Modeling Environmental Literacy of Malaysian Pre-University Students

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In this study attempt was made to model the environmental literacy of Malaysian pre-university students enrolled in a matriculation college. Students enrolled in the matriculation colleges in Malaysia are the top notch students in the country. Environmental literacy of this group is perceived important because in future these students will be joining work force that requires important decision making. Environmental Literacy Model of these students is explained using environmental attitude, belief, conservation knowledge and Responsible Environmental Behavior (REB) with knowledge as a mediator. For this purpose data has been collected from 384 students (114 male and 270 female) and analyzed using covariance based structural equation modeling (CB-SEM) approach. The result shows that REB is influenced by the students' attitude and belief towards performing REB and knowledge about the environmental issues. On the other hand, students' belief towards the environment does not influence the formation of REB. Furthermore students' knowledge also does not mediate the influence of belief on the REB. These findings imply that individual who possess certain desirable attitude, belief and conservation knowledge have more tendencies to engage in REB. The results suggest that the matriculation colleges should integrate approaches that could promote attitude, belief and conservation knowledge into the mainstream of education.

Keywords: environmental literacy, pre-university, covariance based structural equation modeling

INTRODUCTION

Major environmental problems such as deforestation, loss of biodiversity, ozone layer depletion, global climate change, pollution and over consumption of natural resources causes destructive impact on the economics of a country, on the health of the people and other living organism. Malaysia, the country where this study was conducted experiencing environmental problems which to certain extend has impacted the economy of the country. In this country it was reported that 73% of the rivers are polluted; frequent occurrences of rampant illegal logging activities; a very low recycling rate; air quality problem particularly in the urban areas; and an

increase in the amount of toxic and hazardous waste emitted by the industries (Economic Planning Unit, 2001).

These problems generally have been linked with the awareness on the importance of performing Responsible Environmental Behavior (REB). A behavior is considered to be environmentally responsible when "the actions of an individual or group advocate the sustainable or diminished use of natural resources" (Vaske & Kobrin, 2001, p.16). Awareness about REB is lacking among Malaysians, specifically, teachers and students reported to have minimal level of commitment towards the environment (Karpudewan, Ismail and Roth, 2012; Meerah et al., 2010). Change in the life style experienced by the Malaysians resulted in the change of consumption pattern inadvertently have impacted on the environment and concomitantly its related issues on conservation and recycling (Ramayah et al., 2012).

Literature suggests that as a solution or to curb the emerging destructive environmental problems the society needs to be Environmentally Literate (EL) (Hsu & Roth, 1996; Olson & Rothkrug, 1991; Wilke, 1995; Ergodan et al., 2009). This is because environmentally literate citizen will behave in more responsible way in protecting the environment and tend to perform more REBs (Stevenson, 2007). The country is aiming to achieve the status of fully developed country by the year 2020. Parallel with this aim the nation intends to produce 72 researchers, scientist and engineers in every 10000 professional work force by the 2020 (Day and Muhammad, 2011). In the context where certain environmental problem is at an alarming stage, it is crucial for Malaysia to produce more science and technology experts who are environmentally literate as the country's limited resources and fragile ecosystem are being threatened extensively (Chan, 1998). In line with the notion, building EL in children is critical to meeting current and emerging environmental challenges (e.g. Stevenson, 2007) effort to educate the society on environmental literacy should begin from early stage of schooling through effective environmental education (Ozsoy, Ertepinar & Saglam, 2012; Ergodan, Marcinkowski & Ok, 2009).

In Malaysia, as response to the Unesco's Chapter 36, Agenda 21 (UNESCO, 2006) which highlights the role of education in imparting knowledge that leads towards development of behavioral changes, the Ministry of Education has used infusion and integrated approach to introduce environmental issues into various subjects across the curriculum (MOE, 2004). As a consequence, the society reported to have reached the nominal and functional level of EL continuum but have not reached the operational stage (Ibrahim et al., 2011). Similarly, in another recent study, 14-16 years old students reported to have moderate level of EL (Jannah et al., 2013) and Malaysian pre-service teachers scored moderately high for the affective component and obtained lower score for behavioral component of EL (Karimi et al., 2013).

Lower EL rate identified among Malaysian calls for more consorted effort, generally from the educators across various levels to enhance the literacy level of the students. Educating the students consequently will result in developing environmentally literate society in future. Hence, in this study, grounding on Covariance Based-Structural Equation Modeling (CB-SEM) approach, a model that describes the EL of Malaysian pre university students enrolled in a matriculation college has been proposed. Fundamentally, this model hypotheses and quantitatively describe the strength of the relationships between the component of EL. Additionally, this model would be useful in predicting REB through EL components. The component of EL in this study comprises of environmental attitude, belief, conservation knowledge and REB. Previous related studies show that various factors influences formation of EL. However, there is no general agreement on which is the most important factors that contribute towards holistic nature of environmental literacy (Smyth, 1995). For the purpose of this study EL has been formulated after extensively reviewing various relevant literatures. In the

section on *Environmental Literacy* below we provide detail descriptions on how we have formulated EL in this study.   The proposed model will be a useful guide for educators and curriculum designers to plan and implement their strategies so that eventually these strategies will be effective in building the EL of the students. For this purpose, in the following section the evolving definition of EL and theoretical framework underpinning the modeling of EL will be provided.

Environmental literacy

The phrase EL was first used by Roth (1968) when he posed the question 'How to identify environmental literate?' as response to the frequent media references environment illiterate frequently pollutes the environment (Roth, 1992).   At this point of time, Roth highlights the role of education and stated that for the citizen to be environmentally literate, besides environmental knowledge, attitude and sensitivity, it imperative for the society to have skills such as problem solving, planning, and collaborative skills to enhance the environment. Additionally, Hungerford and Tomara (1977) indicated that environmental education is imperative in raising environmentally literate individuals who are able and ready to take action on critical environmental issues.

Tbilisi Convention (1977), defined EL "as an early step with a purpose at improving the population awareness and concerned about the environment and its problems and which has knowledge, attitudes, motivates, commitments and skills to work individually and collectively towards solutions of current problems and the prevention of new ones". Roth (1984) further expanded the definition given earlier and stressed that environmentally literate person should understand the self-regulating systems that supports the planet and perform a life style that protects the support system and eliminates the activities that distrust the system. Considering the interaction between humans and the natural environment, Rockcastle (1989) defined EL as understanding of the mutual interaction. Disinger and Roth (1992) proposed a more generally accepted definition for EL and claimed that it is a capacity to perceive and interpret the relative health of the environmental systems and take appropriate action to maintain, restore or improve the health of the particular system. Accordingly, Disinger and Roth (1992) suggested that environmental sensitivity, knowledge, skills, attitudes, values, responsibility and active involvement as components of EL.

From the various definitions illustrated in the literature it is explicitly clear that EL ultimately targeted towards promoting pro-environmental behaviour of the society. For these particular reason researchers in general agrees that the society needs to be environmentally literate for them to be more responsible and to perform REBs (Roth, 1992; Teksoz et al., 2012). In line with this, various measures have been included as components of EL in the attempt to improve REB. In the following section complete review of literature that guided the framing of Malaysian students' EL will be provided.

Responsible environmental behavior (REB)

Work related to modeling of REB started since 1970 with introduction of the *Early US Linear Model* of REB. This model which was proven wrong indicates that improved environmental knowledge will promote the attitude and this will result in improved REB (Kollmuss & Agyeman, 2002). This model flawed mainly due to the unexplained gap that exist between attitude and behavior (Rajecki, 1982). Attempt to address the gap between attitude and knowledge was made possible through theory of reasoned action (Fishbein & Ajzen, 1975) and theory of planned behavior (Ajzen, 1985). According to Ajzen and Fishbein (1980), correlation exist when

attitude towards a particular behavior was measured and further illustrated that attitude does not have direct influence on behavior rather it influences the behavioral intention and this in turn determines the final behavior. Grounding on Ajzen and Fishbein's work, Hines et al., (1987) further expanded theory of planned behavior and established the *Model of Responsible Environmental Behavior*. In this model environmental behavior was described based on the knowledge of the issue and action; locus of control; attitude; verbal commitment and individual sense of responsibility. Due to the weak relationship between knowledge and attitude; attitude and intention and final behavior this model also was not well accepted (Kollmuss & Agyeman, 2002).

In addition to the aforementioned models, Stern et al., (1993) included altruistic component and proposed a model on REB based on altruism theory of Schwartz (1977). Stern et al., (1993) further expanded the framework and included egoistic and biospheric orientation into the model to describe the REB. On the contrary, in a model of ecological behavior created by Fietkau & Kessel (1981), sociological and psychological dimensions have been considered to explain the pro-environmental behaviors. Fietkau & Kessel (1981) suggested five variables that influence the behavior. However, in this theory gap between attitude and behavior existed mainly because of the individual, societal and institutional constrains in performing the behavior was ignored. As an attempt to address the gap between attitude and behaviour in the model of ecological behavior, Kollmuss & Agyeman (2002) proposed model of pro-environmental behavior. Through this model Kollmuss & Agyeman (2002) claimed that there is no direct relationship between knowledge and behavior. In this model knowledge, values, attitude and emotional involvement cumulatively presented as internal factor and external factor comprises of social and cultural components.

Anchoring on the above mentioned frameworks on REB, in this study, attempt has been made to model the EL of Malaysian students using CB-SEM approach. As indicated in the aforementioned previous studies (theories, empirical claims and data) hypothesized EL model (Figure 1) consisted of environmental attitude, belief, conservation knowledge and REB and the relationships between these components (Ajzen & Fishbein, 1980; Fietkau & Kessel, 1981; Kollmuss & Agyeman 2002). In this model, based on the empirical data, theory and results reported in the previous studies (De Groot & Steg, 2007: Hungerford & Volk, 1990: Hwang et al., 2000), attitude and belief are hypothesized to directly influence the knowledge and REB respectively. Conservation knowledge in turn hypothesized to mediate the relationship between attitude and belief towards REB.

Using the proposed model following hypotheses has been tested:

1. Attitude positively influences REB.
2. Belief positively influences REB.
3. Conservation knowledge positively influences REB.
4. Attitude positively influences conservation knowledge.
5. Belief positively influences conservation knowledge.
6. Conservation knowledge mediates the relationship between attitude and REB.
7. Conservation knowledge mediates the relationship between belief and REB.
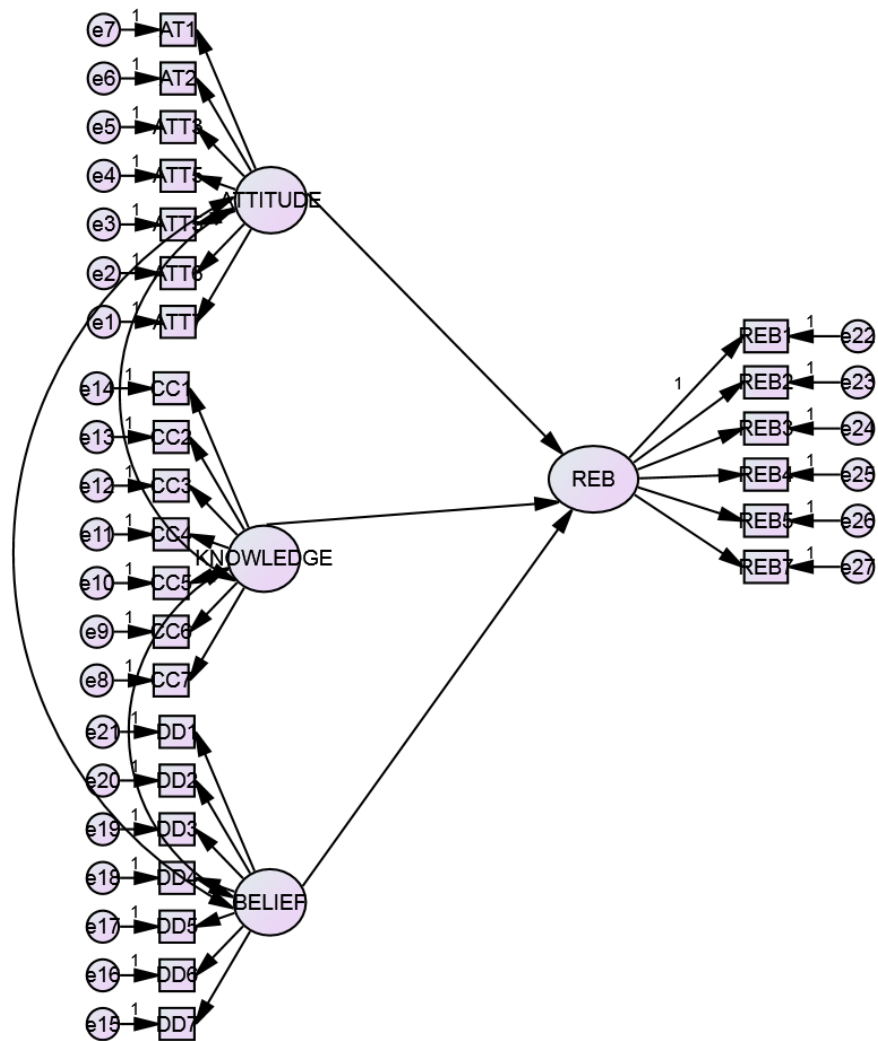
Figure 1. Hypothesized EL Model

METHODOLOGY

This study was designed in the context of Malaysian pre university students (average age of 19 years) with the purpose of modeling EL of these students based on the data obtained from a questionnaire survey on environmental conservation knowledge, attitude, belief and REB. The EL model derived from the questionnaire survey was used to test the seven hypotheses that quantitatively measure the relationship between the components of EL included in the model. The model was empirically tested using structural equation modeling (AMOS version 18) with maximum like hood estimation (Joreskog et al., 1996).

Research participants

Participants in this study were 384 students (114 male and 270 female) enrolled in matriculation courses in a pre university matriculation college located at the Northern Region of Malaysia. Students enrolled in matriculation courses after

completing their secondary education with good grades. At the matriculation colleges, mainly science base courses were offered. Hence, upon completing matriculation studies students will further their undergraduate studies locally as well as at foreign universities in scientific fields such as medicine, engineering and teaching. In total there are 14 matriculation centers in different states in Malaysia in which all the centers implement and follow uniform programs. These students are among the top scorers of the Malaysian school leaving examination at the secondary level (Malaysian Certificate Examination).

Instrument

At total of 400 Questionnaire on Environmental Literacy (QEL) was administered to the students during the lecture hour intervals. Only 384 questionnaires were returned giving the return rate of 96 %. QEL used in this study has been adapted from Environment Attitude Inventory EAI (2010). This instrument has been validated in various other studies (Rodriguez-Barreiro et al., 2013) and reported to be valid and reliable to measure of environmental attitude, belief, conservation knowledge and REB. In the original version, QEL consisted of 19 items with four constructs: attitudes (4 items); belief (4 items); conservation knowledge (4 items) and REB (7 items) and second section of QEL consisted of demographic information

Construct on attitude towards environment consisted of 4 items based on five-point Likert Scale ranging from 1 (never) to 5 (always). The items reflect on attitude of human towards the environment and the interest of individuals towards nature. For instance item ATT 6 was presented as *I'm interested in reading and concern about the impact of waste production towards the environment*. This item tests the students' attitude towards amount of waste produced in the country and students need to indicate to what extent they agree with the statement.

Similar to attitude, construct on belief towards the environment consisted of 4 items based on five- point Likert Scale ranging from 1 (never) to 5 (always). The items refer to the individual judgment about competence to perform a specific task or group of tasks in a given domain. For instance students need to indicate to what extent they belief that *environmental problems can be solved by human with the use of science and technology and human have all the right to modify the environment to suit their needs.*

Construct on conservation knowledge consisted of 4 items pertaining to the environment: saving resources, environment protection and development of new medicine based on five-point Likert scale ranging from 1 (never) to 5 (always). For instance students need to indicate to what extent they agree to the statement *the worst thing about loss of the rain forest is that it will restrict the development of new medicine*. Unlike other studies which commonly use multiple choice questions (Moody & Hartel, 2007; Taylor et.al., 2007), in this study Likert scale was used to judge to which extend the respondents have conservation knowledge on environmental issues (see Gardner et al., 1998). Besides this study various other studies also have used Likert scales to measure environmental knowledge of beginning student teachers (Pe'er et al., 2007) and in developing structural model to assess students' knowledge (Aziz et al., 2012).

Construct on REB refers to practices with respect to the environment such as recycling, consumer behavior, buying environmentally friendly products and reporting environmental problems. Using five-point Likert Scale ranging from 1 (never) to 5 (always) students need to indicate to what extent they agree with the statement such as *I have reported environmental problems or violation that I have noticed to the proper authorities.*

Data analysis

The main task in this model testing procedure is to determine the goodness-of-fit between the hypothesized model and the sample data. To arrive at the conclusion, a confirmatory factor analysis (CFA) was conducted on the hypothesized three-factor structure model using Analysis of Moment Structure AMOS 18 (Bryne, 2004). CFA assessed the reliability and validity of the individual items and the overall measurement model. The program adopted Maximum Likelihood (ML) estimation to generate estimates in the measurement model. To assess the reliability of the instrument in this study the researchers make use of the estimates of internal consistency (Cronbach's alpha). Cronbach's alpha is a commonly used measure testing the extent to which multiple indicators for a latent variable belong together. A general rule is that the indicators should have a Cronbach's alpha of 0.70 or more (Spector, 1994). Following Byrne's (2004) suggestion in this study chi-square (χ^2); Goodness-of-Fit Index (GFI); Comparative Fit Index (CFI); and, Root Mean Square Error of Approximation (RMSEA) were used to assess the model fit. Finally, path coefficients and t-values for the hypothesized relationships are calculated to evaluate the magnitude and statistical significance of the relationships.

RESULTS

Measurement model for each construct in the QEL composed of attitude, belief, knowledge and REB has been evaluated in order to rule out the construct validity. Construct validity is the extent to which a set of measured items actually reflect the theoretical latent construct they are designed to measure. Construct validity consisted of two components: convergent validity and discriminant validity. Convergent validity of a construct could be assessed using three approaches (factor loadings; variance extracted; composite reliability) as presented in table 1 and discriminant validity as presented in table 2.

Table 1. Measurement model of CB-SEM

Variable	Question Item	Loading	AVE	CR
Attitude	ATT6	.55	.513	.741
	ATT8	.66		
Belief	DD4	.91	.513	.731
	DD5	.55		
Knowledge	CC1	.65	.515	.791
	CC4	.72		
Responsible	REB1	.59	.564	.731
Environmental	REB4	.65		
Behaviour	REB6	.57		

Table 2. Discriminant validity of CB-SEM

	REB	Attitude	Belief	Knowledge
REB	**.603**			
Attitude	.559	**.659**		
Belief	- .040	.466	**.559**	
Knowledge	.035	- .440	.340	**.561**

Following Bagozzi & Yi's (1988) suggestion, items which are loaded above 0.5; AVE exceeded 0.5 and CR above 0.7 have been retained (Gefen & Straub, 2005). Items with AVE above 0.5 reflect that the item possesses adequate convergent validity and CR above 0.7 indicates the items adequate internal consistency. The results in table 1 indicate that from the original QEL in total 10 items across the construct have been omitted. These inclusive of 2 items on attitude construct (ATT5, ATT1); 2 from belief (DD1,DD2); 2 from knowledge (CC2,CC6) and 4 from REB

(REB2, REB3, REB4, REB5). In table 3 details of items retained after the loading has been included.

Table 3. Environmental literacy scale

Subscales	Loading	Items	
Attitude	.55	ATT6	I am interested in reading and concerned about the impact of waste production towards the environment in this country
	.66	ATT8	I am concerned about environment problems and health hazards such as these caused by air or water pollution.
Belief	.91	DD4	Most environmental problems can be solved by applying more and better technology
	.55	DD5	Human have the right to modify the natural environment to suit their needs.
Conservation Knowledge	.65	CC1	The worst thing about loss of the rain forest is that it will restrict the development of rain forest.
	.72	CC4	Conservation is important as it improves people's standard of living and contribute towards to the pleasure and welfare of humans
REB	.59	REB1	I used recycled paper at home
	.65	REB2	I put waste and plastic container in recycle bin
	.57	REB3	I buy environmentally friendly products.

Upon ensuring the convergent validity, the square root of the AVE was tested against the inter correlations of the construct with the other constructs in the model to ensure discriminant validity (Chin, 2010; Fornell & Larcker, 1981). As indicated in table 2, for the entire construct, square root of the AVE exceeded the correlations with other variables. Hence, the measurement model was considered satisfactory with the evidence of adequate reliability, convergent validity, and discriminant validity. Next, we proceeded to test the hypotheses generated for this research.

Table 4. Significant effect path coefficient (Direct Effect)

Path	Beta value	SE	t- value
Attitude → REB	.57	.17	3.28 **
Belief → REB	- .04	.08	.53
Knowledge → REB	.04	.12	.29
Attitude →Knowledge	.44	.15	3.09 **
Belief → Knowledge	.34	.13	2.58 *

The results of testing the first 5 hypotheses are presented in table 4. Based on table 4, it could be surmised that attitude significantly influences formation of REB (β= 0.57; p<0.01) and acquisition of environment related knowledge (β= 0.44; p<0.01). It could be also noticed that belief significantly influences students' acquisition of environment related knowledge (β= 0.34; p<0.01). Hence, hypotheses 1, 4 and 5 were supported. On the other hand the other hypotheses 2 and 4 which tested the influences of belief and knowledge on the formation of REB were rejected.

Table 5. Significant effect path coefficient (Mediating Effect)

Path	Beta value	SE	t- value
Attitude →knowledge → REB	.33	.05	2.98**
Belief → knowledge →REB	.09	.12	.75

Results of the mediating effects (testing hypothesis 6 and 7) is presented in table 5. In terms of mediating effect, results presented in table 5 shows that knowledge significantly mediates the relationship between attitude and REB. Hence, hypothesis

6, conservation knowledge mediates the relationship between attitude and REB was supported however, hypothesis 7 has been rejected because the mediating effects of the conservation knowledge between belief and REB appear to be not significant. Based on the results included in table 4 and 5 a path diagram that depicts the REB of the students was formulated.
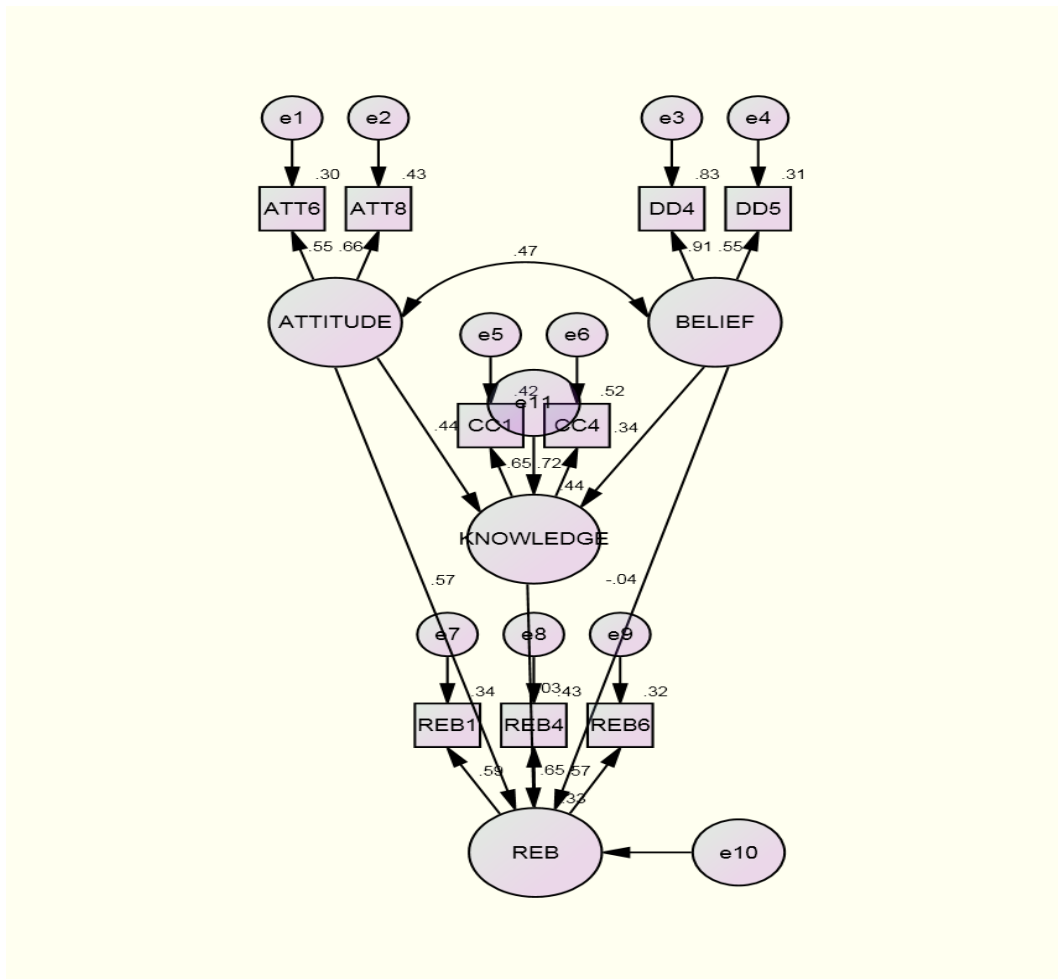

Figure 2. Path Diagram with Beta values and R-square values

Upon establishing the structural model the aforementioned model has been evaluated to test whether this model fits the data. In order to assess the fitness of the measurement model, several indices were generated. The normed chi square $\chi 2$ is 1.775; the goodness-of- fit (GFI) is 0.979; the normed fit index is0.988 (NFI); the comparative fit index (CFI) is 0.972; and the root mean square error of approximation (RMSEA) is 0.045. According to Hair (2009), the value of GFI, NFI, CFI and TLI of 0.9 and above shows a well fitted model. As for RMSEA, a value between 0.03 and 0.08 is considered to be good. Thus from the above findings we can conclude that the measurement model fitted the data well.

DISCUSSION

This study was conducted to model the environmental literacy of the pre-university students enrolled in a matriculation college in Malaysia. Initial model on environmental literacy has been formulated based on the variables depicted to influence formation of responsible environmental behaviors following the claim that society needs to be environmentally literature to perform REBs (Roth, 1992; Teksoz et al., 2012). Knowledge and attitude has been documented as antecedents of REB as

early as 1970's with introduction of *Early US Linear Model* despite the linear relationship of knowledge, attitude and REB was identified as flaw. Additionally, in the context of social science studies, theory of planned behavior prescribed attitude and knowledge as antecedent of general behaviors in social sciences (Ajzen & Fishbein, 1980). Various environmental models have been proposed anchoring on the theory of planned behavior which included attitude and knowledge as two important factors that influence formation of REB (Fietkau & Kessel 1981; Kollmuss & Agyeman, 2002; Oreg & Katz, 2006; Stern et al., 1993). In addition to attitude and knowledge, belief was considered as a psychological domain that explicitly influences formation of behavior (Barber, 2011; Fietkau & Kessel, 1981; Stern et al., 1993). Hence, in the context of this study, EL of matriculation students has been modeled based on attitude, knowledge, belief and REB.

Measurement model analysis using CB-SEM indicates that items with lower loading (10 items) have been removed from the original version of the QEL (19 items) and in the current form QEL consisted of only 9 items. One of the main reasons for the items to have lower loading is because students fail to understand the real intention of the questions. This is because the language used probably confused the students as the items were adapted from different sources used in a different context. Hair et al. (2009) recommended that a minimum of three items are required to provide adequate identification for the construct. However, according to Hayduk & Littvay (2012), two items are often sufficient, but three indicators may occasionally be helpful. Hence, two items for each attitude, belief and conservation knowledge constructs reported in this study is sufficient.

Based on the result of the review seven hypotheses have been developed and tested using CB-SEM analyses. The outcome of CB-SEM analysis shows that out of 7 hypotheses tested, 5 hypotheses have been supported and 2 hypotheses have been rejected. In the context of pre university students in a matriculation college in Malaysia, the REB is influenced by the students' attitude towards performing pro environmental behaviour and knowledge about the environmental issues. Additionally, students' attitude and belief positively influences knowledge about the environment. In terms of mediating effect, attitude of the students towards performing REB is mediated by the students' knowledge about the environment. The results also indicate that students' belief towards the environment does not influence the formation REB among this group of students. Additionally, students' knowledge also does not mediate the influence of belief on the REB.

These outcome reported in this study is parallel with other studies documented in the literature. The positive influence of attitude in forming behavior is in line with the claim that environmental attitude is a powerful predictor of ecological behavior (Flamm, 2009; Kaiser et al., 1999) despite there is discrepancy between attitude and behavior and attempts have been made to explain this gap. Additionally, various studies have done based on this simplistic relationship of attitude and behavior. In an effort to improve REB of the secondary school students, changing the environmental attitude consequently resulted in improved REB among the students (Karpudewan et al., 2012). The positive influence of attitude on the knowledge observed in this study is in line with the Model of Ecological Behavior (Fietkau & Kessel, 1981). Additionally, this model (Fietkau & Kessel, 1981) also claims knowledge does not directly influence behavior but acts as modifier of attitudes. This claim is parallel with the suggestion environmental knowledge per se is not a prerequisite for behavior (Kempton, 1986). Similarly, in this study the result shows that knowledge mediates the relationship between attitude and behavior.

Following Ajzen & Fishbein's (1980) claim 'ultimate determinants of any behavior are the behavioral beliefs, the variable belief has been included as one of the determinant of EL. However, in the context of this study REB appears to be independent of belief. Even in the situation knowledge was included as a mediator

belief in any means does not influence formation of REB. These results is consistent with the finding belief has lesser predictive power than values in explaining personal norms and behavior intention (Steg & Vlek., 2009).

Most recent studies have described the relationship between knowledge, attitude, belief and REB differently. For instance, Wen and Lu (2013) based on the outcome of their study proclaimed that student's knowledge of and attitudes toward marine environmental protection do not have significant influences on behaviors. However, when attitudes are built by increasing the involvement in field trips these experiences indirectly influences the behavior. In another study based on the assertion, attitude and knowledge influences formation of pro environmental behavior, Lee et al. (2013) has designed hands-on 'energy saving house' activities to improve elementary school students' knowledge, attitude and behavior regarding energy saving and carbon-emission reduction. Hence, it could be postulated that despite availability of various descriptions about the relationship between attitude, belief, knowledge and behavior, similar to this study, up to this end these variables dominates any environment related research.

CONCLUSION

The focus of the present study is to derive a model that describes the environmental literacy of pre- university students enrolled in a matriculation college in Malaysia. EL model derived from this study reported to have a relatively good model fit with R^2 of 0.33. This model seems to be in line with other models derived based on the theory on planned behavior among students in Turkey whereby the model significantly predicts the relationship among endogenous variable (attitude, belief, conservation knowledge) and demonstrated these variables as significant determinant of REB (Teksoz et al., 2012).

The positive influences of attitude on the REB as indicated by the model implies individuals favorable concern toward environmental issue can stimulate their responsibility in taking actions in committing behaviors that will allow them to life a sustainable living. Additionally, knowledge also identified to mediate the relationship between attitude and behavior. The positive mediating effect of knowledge between attitude and REB, explains that educational program is imperative to imparting knowledge about conserving the environment for this group of students. This study suggests that nature of the courses offered in the college should be able to provide sufficient knowledge to improve the attitudes of the students. On the other hand, belief about importance of conserving the environmental influences students' acquisition of conservation knowledge. Following this outcome, it is imperative at this level to initiate attempts to enhance students' belief on the importance of conserving the environment as it is evident educational initiatives improve Greek students' belief about usefulness of pro-environmental action and their intention to take action to address global warming (Malandrakis et al., 2011).

Implications and Recommendations

This study proposed a model that describes the EL of the matriculation students in Malaysia. Development of this model in some ways overcome the notion absence of concrete model that could be used to study the environment literacy of young high achieving Malaysian students (e.g. Ibrahim, 2004) following the claim educating these groups of students is considered imperative to ensure the sustainability of resources in the country. This is primarily important because these students in future will be joining workforce that requires decision making on issues concerning the society and the environment. However, in terms of generalization the model

proposed through this study exhibits limitation. The models lacks generalization mainly because it represents only high achieving Malaysian students enrolled in matriculation colleges. The model could be only generalized to the rest of the 13 matriculation colleges located in different states in Malaysia. Following this further studies are recommended to validate the model proposed through this study.

It is also suggested and recommended that research or studies to be taken up using this model at the matriculation colleges in the country and other pre-university level institutions in different context. For instance, programs that are targeted to promote EL of the students could be designed based on the suggested model. Currently, nationwide matriculation colleges have begun to emphasize on the importance of saving our earth through programmes such as 'Recycle Week', 'No Polystyrene Day' and 'Save Day Earth' beginning from the year 2011. The EL model suggested through this study would be useful for the college to investigate to what extend the program implemented improved the students' knowledge, attitude, and belief and consequently resulted in improved REB. In this context, it is recommended other studies to be undertaken using the model suggested to investigate the effectiveness of the initiates in changing the students' behavior.

ACKNOWLEDGEMENTS

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