

# Informal And Formal Environmental Education Infusion: Actions of Malaysian Teachers and Parents Among Students in a Polluted Area

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## ABSTRACT

The study explored Environmental Education infusion among students by teachers and parents in two schools located in a highly polluted area. Qualitative data was collected through observations, interviews and an open-ended questionnaire. Participants of the observations and interviews were 6 Secondary 4 students, 6 teachers and 6 parents. Participants for the open-ended survey consisted of 60 Secondary 4 students, 30 teachers and 30 parents. Data from the three sources were triangulated to identify how Environmental Education infusion happened through formal and informal education in school and at home. Findings indicate that parents and teachers do make an effort to infuse elements of environmental education through different ways.

**Keywords:** *Environmental Education; Infusion; Formal & Informal Education*

## INTRODUCTION

Malaysia is undergoing vast economical growth with the expansion of manufacturing industries, especially in electronics, chemical products and rubber products. Additionally, the increasing rate of production has resulted in excessive releases of organic and non-organic gases, chemical substances and dust (Department of Environment, 2011). Agricultural activities and exploration for natural resources which involves exploring new locations for human settlement and agriculture, logging, construction of infrastructure such as roads, streets and town buildings, and construction projects for human settlement and industrial activities continue to occur. All these activities result in erosion of land which pollutes the rivers (Haliza, 2007). The latest statistics (Department of Environment, 2011) show that 7 rivers are very polluted and 60 rivers are slightly polluted out of the 143 rivers in the country. Malaysia has realised that there is a need to protect and preserve the environment. Preventive measures and conservation efforts have been continually worked into the Five-Year Malaysia Plans since the early days of independence. In the latest 10<sup>th</sup> Malaysia Plan which ends in 2015, the government's focus is on, "Building an environment that enhances quality of life" (10<sup>th</sup> Malaysia Plan, p. 246). Nevertheless, to achieve this enhanced quality of life is not an easy task and has to be related to the education system of the nation. The education on the importance of the environment is essential to increase the level of individuals' self-awareness. Environmental education has the potential to assist the future generation to manage life and to establish a prosperous future (Perikleous, 2004).

Environmental Education has been officially integrated across the national curriculum since the nineties. The process of infusion of Environmental education involves integrating the various environmental aspects into all taught subjects during classroom teaching and learning sessions (Curriculum Development

Center, Malaysia, 1998). The methods and techniques used should create an interesting teaching and learning environment in which the students can participate actively (Adenan Satem, 2004). Several studies have been conducted to try and establish the status of how successful this integration of Environmental Education has been. Pauziah Abdul Wahab's (2004) research among 115 teachers teaching various subjects in 4 primary schools in the northern state of Kedah showed that 92.1% of the sample stated that the integration of Environmental Education across the curriculum was unsuccessful. Furthermore, 53.6% of the respondents had problems in carrying out the Environmental Education due to time constraint and had difficulty in accessing teaching aids. Five years on in 2009, another study carried out by Hazinah Nor Hanipah among 613 secondary school teachers found that 70.85% of the teachers were confident of integrating Environmental Education in the curriculum and only 8.1% were negative. Positive as this was, another study among primary school heads by Ika Liana Khalid, Rosta Harun, Azizi Muda and Ismi Arif Ismail (2011), revealed that the level of knowledge on environmental education is only moderate (69.5% mean score) and more importantly the study found that the heads are little aware of the implementation of cross-curriculum environmental education in schools.

### **Infusion of Environmental Education**

The infusion of environmental education refers to the insertion process, integration and the relationship on the environment into formal and informal education. Teachers are the main factor in successful infusion programmes (Winther, Volk & Shrock, 2002). The environmental teacher's approaches for success include practising student centred learning, utilising students' strengths, exhibit experiential teaching orientation, use cooperative techniques, involve external experts and continuously reflect upon and plan lessons (May, 2000). Ernst (2007) found that teachers who have strong environmental literacy knowledge, have support in their schools, environmental sensitivity, positive environmental attitudes and are receptive to environmental education. These teachers are the ones who will try and infuse environmental education.

Besides the formal infusion of environmental education across the curriculum, there are numerous societies and groups who assist schools in the informal infusion of environmental education. For example in the East Malaysian state of Sabah, the Sabah Environment Protection Department, Department of Environment Malaysia, Sabah Forestry Department, Science and Technology Unit, Kota Kinabalu Wetland Centre, Sabah Education Department and other environment-related organisations are active in trying to assist schools in infusing knowledge and skills related to the environment (Pudin, 2008). In relation to this, a longitudinal intervention study utilising environmental education kits for Geography, English, Bahasa Malaysia (the national language) and Science conducted by WWF-Malaysia on the integration of Environmental Education in four schools strategically located in the main four zones of the Malay peninsula from 2008 to 2012, has indicated that although knowledge of the environment among the students is high and positive attitudes abound, this does not necessarily translate into pro-environmental behaviour. These results are similar to Kollmuss and Agyeman (2002). Furthermore, the multiplier effects from this intervention in the local community and parents were not visible. Nevertheless, the study by Vaughn, Gack, Solorazano and Ray (2003) showed that parents learnt from their children who attended an environmental education course. This negative result pointed to weak implementation by teachers as student views of the teaching approaches did not live up to expectations as the focus was on preparing students for national examinations (WWF-M, Research Report, 2010, 2011, 2012). Another finding from the WWF-Malaysia reports was that students preferred field trips. The same was reported by Barney, Mintzes and Yen (2005). Furthermore, Farmer, Knapp and Benton (2007) found that even one full year after a field trip, the participating students could remember the activities during their trip well and seemed to have developed a pro-environmental attitude. The present article discusses a study conducted to investigate the formal and informal infusion of environmental education within a community in a selected polluted area through a qualitative lens. Thus far, no such study has been conducted in Malaysia.

## METHODOLOGY

A qualitative data collection approach was utilized, that is through observations, interviews and an open-ended survey. The location for this study was an area which has a high air pollution index in a district in the central state of Perak. The location is an industrial area which has many factories dealing with palm oil, rubber, steel, cement and vehicles' accessories and spare parts. The justification for choosing this area is because the researcher assumed that the surrounding pollution should develop awareness towards the environment among students, teachers and parents. Therefore, the researcher wanted to investigate how the location influences the infusion of the Environmental Education in the nearby two schools. These schools will be named as Secondary School 1 and Secondary School 2. The sampling of the students involves Form 4 students. Six (6) students to participate for the interviews and observations. Sixty (60) students participated in the open-ended questionnaire. Six (6) teachers participated in the interview while 30 teachers participated in the open-ended questionnaire. Thirty (30) parents and guardians participated in the open-ended questionnaire, while six (6) of them agreed to participate in the interviews and observations. Data from observations, interviews and the open-ended survey were triangulated to identify concepts and the method of Environmental Education infusion.

### Data Collection Techniques

Data collection techniques done in three ways, namely observation, interviews and open-ended survey. Observations were recorded in the observation record form for analysis. The interviews were taped and transcribed before analyzed. While open-ended survey responses were categorized and analyzed. All three techniques carried out on all three groups of respondents, that are students, teachers and parents. The observations were carried out using three different settings which include formal education in the school classrooms, informal education that occurs in the school environment and informal education that occurs at the students' home. The procedure for the observation was developed based on several aspects which were;

1. The observation related to the informal education at home included i) observations around the students' home, ii) observations of interactions between the parents and students, iii) observations of the house surroundings and iv) observations during the family activities. The collection of data for observations made informally at home by visit to the house of participants and recorded in the special forms namely Observation Protocol Informal Education at Home. Observations carried out twice and observation time was 40 minutes. Trip time depends on the approval of the participants.
2. The observations related to the informal education in school included i) observations around the school environment, ii) observations of the school's facilities and their use, iii) observations of the reading materials and their use, iv) observations of school society activities.
3. The observations related to the formal education in school included lessons conducted in the classroom. The aspects included i) observations on the preparation and use of the teaching aids, ii) lesson set inductions, iii) observations of interactions between the students and the teacher during the lessons, and iv) the closure of the lesson.

The lessons were video recorded after consent was obtained from all participants.

The interviews with the students, teachers and parents were carried out in two phases. Phase 1 interviews were conducted to obtain the specific and detailed information while phase 2 interviews were conducted if there is unclear aspect faced in the first phase interviews. The purpose of this phase is to obtain more comprehensive information regarding vague and uncertain matters during the observations. Three interview protocols were prepared for the three groups of participants.

The open-ended questionnaire was planned to obtain answers and responses without limit from the participants. Each group was given different sets of questions.

### Data Analysis

The researcher analysed the data from triangulating the three resources (Merriam, 2001; Bailey, 2007). The interviews were recorded and transcribed. The frequency of certain expressions, words, phrases and statements from all three sources were identified to decide the themes emerging from the participants. Each transcript was read meticulously and deep attention was given to each word and sentence to determine essential expressions as early coding was conducted (McMillan, 2000). After this, themes were

developed based on comparison of the three sources. Triangulation increases the validity and trustworthiness of the findings. The table below shows an example of triangulation.

**Table 1: Triangulation of the Three Data Sources**

	Data Collection Techniques		
	Observation from Teaching and Learning Session	Interview	Open-Ended Questionnaire
Meaning of infusion		“ The application of Environmental Education throughout the curriculum... Erm..aa... means teaching and learning session which connects , aa... topics related to environment in subjects such as Science, English Language, Arts and others.” [H, IN, T3, SMK B, (02072013), (4:20)/13-16]	The application of Environmental Education throughout the curriculum is an effort to connect the Environmental Education with all subjects such as Malay Language, Geography and others. [T2, OEQ, SMK A, A1]
Teaching and Learning Method: Discussion	“ I’ll give you 10 minutes, alright. 10 minutes for you to <b>discuss</b> with each other. If you don’t know, you can ask me”  [F, T&L, T1, SMK A, BIO, 4P/201-203]	“ Then I use <b>group discussion</b> in which an exercise form is distributed to students and they are given approximately 20 minutes to discuss the effects of human activities.”  [C, IN, T2, SMK A, (21062013), (6:38)/38-41]	“ I do <b>group discussion</b> regarding an essay title related to environment, for example <i>types of environmental pollution, causes, ways to solve</i> and then, the students write an essay about it.”  [ T5, OEQ, SMK B, A3 (i)]

Notes:

1. Observation cord - [F, T&L, T1, SMK A, BIO, 4P/201-203] : Faris (respondent name), Teaching and learning, SMK A (first school), Biology, Class form 4P/line 201 to 203
2. Interview cord - [H, IN, T3, SMK B, (02072013), (4:20)/13-16] : Hani (respondent name), Interview, Teacher 3, SMK B (Second school), date of interview, time/line 13 to 16
3. Open-ended questionnaire cord –[T5, OEQ, SMK B, A3] : Teacher 5, Open ended question, SMK B (Second school), Answer 3(i).

## RESULTS AND DISCUSSION

This section discusses the infusion of Environmental Education informally by the parents at home, formally in the classroom and also informally in school during co-curricular activities.

### Informal Infusion at Home by Parents and Guardians

The techniques which emerged in the study in relation to informal infusion of environmental education at home were i) via verbal communication, ii) via actions and behaviour and iii) via instilling moral values. Communicating verbally to infuse Environmental Education informally at home was seen through providing guidance, giving advice, emphasizing, warning, discussion, explanation, and giving reminders. Infusing via actions and behaviour informally at home was carried out through, i) working together, ii)

modeling or showing examples and iii) teaching from one’s religion. The infusion of environmental education was also subtly done through the instilling of values. Some examples of excerpts are given in Table 2.

**Table 2: Excerpts for Environmental Education Infusion at Home**

Via verbal communication	Via actions and behavior	Via instilling values
<p>"At home, parents guide us so that we keep the surroundings clean. For example they advise us not to throw rubbish everywhere but into the dustbins". [F, IN, S4, SMK B, (02072013), (6:31)/20-22]</p>	<p>"Every weekend, we as a family work together to clean the garden and the house". [K, IN, S6, SMK B, (04072013), (5:17)/23-24]</p>	<p>".....I will teach my children to work together and help one another in cleaning up the surrounding area so that they will realise their responsibilities towards the environment". [N, IN, G3, NH, (29062013), (4:17)/42-45]</p>
<p>"My parents emphasise to me to always keep the house clean – outside as well. Every weekend, we together as a family clean up the garden". [Q, IN, S3, SMK B, (02072013), (5:35)/21-25]</p>	<p>"If there are tins around the house collecting rain water, my mother checks and quickly throws them away properly in order to avoid mosquito larvae. I also follow her example". [F, IN, S4, SMK B, (02072013), (6:31)/22-24]</p>	<p>"Loving nature is a virtue. I love to plant flowers and other plants. So, I teach my children to love plants and to do what I do. During holidays, we sometimes plant new flowering plants together. This not only keeps us healthy but makes our garden beautiful". [M, IN, G1, MH, (01072013), (4:20)/46-50]</p>
<p>"If my parents see me throwing rubbish everywhere, they warn me sternly".." [K, IN, S6, SMK B, (04072013), (5:17)/22-23]</p>	<p>"Before I advise my children, I try and set a good example so that they will follow. For example in the car, I will put all rubbish in a bag and when we reach our destination I will throw the rubbish in a dustbin. I do not want my children to throw rubbish out of the car", [M, IN, G1, MH, (01072013), (4:20)/34-40]</p>	<p>"I advise my children that if we do not take care of the environment now, the negative effects will be felt by the future generations like their children". [N, IN, G3, NH, (29062013), (4:17)/45-48]</p>
<p>"Sometimes my parents discuss with us about ways to improve the surroundings by planting trees and flowers ... to create a garden". [S, IN, S2, SMK A, (02072013), (5:15)/25-27]</p>	<p>"I always emphasise cleanliness as taught by our religion which teaches cleanliness". [N, IN, G3, NH, (29062013), (4:17)/34-36]</p>	<p>"A polluted place can bring about bad health. If we are not healthy, no matter how much money we have has no meaning". [Y, IN, G4 4, YH, (03072013), (4:47)/38-43]</p>
<p>"I explain to my children the benefits of caring for the environment so that my children will develop a more positive attitude and be more responsible in not polluting the environment". [Y, IN, G4, YH, (03072013), (4:47)/27-31]</p>		
<p>"Aa.. I remind my children and grandchildren that we have to care for the environment. If not the environment will become polluted and we will feel the consequences. As it is now we have to face the haze and air pollution here". [Z, IN, G2, ZH, (29062013), (3:42)/23-26]</p>		

Communication between parents and children are important (Abdullah Nasih Ulwan, 2004; Adawiyah Ismail, 2007). Parents must also set good examples for the children (Moore, 1992). It is imperative that parents inform their children that the environment needs to be preserved for future generations (Palmer & Neal, 1994) and that it is everyone’s responsibility (Adenan Satem, 2004). In this study, the pollution in the area probably does encourage parents and guardians to be more conscious in teaching their children about taking care of the environment. As stated by the children, they do ‘hear’ and ‘follow’ what is taught by their parents as was also found by Jaana, Anu , Anssi dan Markku, (2012).

### Formal Infusion in School

The teaching method chosen by a teacher is a way to achieve the learning objectives with a well-managed approach (Hasan Langgulung, 1981; Sharifah Alwiah Alsagoff; 1986; Mok Soon Seng, 1992). In the research discussed in this article, how infusion of Environmental Education occurred was investigated. Several teaching techniques used in the formal classroom emerged, namely giving explanations, discussions, demonstrations, question-and-answer sessions, experiments, simulations and role-play. Excerpts are given in Table 3 to indicate the different ways of infusion.

**Table 3: Ways of Infusing Environmental Education in the Formal Classroom**

No.	Infusion Approach	Excerpt
1.	Explaining	<p>"In Biology, our teacher explains in detail about the environment and how pollution occurs and what steps we can take to overcome it". [OEQ, S15, SMK A, A2(ii)]</p> <p>" Ok, in my class just now, I used several approaches – first I attracted the attention of my students by drawing the cartoon and then I went on to give the explanation". [C, IN, T2, SMK A, (21062013), (6:38)/35-37]</p>
2.	Discussions (by using video/ text book etc) in groups	<p>"Ok. In my class, first I gave the students time to watch the video which had music and song and was in a cartoon form. Secondly, after this I used the discussion method to get the message across based on the video". [H, IN, T3, SMK B, (02072013), (4:02)/29-32]</p> <p>Teacher: Air pollution is a common occurrence here. Remember last year? The air quality here was not good. Okay... now I want you to get into your groups and discuss about this. After this we will have the presentations by each group. [N, T&amp;L T4, SMK B, CHEM, 4SC/28-36]</p> <p>"Ok.. In my class this morning, I asked the students to look for the sources of pollution, the effects and how to solve some of the problems. I divided the students into groups and distributed some reading and reference materials for them to discuss. They had to present the results of their discussion. [A, IN, T5, SMK B, (05.07.2013), (7:01)/37-43]</p>
3	Demonstration	<p>Teacher : Ok, the second activity – we will use empty mineral water bottles – I want you to make flowers or an animal like the penguin? Each group can choose. If you want to make flowers you have to cut like this...can you see? If you want the size to be small you make smaller cuts. After you cut it looks like this.. can you see? [L, T&amp;L, T6, SMK B, VAE, 4I/69-81]</p>

No.	Infusion Approach	Excerpt
4	Question and Answer	<p>".....Ok ya... come to the white board please. I have drawn a cartoon – now my question. Who can tell me the meaning of the cartoon? Who wants to try? Please raise your hand. Do not worry if your answer is wrong...Ok Najmi go ahead try...". [C, T&amp;L T2, SMKA, GEO, 4S/16-21]</p> <p>Teacher : ...Very good. One activity is logging. Besides logging what other human activity can have an impact upon flora and fauna? Who would like to try, please raise your hand..Yes Akmal? [C, IN T2, SMKA, GEO, 4S/45-49]</p> <p>Teacher : How can we control pollution from becoming a big threat? Student: Have a conservation campaign Teacher: Another campaign? What else? : Kempen. Lagi? Yang perempuan? Student: Organise a clean up : Gotong-royong. Teacher: Another clean –up? Other than these every citizen must follow...? : Gotong-royong. Lagi? Aa... selain daripada kempen apa lagi, Student: Environmental Protection laws. Teacher: Good... : Undang-undang. [H, T&amp;L T3, SMK B, SC, 4A/134-142]</p>
5	Experiments	<p>"In Biology, my friends and I have done an experiment to study the level of water pollution around the factory which spills oil..." [OEQ, S26, SMK B , A2(ii)]</p> <p>"Ok. In science we carry out several experiments to study pollution, such as water and air pollution. [F, IN, T1, SMK A, (20092013), (9:25)/53-54]</p>
6	Simulation	<p>Student 1: Good morning everyone. My group is going to simulate what can happen at a supermarket carpark here. One day Arie and her friend Fahira are going home after grocery shopping.</p> <p>Student 2 (Arie): Please start the car I will be there soon. Student 3 (Fahira): Okay will do</p> <p>Student 1: There is another lady driver who was walking towards her car parked behind Arie’s car. When Arie started her car, exhaust fumes came out and the lady driver of the car behind started to have an asthma attack.</p> <p>Student 2 and Student 3 (Arie and Fahira) rush towards the lady to try and help...</p> <p>Student 1: Perhaps the fumes caused her asthma attack – we better take her to the hospital. [N, T&amp;L T4, SMK B, CHEM, 4SC/156-172]</p>

No.	Infusion Approach	Excerpt
7	Role - Play	<p>Student 1(Newsreader): Good evening. We have news that in the small town of TM there is a very unhealthy haze caused by open burning. The residents in TM are facing many health issues because of this. Now let us listen to our reporter who is over there now...</p> <p>Student 2 (Reporter on site): Thank you. I am Aishah from TV X reporting from TM which is experiencing a severe haze since three days ago. I have interviewed several residents .. let us listen to them now.... [N, T&amp;L T4, SMK B, CHEM, 4SC/38-48]</p>

Techniques such as class discussions can be effective in infusing environmental education (Shahabuddin Hashim, Rohizani Yaakub, Mohd. Zohir Ahmad, 2003) as students learn to express themselves clearly and also the skills of argumentation. Demonstrations and Question and Answer sessions can help students to remember and recall concepts that they learn (Ramlah Hamzah, 1993). Experiments strengthen understanding as well as assist students to conceptualise better (Lave dan Wagner, 1991; Ertepinar H. & Geban O., 1996). The findings do indicate that some of the examples used by the teachers are based on local experience. Hence, it appears that the location of the schools in the polluted area may indeed have made the teachers more aware of the environment.

**The Informal Infusion in School**

Much of the informal infusion of environmental education in school occurs during co-curricular activities especially in societal activities after school. The analysis indicates that the most common activities are camping, environmental campaigns, field trips, out of class activities, recycling activities and competitions. Table 4 gives some examples.

**Table 4: Ways of Informal Infusing Environmental Education in the School**

No.	Infusion Approach	Excerpt
1	Camping	"During camping activities, we go jungle tracking and other activities related to nature. We are taught how not to damage any plants and such. We also learn about keeping the environment clean". [F, IN, S4, SMK B, (02072013), (6:31)/58-61]
2	Environmental Campaigns	<p>"During our co-curricular activities sometimes we have an environmental campaign. Normally we have outside speakers who will give us a talk about mother earth and how we should care for it". [Q, IN, S3, SMK A, (02072013), (5:35)/57-59]</p> <p>"In our Science and Mathematics Club, we had a Green Earth campaign and we prepared a herbal garden as our activity. We planted several types of herbal plants.. to guard our mother earth". [H, IN, S5, SMK B, (09072013), (4:55)/55-58]</p>
3	Field trips	".....Yes. in the Geography society, we try and make field trips – for example I take my students to the sewage or rubbish treatment centres". [A, IN, S5, SMK B, (05.07.2013), (7:01)/65-68]
4	Out of class	

No.	Infusion Approach	Excerpt
	activities/ Recycling activities	"Emm... in our Consumer and Recreation clubs we emphasise environmental cleanliness. For example we have activities where our members create objects from recyclable activities such as bottles, paper, boxes and such'. [S, IN, S2, SMK A, (02072013), (5:15)/62-65]
5	Competitions	"Ok.. I can infuse environmental education through competitions. For example in the National Language Society I try and organise speech and poetry competitions, essay competitions and even forums about the importance of caring for the environment. [A, IN, T5, SMK B, (05.07.2013), (7:01)/60-64]

Krantz (2002) emphasized the importance of experiential learning. Through the activities mentioned above, teachers would be able to infuse Environmental Education inside or outside classroom (Mohammad Zohir Ahmad & Nordin Abdul Razak, 2007). It is clear that several societies in the school plan and execute environmental related activities. Once again this could be because of the location of the schools.

## CONCLUSION

Recent disturbing statistics about melting ice and changing weather, the case for effective environmental education [which now in Malaysia as elsewhere evolving into Education for Sustainable Development (ESD)] is even more necessary. In Malaysia as was stated earlier, from the nineties environmental education was to be integrated or infused across the curriculum. Many previous studies of both urban and rural locations have indicated only minimum success in terms of infusion as teachers often say that preparing students for examinations supersedes all else. This study located in a polluted area which investigated both formal and informal approaches both in school and at home indicates encouraging positive behaviour on the part of the teachers and parents in trying to infuse environmental education through the various activities in school and at home. Many of the activities and techniques carried out by the parents and teachers appear to be influenced by the local surroundings. Nevertheless, the parents and teachers for most of the time act independently of each other. Therefore, perhaps this could be a starting point in Malaysia where parents can be consciously included by schools and be continually made aware of what and how they can participate together with the teachers in various school activities to take the infusion of environmental education to the next level. The results also showed the informal infusion of Environmental Education at home and in school are the method of implementing environmental education through experience. The informal infusion at home are also important as a basic environmental education which begins in children's lives. However, since it occurs indirectly and unplanned, so its effectiveness is less than formal infusion in school. Therefore the infusion of formal environmental education in schools is more likely to lead to pro environmental behaviour. This is due to the application of methods that are more effective, organized and planned.

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