

OVERALL REPORT:
INFUSING ENVIRONMENTAL EDUCATION IN THE
EXISTING NATIONAL CURRICULUM

A LONGITUDINAL STUDY: RESULTS & TRENDS

2008-2013

EXECUTIVE SUMMARY

In this report, the discussion centres upon the overall trends of a pilot research project undertaken by WWF Malaysia in cooperation with other agencies to strengthen Environmental Education (EE) in the existing Malaysian curriculum. Yearly detailed reports have already been completed. This longitudinal study was carried out in two cycles.

First Cycle

The first cycle of research was from 2008 to 2010. It was a progressive first cycle in that the first year saw the use of the EEKits for Form 1 only. In 2009, the Form 1 students were followed to Form 2 using the EEKits for Form 2, in addition to the Form 1 students using the EEKits Form 1. In 2010, the Form 2 students were followed to Form 3 and they used the EEKits Form 3. The EEKits for Forms 1 and 2 continued to be used simultaneously.

Second Cycle

The second cycle was from 2011 to 2013. In this cycle as the EEKits were used simultaneously by Forms 1, 2 and 3. Each of the Forms were followed up to the next level each year.

The EE Kits were developed jointly by WWF-Malaysia, Curriculum Development Centre of the Malaysian Ministry of Education, selected public universities and other governmental agencies (Please refer to Annex 1). The Kit contains resource materials for selected units/topic for four subjects namely, Bahasa Malaysia, English, Science and Geography for Forms 1, 2 and 3. Four schools located in different zones were selected in Peninsular Malaysia.

The overall aim of the pilot project was to prepare the teaching-learning modules (EEKits) to be used as a resource for the infusion of environmental education while implementing the formal curricula for Science, Geography, Bahasa Melayu and English for Forms 1, 2 and 3. It was hoped that at the end of the project, a model to infuse EE within the formal curriculum can be identified.

Methodology

The six year long study was a mixed method study. At the start of the study, Head Teachers and related subject teachers of the 4 participating schools were given exposure and training on how to use the EE Kit. The teachers were expected to infuse as much of the materials in the EE Kit from June to October 2008 in their respective subjects. Similar workshops were conducted throughout the study as and when necessary.

One important aspect to note is that there was no compulsion on the part of the teacher to use **all** the activities and suggestions provided within the EE Kits. The teacher had the option to pick and choose whatever was best suited to the teaching learning situation of each subject. However the participating teachers were aware of the EE Kit and its purpose as they had been briefed fully. This flexibility was given to the teachers so as not to curtail their own creativity and teaching approaches. In addition, the infusion had to be natural and fit into the normal school schedule and activities so that it can be applicable at a bigger scale eventually. The EEKits could be a starting point in the inculcation of environmental citizenship and positive environmental behaviour among the students based upon the formal curriculum.

A monitoring team from WWF made frequent visits to the 4 schools to assist the teachers with any problems and queries that they may have. The team also made observations around the schools.

A quantitative survey and a qualitative open-ended questionnaire were administered at these 4 pioneer schools to evaluate the environmental citizenship and environmental behaviour levels of the Form 1, 2 and 3 students. These surveys did not mean to determine the effectiveness of the EEKits. The quantitative results were analysed using the SPSS statistical analysis software. Qualitative data analysis was conducted using the constant-comparative method.

Sample

The sample of students for each year is as follows,

2008	- 703	(Only Form 1 students)
2009	- 1001	(Form 1 and 2 students)
2010	- 907	(Form 1, 2 and 3 students)
2011	- 1331	(Form 1, 2 and 3 students)
2012	- 1539	(Form 1, 2 and 3 students)
2013	- 1414	(Form 1, 2 and 3 students)

Analysis of Data

The quantitative data was analysed according to the four domains of environmental citizenship, namely knowledge, attitude, skills and action. Environmental citizenship is expressed as a sum of all these four components. Environmental behaviour is expressed as a sum of the skills and action components. The data was also analysed to determine what was the level of actual classroom experience in relation to the environment. Furthermore, correlation coefficients were calculated between,

- (i) Classroom experience with knowledge, attitude, skills, action, Environmental Citizenship (EC) and Environmental Behaviour (EB),
- (ii) Classroom experience and perceptions of how students think EE should be,
- (iii) Knowledge and EB,
- (iv) Knowledge with Attitude, Skills and Action, and
- (v) Attitude and EB

The qualitative findings are discussed under several sections namely, (i) students' knowledge about the environment, (ii) students' attitudes towards the environment, (iii) students' environmental behaviour and (iv) students' knowledge and perceptions about environmental education.

The overall knowledge level from the qualitative answers reflected very basic and simple ideas held by the students about the environment when compared with the expected level of knowledge based upon literature (Harde, 1984). The attitudes of the students were determined to have the four important components of emotion, cognitive, evaluative and values put forward by Heberlien (1981). Nevertheless, there did not appear to be any development at a higher level even after six years. The ideas about environmental behaviour of the students were looked at through the lens put forward by Heywood (2002) and Ojala

(2012). The majority of the students' responses had the elements of emotion, empathy, responsibility, moral and cognitive aspects necessary for positive environmental behaviour. Nevertheless, the responses were analysed as being at a surface level and not indicative of a higher pro-environmental behaviour.

Overall, the quantitative results were complemented by the qualitative results in that the intent to bring about changes in environmental behaviour may be a slow process.

Note: Detailed reports for each year has already been completed. This overall quantitative - qualitative report presents the general trends of the six year longitudinal.

Results

The results will present the trends identified through the six years of study for the levels of the four components of environmental citizenship, knowledge, attitude, skills and action. This will be followed by the levels of environmental citizenship (EC) and environmental behaviour (EB).

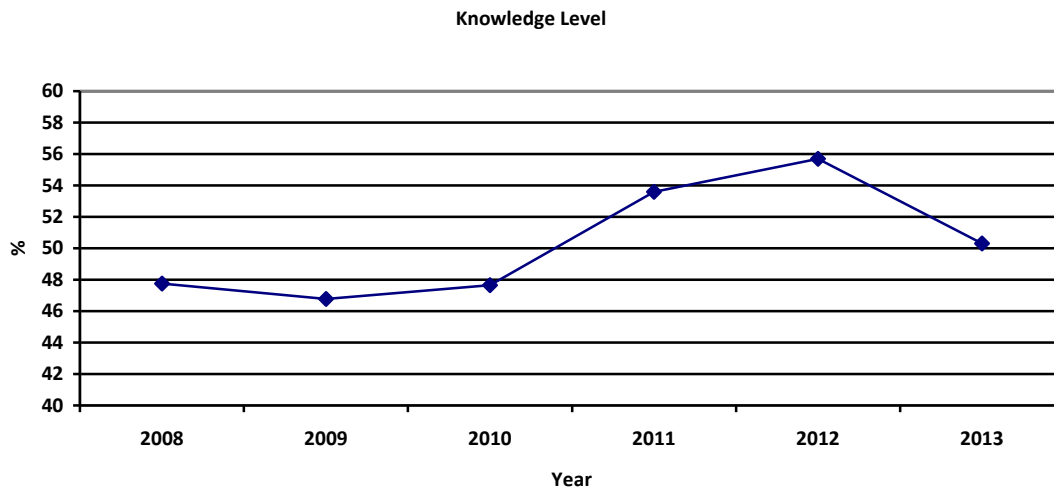
Second the actual level of classroom experience in relation to the environmental and the perceptions of students as to how environmental education should be approached is presented.

In order to interpret the trends identified, pertinent correlation coefficients between the variables are presented and discussed.

Trends of Knowledge, Attitude, Skills, Action, Environmental Citizenship & Environmental Behaviour Levels

Knowledge

Research Cycle	First Cycle			Second Cycle		
Year	2008	2009	2010	2011	2012	2013
Level	47.75%	46.78%	47.65%	53.60%	55.70%	50.30%

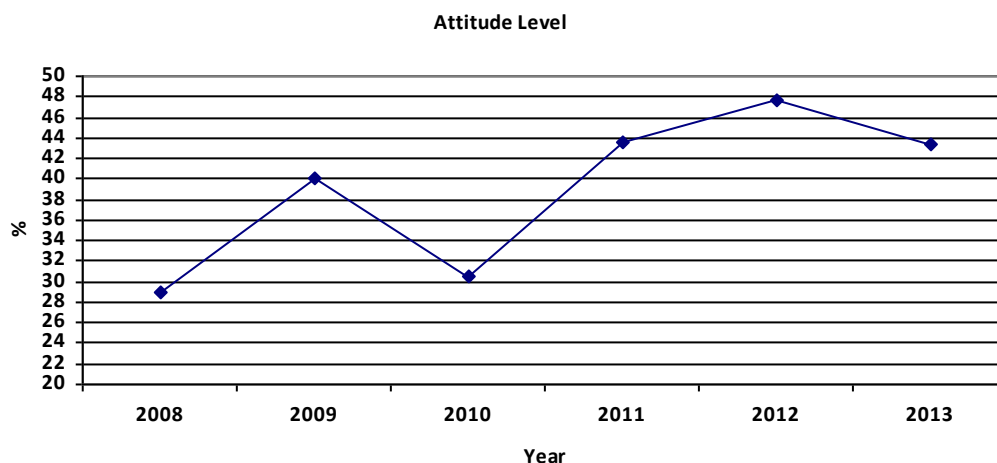


The knowledge that the students were tested related to everyday occurrence in daily living related to the environment in the local context such as the haze and flash floods. The above results indicate a general rise in knowledge levels in the second cycle which then dips in 2013. The highest level attained is just less than 56% in 2012.

The answers given by the students in the qualitative part of the study reflect the quantitative results (**Appendix 1**). Generally the qualitative answers did not reflect a progressive enhancement of answers. When analysed based upon Harde's standard, the interdisciplinary elements are not clearly visible throughout the six years except for the knowledge related to how plants release oxygen for the survival of human beings. The students are able to understand that without green plants and photosynthesis which release oxygen, living things will die.

Attitude

Research Cycle	First Cycle			Second Cycle		
Year	2008	2009	2010	2011	2012	2013
Level	28.94%	40.12%	30.48%	43.59%	47.70%	43.40%

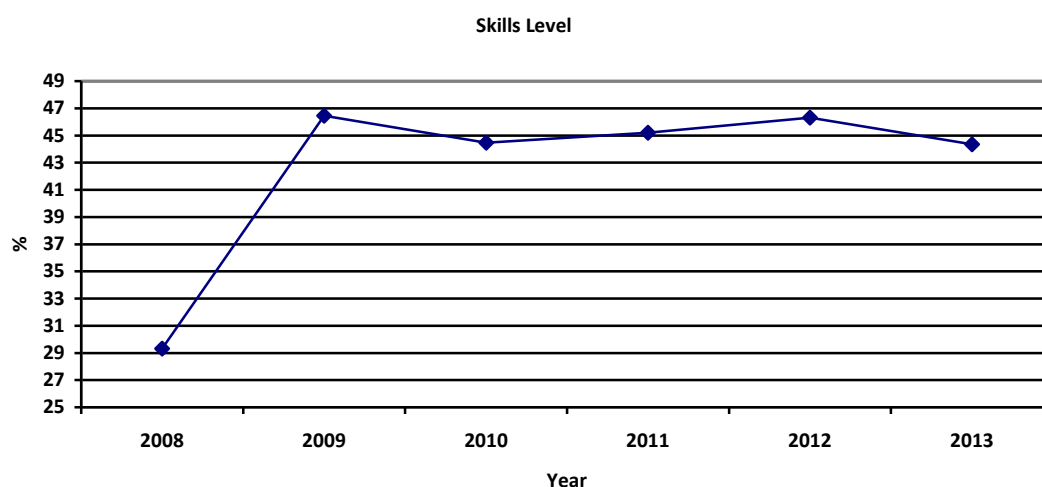


Attitudes towards environmental issues and efforts were tested in the survey. The results show a rise and dip for attitude levels for each cycle. The highest level is just less than 48% in 2012.

The qualitative responses were compared against Heberlien's (1981) components of emotional, cognitive, evaluative and values. **Appendix 2** shows a summary of the qualitative answers from 2008. The answers obtained are similar throughout the six years and do indicate all the four Heberlien's components. However, the answers do not show a progressive deeper development with time.

Skills

Research Cycle	First Cycle			Second Cycle		
Year	2008	2009	2010	2011	2012	2013
Level	29.33%	46.44%	44.46%	45.20%	46.30%	44.34%



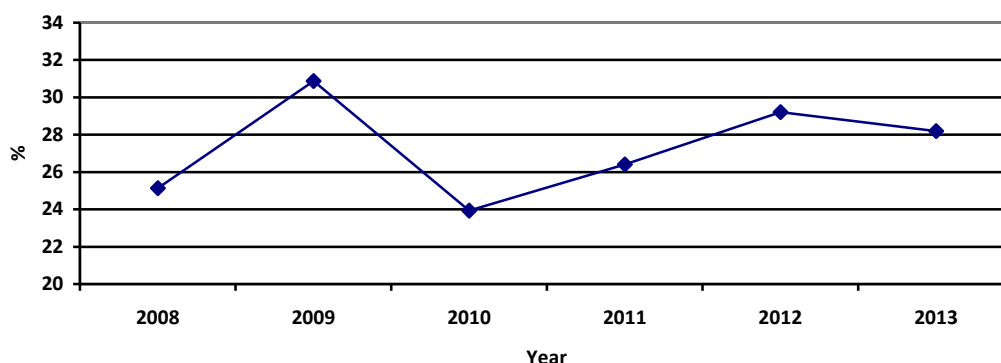
The survey tested for skills in order to handle environmental problems that the students may face such as what they would do if they found a pet shop selling endangered animals. For skills, the levels rises and show minimum change from 2010. The highest level is just less than 47% in 2009 and 2012.

For the qualitative aspect the results for skills will be discussed together with the action aspect under environmental behaviour.

Action

Research Cycle	First Cycle			Second Cycle		
Year	2008	2009	2010	2011	2012	2013
Level	25.14%	30.87%	23.93%	26.41%	29.20%	28.20%

Action Level

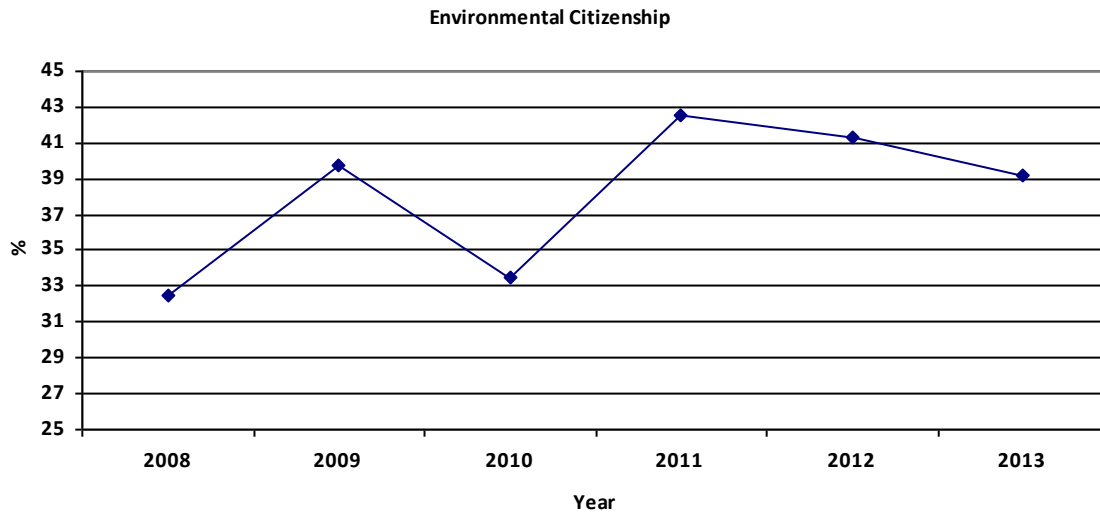


Students were tested in relation to their daily environmental friendly actions, for example whether they used chemical fertilisers and such. The results for action levels show a rise and dip for each cycle. The highest level is just less than 31% in 2009 and in 2012.

The qualitative aspect the results for action will be discussed together with the skills aspect under environmental behaviour.

Environmental Citizenship

Research Cycle	First Cycle			Second Cycle		
Year	2008	2009	2010	2011	2012	2013
Level	32.54%	39.75%	33.52%	42.50%	41.30%	39.20%

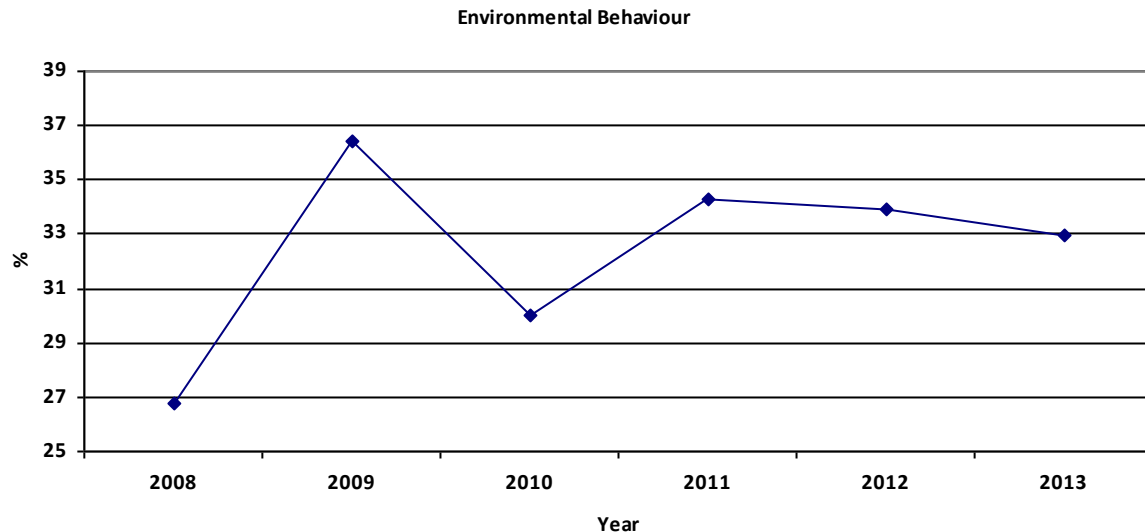


The results for environmental citizenship (a combination of the knowledge, attitude, skills and action) levels show a rise and dip for each cycle. The level, however, stayed below the 50% level. The highest level is just less than 43% in 2011 and 2012.

When the qualitative findings in Appendices 1-5 are looked at, it can be seen that the qualitative results complements the quantitative findings in that the change in Environmental Citizenship is minimal.

Environmental Behaviour

Research Cycle	First Cycle			Second Cycle		
Year	2008	2009	2010	2011	2012	2013
Level	26.74%	36.43%	29.98%	34.30%	33.90%	32.95%



The results for environmental behaviour (which combines the skills and action aspects) levels show a rise and dip for each cycle as well. The level also stayed consistently below 40 %. The highest level is just less than 37% in 2009. Overall the decline is very clear in 2010 and a smaller decline in 2013.

The students' qualitative responses were analysed based upon the elements put forward by Heywood (2002) and Ojala (2012) in relation to environmental behaviour. **Appendix 3** shows the results of the qualitative analysis for the action component and **Appendix 4** is for the skills component. Yet again, students' answers are very much similar throughout the six years with very little change.

Discussion

In trying to find an explanation for the rise and dip as well as the environmental citizenship and behavioural levels which remained consistently below 50%, the results above need to be first weighed against the level of actual classroom experience in relation to the environment.

Classroom Experience

Research Cycle	First Cycle			Second Cycle		
Year	2008	2009	2010	2011	2012	2013
Level	27.87%	17.67%	15.83%	18.3%	21.83%	20.83%

The students were asked about the teaching techniques used in the classroom as well as how much they had learned about the environment in their classrooms. Consistently only 15% to 28% agreed that the teachers has utilised effective techniques and that they had learnt much in their classrooms. This could indicate that the teaching-learning process in the

utilisation of the EEKits may not have been effective as was expected. The level of classroom experience is lowest in 2010.

The qualitative results in relation to students' understanding of environmental education and classroom experience are given in **Appendix 5**. Throughout the study, the students' answers point out that the resources which have been utilised, and the teaching process need to be improved further for behavioural changes towards the environment is desired.

The qualitative findings clearly point to the fact that the quality of knowledge is not at an in-depth level after six years. The main factor that can be zoomed in as a probable cause of shallow knowledge about the environment and a minimal change in pro-environmental behaviour is the classroom experience and resources.

In order to further interpret the above results, correlations between the variables of the quantitative aspect of the study were analysed. These correlations will also be looked at together with what the students state about their experience in their qualitative answers.

Correlation

The Spearman rho correlation was chosen because of the ordinal nature of the data. The scale below (O'Neil, 2009) is followed in the interpretation of the correlation coefficients obtained in this study.

Scale for interpretation of correlation coefficients

Correlation Coefficient (r_s)	Strength of relationship
0.0 – 0.19	Very weak and negligible
0.2 – 0.39	Weak
0.4 – 0.69	Moderate
0.7 – 0.89	Strong
0.9 – 1.0	Very strong

Note:

1. The direction of the correlation must be considered (+ or -)
2. The correlation coefficient can only be interpreted in terms of strength if the correlation is statistically significant.

Statistical significance is a statistical concept indicating that the result is very unlikely due to chance and, therefore, likely represents a true relationship between the variables. Statistical significance is usually indicated by the alpha value (or probability value), which should be smaller than a chosen significance level. For most research studies the significance level of 0.05 or 0.01 is used, thus indicating that the results have only a 5% or 1% chance of being likely by chance alone. In SPSS, we look at the p-value to tell us whether results are statistically significant or not. If the pvalue is smaller than 0.05, we know the results are statistically significant by 0.05.

Classroom Experience correlated with the Main Variables

First, the correlation of the actual classroom experience of the students in the four schools with the knowledge, attitude, skills and action, environmental behaviour and environmental citizenship variables.

Research Cycle	First Cycle			Second Cycle		
Correlation coefficient (r_s) /Year	2008	2009	2010	2011	2012	2013
Classroom Experience & Knowledge	NA	.125** Very weak and negligible	.052** Very weak and negligible	.128** Very weak and negligible	.293** Weak	.222** Weak
Classroom Experience & Attitude		.248** Weak	.106** Very weak and negligible	.211** Weak	.400** Moderate	.287** Weak
Classroom Experience & Skills		.377** Weak	.361** Weak	.366** Weak	.522** Moderate	.412** Moderate
Classroom Experience & Action		.218** Weak	.210** Weak	.256** Weak	.353** Weak	.324** Weak
Classroom Experience & EC		.352** Weak	.263** Weak	.345** Weak	.577** Moderate	.425** Moderate
Classroom Experience & EB		.316** Weak	.304** Weak	.333** Weak	.535** Moderate	.425** Moderate

. ** Correlation is significant at the 0.01 level (2 tailed)

NA: Not available

EC: Environmental Citizenship

EB: Environmental Behaviour

The correlation coefficient values (r_s) follow the trend of the knowledge, attitude, skills, action, EC and EB results shown earlier. The values tend to dip in 2010 and then rise and decline again. Therefore, it appears that the classroom experience may play a major role in the knowledge, attitude, skills, action, environmental citizenship and environmental behavioural levels.

Classroom Experience with Perceptions of what EE should be

Research Cycle	First Cycle			Second Cycle		
Correlation coefficient (r_s) /Year	2008	2009	2010	2011	2012	2013
Classroom Experience & Perceptions of what EE should be	NA	.463** Moderate	.462** Moderate	.478** Moderate	.677** Moderate	.563** Moderate

** Correlation is significant at the 0.01 level (2 tailed); NA: Not available

An increasing moderate significant relationship was found between actual classroom experience and perceptions of how the students would like EE to be taught between 2009 to 2012. This may indicate a slow and steady positive increase in actual classroom experience over these four years. However, it dipped again in 2013, suggesting that the classroom experience may have been less effective.

Qualitative Findings about Classroom experience

Interdisciplinary Knowledge Elements and Perceptions and Experience of Environmental Education (2008 – 2013)

Harde's Interdisciplinary Knowledge elements	Sample of Students' Qualitative answers on knowledge	Sample of Students' Qualitative answers about the Experience of Environmental Education
Biotic	Rivers; Plants; Mountains (Form3, 2013) Flora Fauna Rivers Green trees (Form 3, 2010) Because all living things are interdependent (Form 3, 2010)	No not enough – the information in the textbooks (Form 3, 2013) I do not think so . Only the science textbooks have more focus on the environment. (Form 1, 2013)
Abiotic	Acid Rain (Form 3, 2013) Every living thing depend on each other If we hurt the environment we hurt ourselves (Form 1, 2011) Fresh Air (Form 3, 2010)	Text books are read but teachers should motivate us more (Form2, 2012)
Human	Stop pollution (Form 3, 2013) Use less plastic (Form 3, 2010) Don't throw rubbish Do not litter Don't burn rubbish (openly) (Form 1, 2008)	If there isn't a person for example, a teacher to explain the importance of the environment “. . . we need to learn through experience”; . . . (Form 1, 2011) Teachers should stress more in class (Form 1, 2011)

As seen throughout the six years, the students' answers reflect surface level understanding of interdisciplinary elements in their knowledge. However, the level has not indicated a trend towards a higher level of understanding. When this is compared against the responses of the students about the resources used and the classroom, the crucial experiential component in the teaching-learning process is lacking.

Knowledge and Environmental Behaviour

Research Cycle	First Cycle			Second Cycle		
Correlation coefficient (r_s) /Year	2008	2009	2010	2011	2012	2013

Research Cycle	First Cycle			Second Cycle		
Knowledge & EB	NA	.132** Very weak & negligible	.179** Very weak & negligible	.111** Very weak & negligible	.204** Weak	.222** Weak

** Correlation is significant at the 0.01 level (2 tailed); NA: Not available

The correlation ranges from a very weak and negligible correlation value to a weak significant correlation between knowledge and environmental behaviour From 2009 to 2013. This finding shows that an increase in knowledge does not necessarily translate into behavioural changes.

Knowledge with Attitude, Skills and Action

Research Cycle	First Cycle			Second Cycle		
Correlation coefficient (r_s) /Year	2008	2009	2010	2011	2012	2013
Knowledge & Attitude	NA	.089** Very weak & negligible	.077** Very weak & negligible	.139** Very weak & negligible	.163** Very weak & negligible	.152** Very weak & negligible
Knowledge & Skills		.185** Very weak & negligible	.192** Very weak & negligible	.143** Very weak & negligible	.233** Weak	.267** Weak
Knowledge & Action		.086** Very weak & negligible	.132** Very weak & negligible	.075** Very weak & negligible	.098** Very weak & negligible	.155** Very weak & negligible

** Correlation is significant at the 0.01 level (2 tailed)
NA: Not available

The results also show a weak negligible significant correlation between knowledge and attitude, skills and action. This could also be interpreted that an increase in knowledge does not necessarily translate into changes in attitudes, skills or action.

Attitude with Environmental Behaviour

Research Cycle	First Cycle			Second Cycle		
Correlation coefficient (r_s) /Year	2008	2009	2010	2011	2012	2013
Attitude & EB	NA	.373** Weak	.301** Weak	.373** Weak	.435** Moderate	.494** Moderate

** Correlation is significant at the 0.01 level (2 tailed)

NA: Not available

The correlation between attitude and environmental behaviour, appears to have slowly increased from weak to moderate. Therefore, it can be said that this change in attitude has a possibility of being translated into changes in environmental behaviour.

Qualitative Findings about Attitude

Heberlien's Components of Attitude and Perceptions and Experience of Environmental Education (2008 – 2013)

Heberlien's Components	Sample of Students' Qualitative answers	Sample of Students' Qualitative answers about the Experience of Environmental Education
Emotional	Without nature our lives are not complete (Form 3, 2013)	Never heard of EE (Form 2, 2013)
Cognitive	Nature provides oxygen (Form 3, 2013)	EE informs people about the environment (Form 2, 2013)
Evaluative	<p>Lessen the green house effect and reduce the temperature of the earth to avoid sickness (Form 2, 2013)</p> <p>Plants will not grow and animals have no place to live If the environment is polluted humans will fall sick No more fresh air (Form 1, 2011)</p> <p>If plants photosynthesise we get fresh air (Form 1, 2011)</p> <p>Punish students who destroy the school environment (Form 2, 2012)</p> <p>Summon those who destroy the environment (Form 1, 2013)</p> <p>Tighten environmental laws (Form 2, 2013)</p>	<p>Teachers just briefly say that we should care about the (Form 1, 2013)</p> <p>Learn about the environment more deeply (Form 2, 2013)</p>

Heberlien's Components	Sample of Students' Qualitative answers	Sample of Students' Qualitative answers about the Experience of Environmental Education
Values	We are God's stewards to look after the earth It is our duty and job to look after the earth (Form 3, 2010)	

Students show that they have acquired the different components in relation to attitudes towards the environment, but at the surface end of the continuum. Some students have stated that they do not know what EE is, reflecting that the classroom experience experienced by students indicates a situation where the environment may not have been emphasised.

Qualitative Findings about Environmental Behaviour

Heywood and Ojala's Environmental Behaviour Elements and Perceptions and Experience of Environmental Education (2008 – 2013)

Harde's Interdisciplinary Knowledge elements	Sample of Students' Qualitative answers	Sample of Students' Qualitative answers about the Experience of Environmental Education
Emotion	Clean air calms the mind Nature cools the eye (From 2, 2013)	EE is knowledge about the environment and how to care for it (Form 3, 2013)
Empathy	Birds feel pain just like humans (Form 1, 2008) I will ask them how they will feel if they were the birds (Form 3, 2013)	There is some information about the environment in the textbooks (Form 2, 2013) Not enough information about the environment in the textbooks (Form 1, 2013)
Responsibility	Preserve the earth for future generations The earth is our heritage and must be looked after (Form 3, 2013) Taking care of the environment is our responsibility (Form 2, 2009)	Infuse environmental elements into every subject (Form 1, 2013) Got some recycling (Form 1, 2013) Teachers rarely mention any environmental issues in them (Form 2, 2012) I personally find that the student's are still not fully aware of the environment It's not really enough to create awareness and increase understanding of the local environment (Form 2, 2012)
Morals	I will tell them that what they are doing is wrong And get them to stop (Form 1, 2013)	

Students' responses indicate that all elements necessary for pro- environmental behaviour can be identified. Nevertheless, the classroom experience indicates that there is room for improvement in order to enhance pro- environmental behaviour.

Model of Implementation

The study in 2008 started out with the simple model of implementation. The EEKits were prepared and carefully selected teachers trained to use the Kits for Geography, Science, Bahasa Melayu and English. The EEKits produced in the research for Forms 1, 2 and 3 Science, Geography, Bahasa Melayu and English were implemented in a manner that were very unobtrusive so as to infuse environmental education naturally within the natural context of each classroom. The activities in the EEKits have all been tested and verified. The EEKits are a set of rich and effective resources for EE infusion.

These Kits were to be utilised in the classroom teaching and learning as the curriculum was implemented. Furthermore, this infusion could add to other already existing pro-environmental activities already being played out in the four selected schools. It was expected that if knowledge of the environment is infused it could lead to improved pro-environmental behaviour as it can influence attitudes towards the environment (Diagram 1).

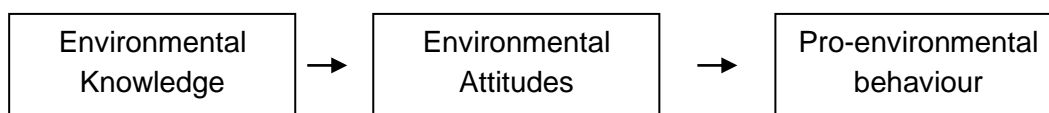


Diagram 1: Early Model of Pro-environmental behaviour

The one thing that was needed was a conscious awareness on the teachers' part to **adopt, adapt or innovate** the suggested activities emphasising experiential and hands-on learning as needed according to the topics being taught in the normal classrooms.

Conclusion

Results indicate that this process of conscious awareness that needs to be applied in the classroom by the teachers may be increasing very slowly as can be seen in the correlation values between Classroom Experience with Perceptions of what EE should be as well as the correlation values obtained between Attitude and Environmental Behaviour.

Nevertheless, the training of teachers has to go beyond just exposure to the teaching-learning techniques and transform the mind set of teachers to become sensitive and very conscious with regards to environmental issues both local and global. The fine balance of the impartation of necessary academic knowledge with the creation of environmental awareness through real-time experiences must be realised by the teachers involved.

Based upon the results above, which shows that the road to pro-environmental behaviour is slow and needs appropriate teaching and learning approaches supported by suitable resources, the original model can be modified as in Diagram 2 :

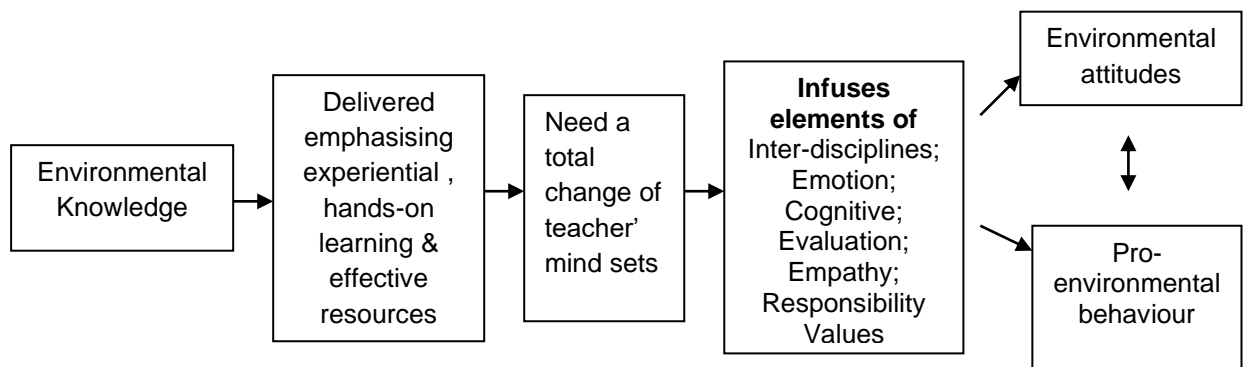


Diagram 2: Modified Model of Pro-environmental behaviour