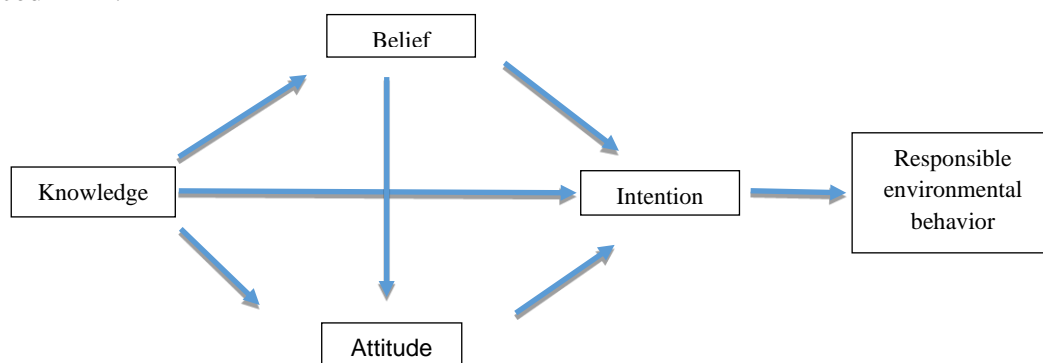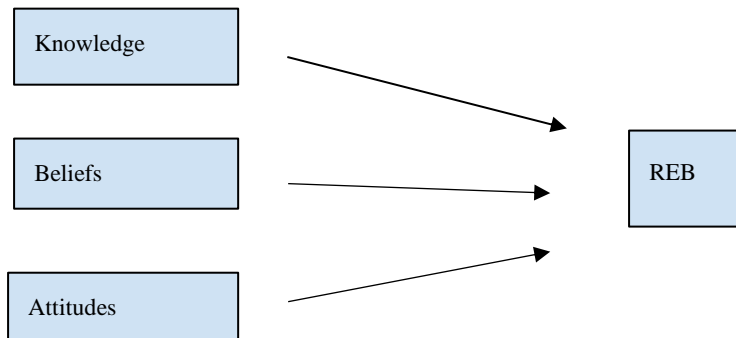

Figure 1 Theoretical Framework

Figure 2 Conceptual Framework

Conceptual framework for this study as shown in Figure 2 is to design research of the relationship between (3) independent variable (IV); knowledge, beliefs, and attitudes, and (1) dependent variable (DV); REB

The hypothesis of this study: -

H_{a1}: There is a significant relationship between knowledge toward REB
H_{a2}: There is a significant relationship between beliefs toward REB
H_{a3}: There is a significant relationship between attitudes toward REB
H_{a4}: There is a significant influence of knowledge toward REB
H_{a5}: There is a significant influence of beliefs toward REB
H_{a6}: There is a significant influence of attitudes toward REB

Research Methodology
The study is quantitative research and applied correlation design to determine the strength of the relationship between independent variables and dependent variables and was able to describe the level of environmental literacy in public schools in Putrajaya, Malaysia. The study approach uses a survey method with the use of a questionnaire based on adopt and adapt from an Environmental Attitude Inventory Questionnaire (EAI). The data collection has been conducted for one month.

Location
The research was executed at four public secondary schools that were chosen randomly in Putrajaya, Malaysia.

Research Sample
The respondent in this research consisted of 120 upper secondary school nature clubs from four schools in Putrajaya. The samples were chosen using simple random sampling. According to Sapnas (2004), 100 participants are sufficient for the study to be adequate.

Instruments and Data Analysis
Data collection was conducted using the instruments Environmental Attitude Inventory (EAI) developed by Milfont & Duckitt, (2010). The EAI was used to determine to the level of environmental knowledge, beliefs, attitudes, and REB. The data was analyzed using version 26.0 of SPSS (Statistical Package for Social Sciences) software to conduct statistical data

analysis and generated correlation tests and descriptive statistics. Descriptive statistics included response frequencies; means and standard deviation were calculated to summarize all responses from the students and background demographic data. In order to determine the level of environmental literacy among public secondary school students in Putrajaya, Malaysia, we will use descriptive analysis. To determine the strength of the relationship between environmental knowledge, beliefs, and attitudes toward REB, we will use Pearson correlation analysis and to investigate the influence of knowledge, beliefs, and attitudes toward responsible behavior, we will use multiple regression analysis.

Result and Discussion

Objective 1: To Determine The Level Of Environmental Literacy Among Secondary School Students In Putrajaya, Malaysia

In order to determine the level of environmental literacy among secondary school students in Putrajaya, Malaysia, this study applied descriptive analysis. Descriptive analysis report findings in the form of frequency distribution, mean, percentage, and standard deviation. In order to determine the level of environmental literacy, this study used mean score and standard deviation refers to the level of environmental knowledge, beliefs, attitudes, and responsible behavior. Table 1 refers to mean interpretation.

Mean score	Level of Mean score
1.00 to 1.66	Low
1.67 to 3.33	Moderate
3.34 to 5.00	High

Table 1: Mean Interpretation. (Cohen,1955)

According to Cohen (1955), a mean score between 1.00 to 1.66 is considered a low level, mean score between 1.67 to 3.33 is considered a moderate level, and 3.34 to 5.00 is considered a high level. This study analyzed every item of each construct to determine the level of environmental literacy. In conclusion, in this study, environmental literacy was assessed through environmental knowledge, beliefs, attitude, and responsible behavior. The overall mean value for environmental knowledge is high (M=4.06), environmental beliefs are moderate (M=2.78), environmental attitudes is high (M=4.15), and responsible environmental behavior is high (M=3.96). The finding of this study shows the level of environmental knowledge, attitudes and, responsible behavior is high while the level of environmental beliefs is moderate among secondary school students in Putrajaya.

Thus, the research can be concluded that the level of environmental literacy among secondary school students in Putrajaya, Malaysia is high. This result is in line with previous research by (Rohana, Rosta, Azizi &Ismi 2013) found that exposure to environmental education affects the level of knowledge and awareness of students toward the environment.

No.	Item (EK)	Likert Scale 1 F	1 %	2 F	2 %	3 F	3 %	4 f	4 %	5 F	5 %	SD	M	I
1.	Increasing demand for meat of a growing population reinforce greenhouse effect. Cows is animal that responsible for methane production.			4	3.3	14	11.7	32	26.7	70	58.3	0.735	3.78	High
2.	The release of carbon dioxide into the air led to greenhouse effect.			6	5.0	14	11.7	51	42.5	49	40.8	0.8331	4.19	High
3.	The haze is regarded as air pollution caused by open fire.							38	31.7	52	68.3	0.467	4.68	High
4.	Coal is categorized under non-renewable energy.			4	3.3	14	11.7	32	26.7	70	58.3	0.824	4.40	High
5.	Almost 70 % of fresh water consumption is used for agricultural purposes.			9	7.5	50	41.7	45	37.5	16	13.3	0.817	3.56	High
6.	The ozone layer at earth atmosphere protect us from harmful radiation that causing cancer.					24	20.0	50	41.7	46	38.3	0.744	4.18	High

EK: Environmental Knowledge/ SD: Standard Deviation/M: Mean/I: Interpretation

Table 2: Construct of Environmental Knowledge

No.	Item (EB)	Likert Scale 1 F	1 %	2 F	2 %	3 F	3 %	4 F	4 %	5 F	5 %	SD	M	I
1.	Nature has the ability to recover itself.	11	9.2	24	20.0	30	25.0	42	35.0	13	10.8	1.15	3.18	Moderate
2.	Humans have the right to change nature as they see fit for human need.	12	10.0	38	31.7	35	29.2	29	24.2	6	5.0	1.07	2.83	Moderate
3.	Our earth has unlimited resources.	21	17.5	33	27.5	33	27.5	28	23.3	5	4.2	1.14	2.69	Moderate
4.	Designated forest reserve area unable to protect endangered species	12	10.0	40	33.3	35	29.2	24	20.0	9	7.5	1.10	2.82	Moderate
5.	Deforestation for plantation purpose is important to ensure there is enough food supply	8	6.7	14	11.7	28	23.3	52	43.3	18	15.0	1.09	3.48	High
6.	Society do not care about the threat of global warming	4	3.3	2	1.7	5	4.2	54	44.4	55	45.5	0.901	4.29	High

EB: Environmental Beliefs/ SD: Standard Deviation/M: Mean/I: Interpretation

Table 3: Construct of Environmental Beliefs

No.	Item (EA)	Likert Scale 1		2		3		4		5		SD	M	I
		F	%	F	%	f	%	F	%	f	%			
1.	I consciously enjoy smell scent of nature such as flowers,treese, or grass.			4	3.3	7	5.8	55	45.8	54	45.0	0.735	4.33	High
2.	Listening to the sound of nature makes me calm			3	2.5	7	5.8	39	32.5	71	59.2	0.721	4.48	High
3.	I enjoy spending time in the forest			4	3.3	15	12.5	58	48.3	43	35.8	0.770	4.17	High
4.	The silence in the forest makes me anxious	22	18.3	32	26.7	21	17.5	28	23.3	17	14.2	1.342	2.88	Moderate
5.	Dirty smoke from industrial chimney make me angry			2	1.7	11	9.2	44	36.7	63	52.5	0.726	4.40	High
6.	I hate people throwing away rubbish on the highway					4	3.3	24	20.0	92	76.7	0.514	4.73	high

EA: Environmental Attitudes/ SD: Standard Deviation/M: Mean/I: Interpretation

Table 4: Construct of Environmental Attitudes

No.	Item (REB)	Likert Scale 1		2		3		4		5		SD	M	I
		f	%	F	%	F	%	f	%	f	%			
1.	I re-use recycle paper at home.	6	5.0	11	9.2	24	20.0	50	41.7	29	24.2	1.09	3.71	High
2.	I switch off all unused electronic and electrical devices before I left the room.	3	2.5	7	5.8	8	6.7	44	36.7	58	48.3	0.982	4.23	High
3.	I prefer to walk or ride a bicycle to meet a friend nearby my home.	3	2.5	6	5.0	23	19.2	37	30.8	51	42.5	1.02	4.06	High
4.	I actively participate in an environmental awareness campaign	6	5.0	15	12.5	23	26.7	42	35.0	25	20.8	1.10	3.54	High
5.	I sort out recyclable trash based on the color of recycle box	5	4.2	9	7.5	21	17.5	44	36.7	41	34.2	1.09	3.89	High
6.	I plant a tree around my home yard.	2	1.7	5	4.2	10	8.3	46	38.3	57	47.5	0.903	4.26	High

REB: Responsible Environmental Behavior/ SD: Standard Deviation/M: Mean/I: Interpretation

Table 5: Construct of Responsible Environmental Behavior

Objective 2: To Determine The Relationship Between Knowledge, Beliefs, And Attitudes Toward Responsible Environmental Behavior.
To answer objective 2, this study applied correlation coefficient analysis to determine the relationship between knowledge, beliefs, and attitudes toward responsible environmental behavior. Table 5 shows the value of the relationship between variables known as the correlation coefficient (r). The interpretation of the value of r is based on Guildford (1973) as discussed in Chapter 3.

Table 6: Pearson Correlation Analysis

Variables (IV-DV)	P	R	Direction	Strength of relationship
Environmental knowledge – Responsible Environmental Behavior	0.133	0.138	-	nil
Environmental Beliefs – Responsible Environmental Behavior	0.001	-0.332**	Negative	weak
Environmental Attitudes- Responsible Environmental Behavior	0.001	0.413**	Positive	moderate

Based on Table 6, the finding shows there is no significant relationship between environmental knowledge with responsible environmental behavior (r = 0.138, p = 0.133). This finding is supported by previous studies that knowledge itself is unable to change individuals' attitudes or behavior (Stern,2000) and rejected the previous studies that found increasing students' environmental knowledge will enhance behavioral intentions (Pan, Chou, Morrison, Huang & Lin, 2018). The next finding shows there is a negative significant relationship between environmental beliefs with responsible environmental behavior (r = -0.332**, p=0.001). The strength of these two variables however is weak. Lastly, this study shows there is a positive significant relationship between environmental attitudes with responsible environmental behavior (r = 0.413**, p =0.001). The strength of these two variables is moderate.

Objective 3: To Determine The Significant Influence Of Knowledge, Beliefs, And Attitudes Toward Responsible Environmental Behavior.

To answer the third objective of the research, this study used multiple regression analysis to identify the factors (knowledge, beliefs, and attitudes) that influence the dependent variable (REB)

Model	R	R Square	Adjusted R Square	Std. The error in the Estimate	R Square Change
1	.528[a]	.279	.260	3.53852	.279

a. Predictors: (Constant), Attitudes, Beliefs, Knowledge
b. Dependent Variable: Responsible Environmental Behavior

Table 7: Regression model

Based on Table 7, the finding shows the value of Adjusted R Square is 0.260. Thus, the value indicates that the factor-independent variables (knowledge, beliefs, and attitudes) only contributed to 26% of the influencing dependent variable (responsible environmental behavior). This study suggested other factors may influence responsible behavior. However, Tabachnick and Fidell (2007) stated that this value is more appropriate for determining the actual value in a population with a small sample size.

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	13.828	4.324		3.198	.002
	Knowledge	.049	.138	.029	.358	.721
	Beliefs	-.352	.085	-.326	-4.118	.000
	Attitudes	.576	.115	.404	5.015	.000

a. Dependent Variable: Responsible Environmental Behavior
Table 8: Coefficients of multiple linear regression

Based on Table 8, Coefficients multiple linear regressions show that knowledge does not contribute to responsible environmental behavior significantly. However other independent variables (beliefs and attitudes) contribute to responsible behavior significantly. The value of t=0.358 shows knowledge does not influence responsible behavior while the most dominant influencing factor is attitudes with a value of t=5.01 followed by beliefs with a value of t=4.12. This finding is supported by previous studies that knowledge itself is not enough to change individuals' attitudes or behavior (Stern, et.al., 2000). Another previous study also stated that responsible environmental behavior is influenced by the student's attitudes and beliefs (Shamuganathan et. al.,2015)

Discussion

In this chapter, the researcher reported the result of the study based on descriptive analysis, correlation analysis, and regression analysis. The finding of descriptive analysis shows that the level of environmental literacy is high among secondary school students in Putrajaya. Pearson correlation analysis found that there is a significant relationship between beliefs and attitudes with responsible environmental behavior while knowledge has no significant relationship.

Lastly, regression analysis shows that knowledge is not a predictive factor but beliefs and attitudes are a predictive factor. Attitudes are the most influencing factor for responsible behavior.

	Hypothesis	Accepted/ Rejected
1	There is a significant relationship between knowledge toward REB	Rejected
2	There is a significant relationship between beliefs toward REB	Failed to reject
3	There is a significant relationship between attitudes toward REB	Failed to reject
4	There is a significant influence of knowledge toward REB	Rejected
5	There is a significant influence of beliefs toward REB	Failed to reject
6	There is a significant influence of attitudes toward REB	Failed to reject

Table 9: Summary Of The Result

Conclusion

The study finding shows there is a significant improvement in the level of environmental literacy from previous studies those 14-16 years old students have moderate levels of environmental literacy (Jannah, 2013). As well as the outcome of the Ministry of Education's approach of integrating environmental education into the national curriculum led to the community reaching the nominal and functional level of EL as well as the operational level, as compared to previous studies that the community only reached a nominal and functional stage of EL but have not reached the operational stage (Ibrahim et.al., 2011).

The findings also indicate a relationship between all independent variables and REB. It has been determined that the strength and direction of the relationship between the variables are different. All independent variables have been linked to the dependent variable through the correlation analysis. The study examined the relationship between knowledge, beliefs, and attitudes toward REB and found that there is no relationship between knowledge and REB, a weak relationship between beliefs and REB, and a moderate relationship between attitudes and responsible behavior. Moreover, regression analysis shows knowledge did not predict responsible behavior but beliefs and attitudes were able to influence responsible behavior.

This finding contradicts previous studies stating that knowledge is one of the key factors for environmentally significant behaviors (Mobley et.al, 2010; Campbell-Arvail. et.al.,2015; Owusu. et.al, 2017) but consistent with the previous finding that knowledge itself is not enough to change individuals' attitudes or behavior (Stern, et al., 2000). This finding on beliefs is supported by a previous study that claims beliefs are able to explicitly influence the formation of behavior (Fishbein, et.,al 2011). Lastly, the finding on attitudes is supported by a previous study that children's experience in nature had a direct and indirect positive effect on environmental behavior through environmental attitude (Cheng & Monroe, 2012). This study is also consistent with the report (Shamuganathan, et al., 2015) that responsible environmental behavior is influenced by students' attitudes and beliefs toward performing responsible behavior.

The outcome of this research indicates that of all the variables being tested, attitudes have the greatest impact on REB followed by beliefs. All the research objectives of this study are believed to have been met upon completion of this study. This study contributes to the existing body of knowledge about the importance of EL in education and the development of the environmental education curriculum field in Malaysia. The results of this study indicate that

further research is necessary. Hence, the population of the study should be expanded and include suburban and rural areas. Currently, this study draws conclusions through relatively simple research methods and data analysis. Future research could apply more elaborate methods to study this topic such as qualitative and experimental approaches. Furthermore, there is potential work on the same subject can be carried out in a variety of categories.

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