

Knowledge, Internal, And Environmental Factors On Environmental Care Behaviour Among Aboriginal Students In Malaysia

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ABSTRACT

This study determined the contribution of predictor factors (i.e. knowledge about the environment as well as internal and environmental factors) on environmental care behaviour among aboriginal students. The knowledge about the environment that was investigated in this research includes environmental knowledge and environmental action knowledge. The internal factors include elements of attitude, personal responsibility, and beliefs, while the elements of environment factors are social influences, information resources, and environmental management facilities. In addition, this study used an environmental knowledge test and questionnaire as research instruments. A total of 445 aboriginal students from the Malaysian state of Pahang were involved in this research. The research data were analysed using Structural Equation Modelling (SEM). The research findings showed that the predictor factors (knowledge, attitude, personal responsibility, beliefs, social influences, information resources, and environmental management facilities) contributed 44% towards environmental care behaviour. In fact, the factors that contributed most to environmental behaviour were social influences and beliefs, followed by environmental management facilities, attitude, and personal responsibility. Nonetheless, knowledge concerning the environment did not contribute towards behaviour, but it influenced attitude, which in turn affected behaviour. Hence, the factors that have been identified to contribute to environmental care behaviour should be considered in planning educational development for the aboriginal community in order to achieve environmental sustainability.

KEYWORDS

Environmental education, environmental behavior and aboriginal environmental knowledge

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Introduction

It is everyone's responsibility to maintain environmental sustainability, regardless of which community they belong to. This includes aboriginal people,

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whose role has been emphasized in the 1992 Earth Summit Conference in Rio de Janeiro (United Nations, 1992). They are indeed the people most knowledgeable about this matter as they depend on natural resources for their economic livelihood (Hood, 2012; Lim, 1997; Ramle & Faridah, 2011; Zalizan, Abdul Razaq, & Ahmad Razaai, 2009). Therefore, monitoring students' environmental behaviour has been emphasized to ensure that aboriginal people are not exploited by unscrupulous parties in using natural resources for commercial benefits (Nicholas & Lasimbang, 2004). However, previous studies have indicated that the involvement of aboriginal communities in environmental issues is still inadequate (Haliza, 2010). Thus, it is necessary to study the factors that influence the behaviour of aboriginal people in preserving the environment in order to ensure environmental sustainability.

In line with the goals of environmental education, knowledge, environmental awareness and behaviour changes are important in solving environmental issues (Hungerford et al., 2005; Palmer, 1998; Palmer & Neal, 1994; United Nations, 1992). Environmental knowledge is a foundation in understanding the impact of human behaviours on the environment (He et al., 2011), as well as in shaping attitude and changing behaviour for the purpose of protecting the environment (Elder, 2003; Hines, Hungerford, & Tomera, 1986/87; Ramsey & Rickson, 1976). A previous study by Norjan et al. (2005) showed that environmental knowledge among aboriginal students is still at a low level. However, that study only focused on environmental knowledge. Hines, Hungerford and Tomera (1986/87) and Emmons (1997) asserted that to predict responsible environmental behaviour, the element of environmental action knowledge is also crucial. Therefore, this study focused on environmental knowledge and environmental action knowledge as overall knowledge about the environment when predicting environmental care behaviour among aboriginal students.

Apart from that, previous studies have also showed that the level of environmental awareness and the interest of aboriginal students are low (Haliza, 2010; Quimby, Seyala, & Wolfson, 2007; Sheppard, 1995). According to Ramsey and Rickson (1976), Hungerford et al. (2005) and Elder (2003), environmental awareness and interest are internal factors which affect environmental care behaviour. Other internal factors which influence behaviours are attitude, personal responsibility and locus of control (Hines, Hungerford, & Tomera, 1986/87). One reason that explains the low level of the internal factors is that the new generation of indigenous people no longer hold strong beliefs about the environment (Chopil & Hunt, 2009). The beliefs of aboriginal communities about the environment is seen as a key element for controlling their actions towards the environment (Department of the Orang Asli Affairs, 2011; Hood, 2004; UNEP, 2008). Therefore, the element of aboriginal belief towards the environment was investigated in this study.

Changes in the surroundings of aboriginal communities have resulted from changes in their living conditions and upgrading of their economic activities. All these have affected the way the people think and act. This is supported by Brooks (2010), Hines, Hungerford and Tomera (1986/87) and Kollmuss and Agyeman (2002), who stated that environmental factors such as family environment, school, community, mass media, economy and infrastructure influence behaviour towards the environment. Therefore, it is necessary to investigate the environmental influences of aboriginal students that affect their knowledge,

internal factors and behaviour in taking care of the environment. Furthermore, due to the reasons that the aboriginal community in Pahang is socially and economically advanced and has a better life compared to other aboriginal communities in other states, the Malaysian state of Pahang was chosen as the location for this study.

Based on previous studies, the contribution of predictive factors that affect behaviour was conducted separately from each other and performed in one direction only. However, predicting environmental behaviour could be complex as many factors are related to each other in performing environmental care behaviour (Cottrell & Graefe, 1997; Kollmuss & Agyeman, 2002; Stern, 2000). Therefore, improvement is needed in a study to better understand the inter-relationship among the factors that influence environmental behaviour. Hence, this study also considers the contribution of predictive factors that determine environmental behaviour in a holistic manner by linking all those factors presented in a form of a diagram or in a structural equation model. This study focuses on aboriginal students as respondents because they are the new generation that will inherit the natural treasures of the country and they are important assets for planning environmental sustainability in the future.

Theoretical Framework

Conceptual Model of Environmental Care Behaviour Among Aboriginal Students

Changing behaviour is the ultimate goal in environmental education. Therefore, many studies have investigated the development of models for predicting environmental care behaviour based on related previous theories and models. In a conventional model, improved environmental knowledge will promote attitude and this will result in improved environmental behaviour (Ramsey & Rickson, 1976). However, this model often does not work in real situations (Kollmuss & Agyeman, 2002). An attempt to solve the problem related to behaviour change, the theory of planned behaviour (TPB) (Ajzen, 1985; 2005) was established instead of a theory of reasoned action (TRA) (Fishbein & Ajzen, 1975). TPB stipulates that when confronted with the need to decide on a course of action, people consider required resources and potential obstacles (control beliefs). These considerations or beliefs result in the formation of attitudes towards the behaviour of interest, subjective norms with respect to the behaviour, and perceived behavioral control. According to Ajzen and Fishbein (1980), attitude towards a particular behaviour, subjective norms, and perceptions of behavioral control do not have direct influence on behaviour; rather, these influence the behavioral intention and in turn determine the actual behaviour. Based on Ajzen & Fishbein's theory, Hines, Hungerford, and Tomera (1986/1987) established the model of responsible environmental behaviour from a meta-analysis. In this model, environmental behaviour was described based on the knowledge of the issue and action, locus of control, attitude, verbal commitment and individual sense of responsibility.

In addition to the aforementioned models, Stern (2000) introduced a value-belief-norm theory in which personal values affect environmental beliefs, beliefs affect behavioral norms and norms subsequently influence pro-environmental behaviour. Beliefs are one of the psychological domains that influence performing a behaviour (Stern 2000). Contrary to research by Shamuganathan and



Karpudewan (2015), beliefs towards the environment do not influence the formation of responsible environmental behaviour. This finding is in line with the study by Steg and Vlek (2009), in which beliefs seemed to have lesser predictive power than values in explaining personal norms and behaviour intentions. However, in this research, beliefs particularly refer to aboriginal beliefs about the environment instead of general beliefs of the environment because aboriginal beliefs about the environment are important to control their actions towards the environment (Department of the Orang Asli Affairs, 2011; Hood, 2004; UNEP, 2008).

Schwartz (1977) proposed the altruism theory, which argued that personal norms are the only direct determinants of prosocial behaviour patterns. Personal norms are conceptualized as feelings of moral obligations that people hold for themselves. Schwartz (1977) seemed to reject the proposal that the effect of personal norms on behaviour is mediated by behavioral intentions. Furthermore, he proposed that behaviour will correspond only to one's personal norms to the extent that one is both aware of the consequences of this behaviour and feels some responsibility for these consequences. So, the relationship between personal norms and actual helping behaviour should be stronger among people who are aware of the negative consequences of not helping and feel some responsibility for these consequences than among those who deny negative consequences and responsibility.

Kollmuss and Agyeman (2002) proposed a model of pro-environmental behaviour. Through this model, Kollmuss and Agyeman (2002) claimed that there is no direct relationship between knowledge and behaviour. In this model, knowledge, value, attitude and emotional involvement are cumulatively presented as internal factors while external factors comprise of social and cultural components.

Based on previous theories, models, and research, the hypothesized model is presented in Figure 1. This study takes into account three factors, namely knowledge about the environment (i.e. environmental knowledge, EK, and environmental action knowledge, EAK), internal factors (i.e. attitude, personal responsibility and beliefs), and environmental factors (social influences, information resources and environmental management facilities) in predicting environmental behaviour. These three aspects are complementary to each other. Both internal and environment factors are parallel with the opinion of Habibah and Noran Fauziah (2006), who claimed that the formation of personality and positive behaviour depends on the internal and environmental factors or interactions between the two factors. In addition, the need to combine internal and environmental factors has been suggested by previous researchers. Van Liere and Dunlap (1980) pointed out that researchers should give the same attention to cognitive factors in determining environmental awareness. This is also supported by Messick and Brewer (1983) and Guagnano, Stern, and Dietz (1995), who have recognized the need for researchers to combine individual psychological factors and environmental factors in finding a solution regarding the behaviour, especially in environmental care behaviour.

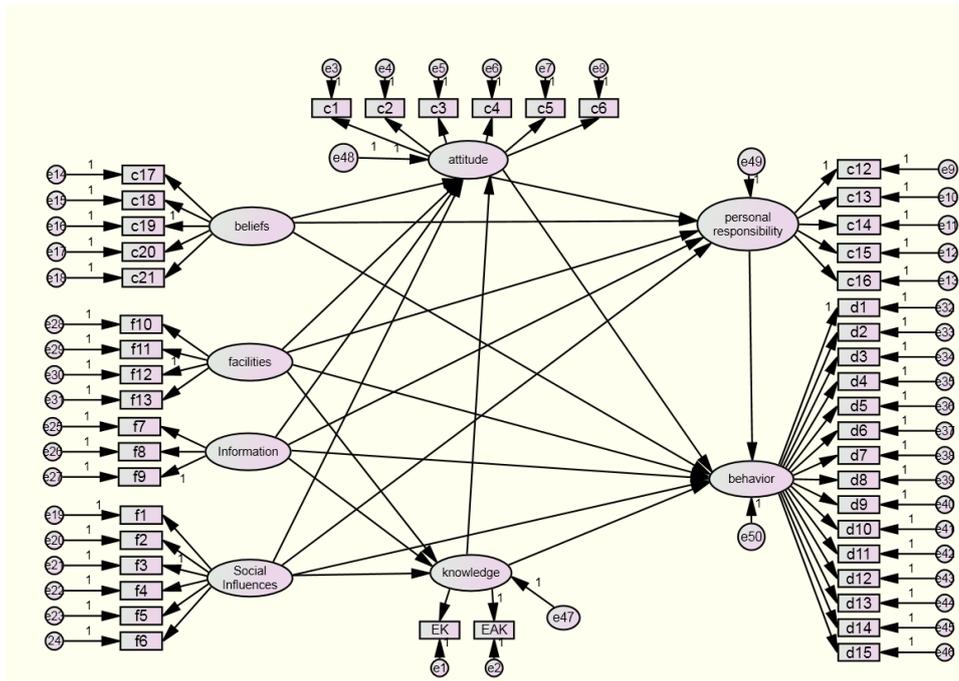


Figure 1. Hypothesized model of environmental care behavior of aboriginal students

Hypotheses

Using the proposed model in Figure 1, the following 20 hypotheses, H₁ to H₂₀, were tested:

- H₁ - Social influences positively influence knowledge;
- H₂ - Information resources positively influence knowledge;
- H₃ - Environmental management facilities positively influence knowledge;
- H₄ - Social influences positively influence attitude;
- H₅ - Information resources positively influence attitude;
- H₆ - Environmental management facilities positively influence attitude;
- H₇ - Knowledge positively influences attitude;
- H₈ - Beliefs positively influence attitude;
- H₉ - Social influences positively influence personal responsibility;
- H₁₀ - Information resources positively influence personal responsibility;
- H₁₁ - Environmental management facilities positively influence personal responsibility;
- H₁₂ - Beliefs positively influences personal responsibility;
- H₁₃ - Attitude positively influences personal responsibility;
- H₁₄ - Social influences positively influence behaviour;
- H₁₅ - Information resources positively influence behaviour;
- H₁₆ - Environmental management facilities positively influence behaviour;
- H₁₇ - Knowledge positively influences behaviour;
- H₁₈ - Beliefs positively influence behaviour;



H₁₉ - Attitude positively influences behaviour; and

H₂₀ - Personal responsibility positively influences behaviour.

Research Methodology

Study Context

This study was designed in the context of Malaysian aboriginal students, average age from 11 to 14 years with the purpose of modeling environmental care behavior of these students based on the data obtained from the environmental knowledge test and questionnaire survey on environmental factors, environmental attitude, aboriginal beliefs, personal responsibility, as well as environmental care behavior. The Environmental care behavior model derived from the test and questionnaire survey was used to test the 20 hypotheses that quantitatively measure the relationship between the factors included in the model. The model was empirically tested using structural equation modeling (AMOS version 18).

Sample and Procedure

This study uses a knowledge test and a questionnaire as research instruments. The test and questionnaire were distributed to 450 randomly selected literate aboriginal students in the state of Pahang. The state of Pahang was chosen as the research location as it has the largest aborigine population (67,506) in Malaysia and their lifestyle is more modern compared to other aboriginal communities in other states (Department of the Orang Asli Malaysia, 2009). Of these 450 students, 445 returned the completed questionnaire. The selection of respondents was assisted by teachers. Of the respondents, 250 of them were primary school students and 195 were from secondary school. The age of respondents from primary school ranged from 11 to 12 years and the age of respondents from secondary school ranged from 13 to 14 years. Of these students, 32.5% of them were males whereas 65.7% were females. Nonetheless, for inferential statistics analysis, only 428 respondents were involved in this study because 17 respondents were deleted due to the presence of outliers' data.

In order to collect data, the researchers obtained permission from the Ministry of Education first to conduct the research, after which the test and questionnaire were sent by post, enclosed with the letter of application to conduct research in the school, the letter of approval to conduct the research from the Ministry of Education, a pen each as a souvenir for the respondents and an express mail envelope for the school administration to send back the answered test and questionnaire to the first author.

Instruments

The environmental knowledge test and questionnaire was used as instrument in this study. The research instruments used in this research were developed by the first author based on the Environmental Education across the Curriculum guidebook that was published by the Ministry of Education and adapted from previous researchers based on the constructs that were measured. These instruments were validated by three experts in the field of environmental education, moral education and urban development.

The following two types of knowledge about the environment were measured: environmental knowledge and environmental action knowledge. The test of environmental knowledge was developed by the first author based on the Environmental Education Across the Curriculum guidebook that was published by the Ministry of Education whereas the test of environmental action knowledge was adapted from Goldman, Yavetz, and Pe'er (2006) regarding choosing alternative behaviour based on given environmental issues. The test of knowledge about the environment consisted of multiple-choice questions. There were 12 questions regarding environmental knowledge and eight questions regarding environmental action knowledge. For the purpose of analysis, the total score of environmental knowledge and environmental action knowledge was divided by five scales in order to convert the data to interval data.

The following three internal factors were measured: beliefs, attitudes, and personal responsibility. Items regarding beliefs towards the environment among aboriginal people were adapted from the statements by Chopil and Hunt (2009): i) taking forest resources according to the needs, ii) need to ask permission to use environment resources, iii) cannot damage the environment, iv) the environmental resources should be shared and v) the forest is guarded by an environmental spirit and God. This section contains five items. Items of attitude were adapted from the research by Bodur dan Sarigollu (2005) and by Stern, Dietz, and Guagnano (1995). This section contains six items about attitude of environmental care behaviour. Items regarding personal responsibility towards environmental behaviour were adapted from the research by Lam and Cheng (2006) and also by Stern, Dietz, and Guagnano (1995). This section contains five items.

The three environmental factors that were measured were: i) social influences, ii) information resources and iii) environmental management facilities. Items in this section were designed by the researchers to take into account the views of Hines, Hungerford, and Tomera (1986/87) and Kollmuss and Agyeman (2002). There are six statements about social influences, including influences from parents, family, teachers, school, friends, and local communities. Information resources about the environment contain three items, namely resources from print media, television and the internet. The environmental management facilities contain four items, namely facilities of rubbish, recycling bin, recycling centers and waste disposal center in local communities.

The environmental care behaviour in this study was assessed for the frequency of action for avoiding four related environmental problems in aborigine lifestyle: river pollution, endangered flora and fauna, solid disposal and acting to create knowledge about the environment. This section contains 15 items. The total number of items in the research instrument was 64.

Validity and Reliability

Two pilot studies were conducted in order to confirm the validity and reliability of the instruments that were used in this study. The first pilot test was conducted in an Aborigine Primary School with a focus group that involved students from standard five and six to identify misunderstood terms or vocabulary in the instruments. The second pilot test that was conducted involved 400 students to ascertain the validity and reliability based on exploratory and confirmatory factors analyses. After an EFA was carried out, seven items were dropped due to lower factor loadings (lower than 0.30) and not grouped to any

construct; the total number of items that remained was 57. The items that were dropped were one from attitude, one from personal responsibility, and five items from behaviour. After a CFA was performed, another five items were dropped as the factor loadings were lower than 0.50; two items were from beliefs, one item from social influence, one item from environment management facility and one item from behaviour, leaving 52 items. After the EFA and CFA were carried out, the factor loading for each item was greater than 0.50.

Table 1. Findings of confirmatory factor analysis

Construct	Subconstruct	Item	Factor loading	Kuder-Richardson/Cronbach's Alpha	CR	AVE (Pilot study)	AVE (Actual study)
Knowledge about the environment	Environmental Knowledge (EK)		0.65	0.604	0.600	0.429	0.656
	Environmental Action Knowledge (EAK)		0.66				
Internal factors	Attitudes	c1	0.72	0.801	.0802	0.450	0.642
		c2	0.65				
		c3	0.56				
		c4	0.71				
		c5	0.70				
	Personal responsibility	c12	0.52	0.702	0.703	0.377	0.706
		c14	0.61				
		c15	0.55				
	Beliefs	c16	0.75	0.702	0.708	.450	.678
		c18	0.64				
Environmental factors	Social influences	c19	0.77	0.780	0.784	0.421	0.670
		c20	0.59				
		f1	0.66				
		f2	0.60				
		f3	0.62				
	Information resources	f4	0.68	0.751	0.754	0.507	0.609
		f6	0.68				
		f7	0.78				
	Environment Management facilities	f8	0.70	0.709	0.703	0.443	0.550
		f9	0.65				
f10		0.74					
Environmental care behaviour		f11	0.65	0.882	0.882	0.585	0.564
		f13	0.60				
		d1	0.62				
		d5	0.62				
		d6	0.62				
		d8	0.61				
		d9	0.76				
d10	0.72						
d13	0.69						
	d14	0.72					
	d15	0.69					

Based on Table 1, Kuder-Richardson values for the test of knowledge about the environment and Cronbach's alpha values for the questions related to internal factors, environmental factors and behaviours, also showed values higher than 0.60. This shows that the questions have high internal reliability (Chua, 2009; Hair et al., 2010; Zainuddin, 2012). The reliability of the construct (Construct Reliability, CR) also showed that all constructs had a value of at least or greater than 0.60. This showed that the questions have high construct reliability (Chua, 2009; Hair et al., 2010; Zainuddin, 2012). However, the Average Variance Extracted (AVE) of construct which showed that the convergent validity lower than 0.50 as suggested by Chua (2009), Hair et al. (2010) and Zainuddin (2012) was not fulfilled. Only the constructs of behaviour and information resources had a value greater than 0.50. However, the convergent validity can be achieved if all the items that measured the construct in the model showed a significant level (Zainuddin, 2012). As an output of CFA, all items showed a significant value. However, the AVE for the actual study also passed the value limit, which is greater than 0.50, showing that the construct has good convergent validity.

Findings and Discussion

The structural equation model analysis in Figure 2 shows the value of fit index. In order to assess the fitness of the structural model, several indices were generated as suggested by Byrne (2010). The normed chi square λ^2 is 2.107; considering the model is compatible with the survey data, λ^2 is greater than 1 and less than 5; the Root Mean Square Error of Approximation (RMSEA) = 0.051 which is less than 0.08, is considered good. The Comparative Fit Index (CFI) is 0.934, the Tucker-Lewis Index (TLI) is 0.927 and the Incremental Fit Index (IFI) is 0.935. Each of these values is larger than the suggested value of 0.90, which shows a well-fit model (Byrne, 2010; Hair et al., 2010). Thus, from the above findings, we can conclude that the measured model fits the data well.

Based on Figure 2, analysis of the path structural equation model indicates that 44% of the variance in behaviour is predicted by factors of social influences, information resources, environmental management facilities, knowledge, beliefs, attitudes and personal responsibility. This means that the remaining 56% of variance is attributed to other factors that are not investigated in this study. This is because the factors that contributed to the behaviour were studied based on theoretical models and previous studies in which the background of the respondents was not taken into account; some of the respondents in this study could possibly be categorized as marginalized students. The contribution of predictive factors in this study may be increased if the study was also carried out among the students of other primary ethnicities. However, this study serves as a pioneer in identifying the contributing factors to the environmental behaviours of the aboriginal students. On top of that, this study has also proven that the predictors of environmental behaviour are complex and they involve interactions among various factors (Cottrell & Graefe, 1997; Kollmuss & Agyeman, 2002; Stern, 2000).

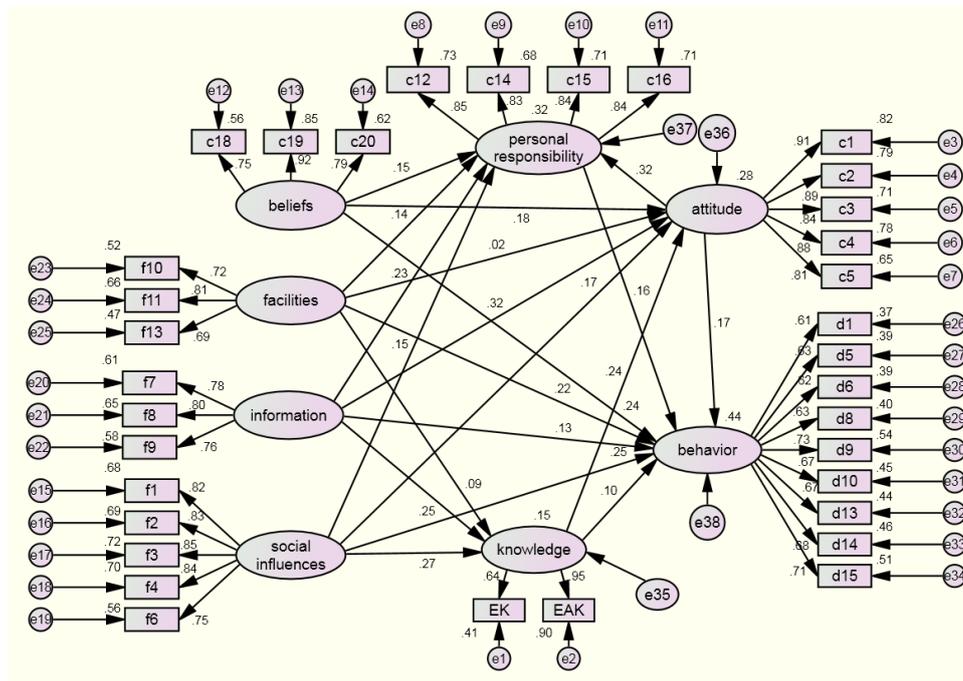


Figure 2. Path diagram with beta values and R² values for the Structural Equation Model

The overall findings as presented in Table 2 showed that from the 20 hypotheses tested, only four hypotheses were not supported while the remaining 16 hypotheses were supported. Based on the beta (β) standard value, the factors of social influences ($\beta = 0.246$; $p < 0.001$) and beliefs ($\beta = 0.245$; $p < 0.001$) contributed the most to the formation of environmental care behaviour. This is followed by the factors of environmental management facilities ($\beta = 0.225$; $p < 0.001$), attitude ($\beta = 0.168$; $p < 0.003$) and personal responsibility ($\beta = 0.162$; $p < 0.004$). This finding indicates that individuals who are closest to the aboriginal students such as family members, people they meet at school and the aboriginal community play an important role in changing the students' environmental care behaviour. This idea supports the findings from a study by Schuett (2011), who found that a social network such as family and friends have greater influence on one's environmental behaviour compared to the mass media. This is because an individual would use their social networking skills to learn and mimic the behaviour of others (Schuett, 2011).

The beliefs of the aboriginal community on the environment are also the highest contributor to the development of environmental behaviour. This is similar to the previous research by Stern (2000), who found that belief leads to environmental behaviour. Therefore, it is confirmed that aboriginal students need to have strong beliefs about the environment in order to regulate their behaviour towards the environment. These findings suggest that the aboriginal people in the past lived in harmony with the environment by holding strong beliefs regarding the environment, which is considered sacred. Unfortunately, the young aboriginals today no longer have strong beliefs about the environment, which thus affects their behaviour towards the conservation of the environment.

Table 2. Significant effect path coefficients

Path	B Standard	Standard error	t	p	Results of the hypotheses
Knowledge <--- Social	0.274	0.043	4.286	***	Supported
Knowledge <--- Information	0.247	0.044	3.853	***	Supported
Knowledge <--- Facilities	0.094	0.047	1.434	0.152	Not Supported
Attitude <--- Beliefs	0.184	0.054	3.807	***	Supported
Attitude <--- Facilities	0.020	0.070	0.349	0.727	Not Supported
Attitude <--- Information	0.316	0.072	5.268	***	Supported
Attitude <--- Social	0.169	0.061	3.180	0.001*	Supported
Attitude <--- Knowledge	0.242	0.091	4.583	***	Supported
Personal responsibility <--- Beliefs	0.152	0.056	3.093	0.002*	Supported
Personal responsibility <-- - Attitude	0.317	0.055	5.840	***	Supported
Personal responsibility <- -- Facilities	0.144	0.072	2.504	0.012*	Supported
Personal responsibility <- -- Social	0.150	0.061	2.878	0.004*	Supported
Personal responsibility <-- information	0.227	0.076	3.636	***	Supported
Behavior<-- knowledge	0.102	0.053	2.007	0.045	Not Supported
Behavior <--- social	0.246	0.038	4.540	***	Supported
Behavior <-- Information	0.134	0.044	2.182	0.029	Not Supported
Behavior <--- Facilities	0.225	0.043	3.890	***	Supported
Behavior <---Beliefs	0.245	0.035	4.824	***	Supported
Behavior <--- Personal responsibility	0.162	0.033	2.887	0.004*	Supported
Behavior <--- Attitude	0.168	0.034	2.974	0.003*	Supported

Notes:

 B = Beta Standard (*Standardized Regression Weight*)

* = Significant at level < 0.025 (one tailed)

*** = Significant at level < 0.001

Environmental management facilities are another contributing factor which positively influence the development of behaviour. This finding suggests that the government should provide environmental management facilities such as garbage bins, recycling bins, landfill and a recycling centre at the aborigine locality. Such facilities lead to greater awareness about aboriginal students' responsibility towards the environment (Kennedy et al., 2009), whilst lack of environmental management facilities would inhibit responsible behaviour towards the environment (Prabawa-Sear & Baudains, 2012).

The aboriginal students' internal factors, which are attitude and personal responsibility, also contribute significantly towards their behaviour. This is consistent with the opinion of Newhouse (1990), who stated that the behaviour towards any object or event would depend on the attitudes and values held. Parallel with these findings, previous models and findings have found that attitudes (Ajzen, 2005; Bodur & Sarigollu, 2005; Emmons, 1997; Hines, Hungerford, & Tomera, 1986/87; Hsu & Roth, 1999; Kasapoglu & Ecevit, 2002;



Kuhlemeier, Bergh, & Lagerweij, 1999; Norshariani, 2009; Stern, 2000; Ramsey & Rickson, 1976; Wan Nor Fadzilah, 2010) and personal responsibility (Hines, Hungerford, & Tomera, 1986/87; Hsu & Roth, 1999; Norshariani, 2009; Schwartz, 1977; Stern, 2000) contribute to environmental behaviour.

Knowledge does not contribute directly to behaviour. Rather, it considers attitude as its intermediary variable. This finding is consistent with the findings of previous studies suggesting that there was a positive correlation between knowledge and attitude (Meinhold & Malkus, 2005; Pe'er, Goldman, & Yavetz, 2007; Tiwi, 2006; Zarrintaj et al., 2013), in line with the model of Behavioral Change System by Ramsey and Rickson (1976). Ramsey and Rickson's model assumes that as an individual acquires knowledge, he would increase his awareness on environmental issues and is motivated to protect the environment. Besides, the cognitive stress theory also explains that the pressure of environmental problems leads to pro-environment behaviour (Homburg & Stolberg, 2006). This is because knowing about environmental issues causes individuals to feel their well-being is being threatened if the situation is appraised as harmful or threatening their personal goals, health and identity (Homburg & Stolberg, 2006). This shows that knowledge requires the support of a positive internal factor, which is an attitude for demonstrating positive behaviour towards environmental protection. Although knowledge does not directly affect behavioral change, it is still required in order to understand the impact of human behaviour on the environment (He et al., 2011). This finding contradicts the finding of a study by Shamuganathan and Karpudewan (2015), who found that the attitude towards performing responsible environmental behaviour is mediated by knowledge about the environment.

Similarly, sources of information do not directly impact behaviour, but they have impacts on knowledge, attitude and personal responsibility to become intermediary variables of behaviour. This finding supports the findings of previous studies where the mass media not only affect the mindset of readers or viewers, but also enable them to change their attitude and behaviour of becoming proactive environmentalists (Jamilah et al., 2011; Mohd Yusop, Jailani, & Ahmad, 2003; Sahin, Ertepinar, & Tesoz, 2012; Schuett, 2011). These findings explain that print media, electronic media and the internet are the main sources of information that will influence the cognitive factor, which is knowledge. This is followed by internal factors, namely attitude and personal responsibility. The interaction between the cognitive and internal factors will have an impact on environmental behaviour. In contrast, a study by Zurina and Norjan (2003) found that sources of information are not a contributing factor to environmental behaviours of aboriginal students.

Environmental factors, which are social influences, information resources and facilities, accounted for 15% of environmental knowledge. This finding indicates that the balance of 85% is contributed to by other factors which are not investigated in this study. Among these, the possible factors are the experiential learning experienced by the aboriginal students through environmental activities in their leisure time (Biermann, 2008; Vishwanath, 2006) and the lives of those close to the environment (Hood, 2004). This is due to the impacts that are caused by environment-related life experiences and knowledge on their actions towards the environment (Palmer & Neal, 1994). Based on the beta (β) value, social influence is the factor that contributed the most to the formation of environmental

knowledge ($\beta = 0.274$; $p < 0.001$), followed by information resources ($\beta = 0.247$; $p < 0.001$). However, facility does not contribute significantly to environmental knowledge.

Based on the structural equation model, 28% of the variance in attitudes is predicted by knowledge, social influences, information resources, personal responsibility and beliefs. However, environmental management facilities do not contribute significantly to the formation of positive attitudes towards the environment. Based on the beta (β) value, information resources is the major contributor to the formation of attitudes ($\beta = 0.316$; $p < 0.001$), followed by knowledge ($\beta = 0.242$; $p < 0.001$), beliefs ($\beta = 0.184$; $p < 0.001$) and social influence ($\beta = 0.169$; $p = 0.025$). This indicates that sources of environmental information such as the print media, television, and the internet have important roles in providing environmental knowledge and also have the potential to develop positive attitudes towards the environment among students.

Social influence, sources of information, environmental management facilities, beliefs and attitude contribute 32% to personal responsibility. The beta (β) value indicates attitude as the factor that contributed the most to the formation of personal responsibility ($\beta = 0.317$; $p < 0.001$), followed by information resources ($\beta = 0.227$; $p < 0.001$), beliefs ($\beta = 0.152$; $p < 0.025$), social influences ($\beta = 0.150$; $p < 0.025$) and environmental management facilities ($\beta = 0.144$; $p < 0.025$). This shows that attitude is essential for creating a sense of responsibility in the students to show positive behaviour towards the environment.

The overall findings reveal a gap between the variables of environmental influences, knowledge and internal factors with positive environmental behaviours. This is due to the fact that predictive variables contributed only 44% towards behaviours, even though the predictors were carefully taken into consideration based on findings by previous studies, theories and models which have considered the significance of those predictors as contributors towards environmental care behaviours. The gap can also be caused by several other factors such as the inability of students to apply their environmental knowledge properly to their actions, and failure in translating internal factors into behaviours (Pe'er, Goldman, & Yavetz, 2007; Quimby & Angelique, 2011). Other hindrance factors are financial constraints, insufficient information, technology, facilities and personal beliefs (Kollmuss & Agyeman, 2002; Pruneau et al., 2006; Quimby & Angelique, 2011; Stern, 2000). Hence, it is important to overcome the hindrance factors to ensure students have the desire to practice environmental behaviours (Kollmuss & Agyeman, 2002; Stern, 2000; Quimby & Angelique, 2011), and at the same time, action should be taken to improve environmental education and other support systems (Quimby & Angelique, 2011). Therefore, this study suggests that the constraints and hindrance factors should be considered in predicting environmental care behaviours; this is to help find a solution for environmental issues in the context of behaviour change among aboriginal students.

Conclusion

On the whole, 44% of the variance in behaviour is predicted by social influences, information resources, environmental management facilities, knowledge, beliefs, attitudes and personal responsibility. The remaining 56% of variance is attributed to other factors that are not investigated in this study.



Hence, further research is needed to investigate the other contributory factors which are significant to environmental care behaviour in order to establish a more complete model. The factors should take into account the specific factors related to aboriginal lifestyle, culture, and their indigenous knowledge.

The factors that contributed most to the environmental behaviour were social influences and beliefs. This indicates the important role of social support in enhancing the environmental care behaviour of aboriginal peoples and the importance of planning their development without neglecting their environmental beliefs. This study showed that particular beliefs related to the environment of aborigines affects their behaviour. It gives added value to the development of the model of environmental care behaviour of aboriginal students. This is because the previous model and theory did not focus on the specific factor of aboriginal beliefs because the background of the individual was not taken into account. In addition, this study can serve as fundamental to developing a model of environmental care behaviour to achieve environmental sustainability in the context of marginalized students particularly aboriginal students.

Implications

This study proposed a model of environmental care behavior of aboriginal students. Development of this model in some ways overcame the notion absence of concrete model that could be used to study the environment care behavior of aboriginal students based on environmental knowledge, individual psychological factors, environmental factors and aboriginal's environmental beliefs. This model is in line with findings in current research that demonstrated the social influences (Schuett, 2011), environmental management facilities (Kennedy et al., 2009; Prabawa-Sear & Baudains, 2012), aboriginal's environmental belief (Sutherland & Swayze, 2012), attitude (Zarrintaj et al., 2013), and personal responsibility (Babcock, 2009) as significant determinant of environmental care behaviour. Although knowledge does not directly affect behavioural change in this model, it is still required in order to understand the impact of human behaviour on the environment (He et al., 2011; Prabawa-Sear & Baudains 2012).

Based on the results of this study, it is found that social influences have a significant contribution on the students' environmental behaviours. Thus, the aboriginal students do need solid support from their closest socialization agents to show correct attitudes and behaviours on how to care for the environment. As a result, it is vital to consider environmental factors to develop behavioral models related to the environmental care by the aboriginal students. The basic model developed by this study actually supports the Theory of Planned Behavior (Ajzen, 2005), Responsible Environmental Behavior Model (Hines, Hungerford, & Tomera, 1986/87) and Psycho-social Model of Environmental Awareness (Stern, Dietz, & Guagnano, 1995), which all consider social influences as significant factors in engendering environmental behaviours. Thus, teachers and parents should play the role in fostering environmental care behavior among aboriginal students. Teacher should use hands-on activities (such as make the handicraft from used item and three planting) and fun-learning strategies (such as song and playing related to environmental education). These learning strategies are more relevant to the aboriginal context. In addition, educating on parents should be implemented so that they will be a good role model to their children.

The element of beliefs in internal factor also significantly contributes to environmental care behaviour. Thus, the element of beliefs should be taken into consideration in developing models of environmental care behaviours of the aboriginal students. However, the element to be used in predicting behaviours of the aboriginal students should be focused on their particular belief related to the environment, instead of the general belief stated in the Value-Belief-Norms Theory (Stern, 2000). One educational implication is for teachers to relate environmental care behaviour to students by using their everyday context and culture. Thus, the teacher should be given in service training in order to acquire the competency how to integrate environmental education and aboriginal culture in the subject taught.

This study has also revealed that attitude is a mediating variable between knowledge and environmental care behaviours. This finding supports the Environmental Behavioral changes system model by Ramsey and Rickson (1976). Hence, the results of this study can be used to formulate strategies for environmental awareness campaigns and programs particularly targeting aboriginal students. This is to provide valuable information to increase their environmental knowledge, with hopes to alter their inner attitudes and to shape their behaviours to be more responsible towards their own environment. Internal factors such as attitude, personal responsibility and beliefs directly influence one's environmental care behaviours. Thus, these internal factors should be developed in environmental education programs by promoting environmental value awareness. This method can stimulate inner force to react responsibly in taking care of the environment.

Environmental management facilities are another significant contributing factor to behaviours. Thus, these elements cannot be neglected in predicting environmental care behaviours. The absence of these facilities such as rubbish bins, recycling bins, waste disposal centers and recycling centers have led to constraints for the aboriginal people to practice environmental care. Thus, the environmental management facilities are added value to a new variable in predicting environmental care behaviours among aboriginal students. So that, facilities related to environmental management such as disposal center should be provided in the aboriginal community. This is aimed to foster positive behaviors in managing solid waste.

This study highlights that environmental care behavior is dependent on the interrelationship of social influences, facilities, information resources, environmental knowledge, attitude, beliefs and personal responsibility factor. This interrelationship is strengthening through environmental education for aboriginal children and the community.

Disclosure statement

No potential conflict of interest was reported by the authors.

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