

**Environmental Perceptions of Teenagers:
The Effects of Family Income and Parents' Education**

Dr ZARRINTAJ AMINRAD

Institute of Environment and Development (LESTARI), National University of Malaysia
(UKM), 43600 Bangi, Selangor, Malaysia

*Dr SHARIFAH ZARINA BINTI SAYED ZAKARIYA

Institute of Environment and Development (LESTARI),
National University of Malaysia (UKM), 43600 Bangi, Selangor, Malaysia

Professor ABDUL SAMAD HADI

Institute of Environment and Development (LESTARI),
National University of Malaysia (UKM), 43600 Bangi, Selangor, Malaysia

ABSTRACT

Evaluation of public environmental perception provides authentic data for decision makers to manage the protection of natural resources. Comprehensive understanding of the environment is always affected by socio-economic factors such as economy and education. In order to measure the effectiveness of these variables, three environmental education components, awareness, knowledge and attitude, were measured against the economic parameter of household income among selected secondary school students (n=470) in Malaysia. A comprehensive questionnaire (73 questions) was employed to investigate the effects of family income on the understanding of the students on various environmental topics. The collected data were analyzed by comparing variances and means in SPSS software (ver. 19). The results demonstrate a significant difference ($P < 0.05$) in the level of respondents' knowledge about the environment while the attitude and awareness remain the same. Students who come from families around the national poverty line demonstrate less environmental knowledge than students from wealthy families. The level of formal education among their parents demonstrates statistical correlation with the levels of environmental awareness, knowledge and attitude, suggesting the effect of family influences. The study concluded that a public source of education such as the mass media with a high level of environmental attitude and awareness was dominant among all income groups regardless of the family income and/or parents' educational background. The study demonstrates the effectiveness of education, wealth and media in order to increase the environmental perception in Malaysia. However, educational level seems to be more effective than wealth since higher income nations cause more environmental problems due to excessive consumption of resources. The above mentioned factors may contribute significantly to public environmental awareness if further investigations are conducted to uncover effective points in school syllabuses.

Keywords: Environmental Knowledge, Attitude, Awareness, Teenager; household Income; Formal Education; Malaysia

1. Introduction

In recent decades, environmental problems have appeared as complicated issues around the world **Brown**(1990). The complexity of environmental issues involves a variety of knowledge and disciplines to achieve possible solutions. The prohibiting approaches of the past decades have turned into modern interactive collaboration between authorities and the public, based on environmental understanding. The planned behavior as the result of human intention is in direct and indirect relation with 3 components of attitude, subjective norms and perceived behavioral control where attitude is the person's favorable or unfavorable feeling in performance of a behavior. Furthermore, subjective norm refers to the individual's perceptions of social pressure in performing or not performing of a given behavior where determined by normative beliefs with individual social pressure assessment on a particular behavior **Ajzen**(1991). In order to achieve an authentic and positive organizational behavior towards environmental protection, the basic measures should be taken into account **Luthans**(2002). Studying environmental measures including attitude, awareness and knowledge provides basic and insight views on how effective the public would protect the environment **Palmer** (1998). Moreover, awareness is given as a general concern over the environmental issues happening around us. Evaluating people's environmental education levels provides information on how government and the public can work in order to address challenges and suggest solutions **UNESCO**(1980). Environmental education has rapidly influenced environmentalists, governments, educators, public and NGOs since the Tbilisi summit that emphasized principals of environmental literacy and education **Tbilisi**(1977). The term "Environmental Literacy" is defined by **Rockcastle** (1989) as the following:

"Environmental literacy is an understanding at some basic level of the interaction of humans and their natural environment with regard to both living things and non-living things (air, water, soil and rocks). The interaction implies taking from as well as putting into (the environment)".

A decade earlier, the state of emergency was announced by **Guyer & Peters** (1987) to educate a generation of "quality environmentalists" who care about the future of our planet. This topic became highly attractive among groups of people who appear to be current or future decision makers of the society **Roth**(1992). This is why environmental education as an important factor for protection of nature is believed to be more effective when children are exposed in their earlier age of schooling to the environment **Shim**(2008). However, in many countries environmental education is not included in the school curriculum **Nadson & Shidawati**(2005); **Said**(2003). The public obtains environmental knowledge from other independent sources **Chukwuma**(1998); **Ramsey & Rickson**(1976). The Public with an understanding of environmental issues supports local and national activities such as recycling of waste materials **Huang et al.**(2006).

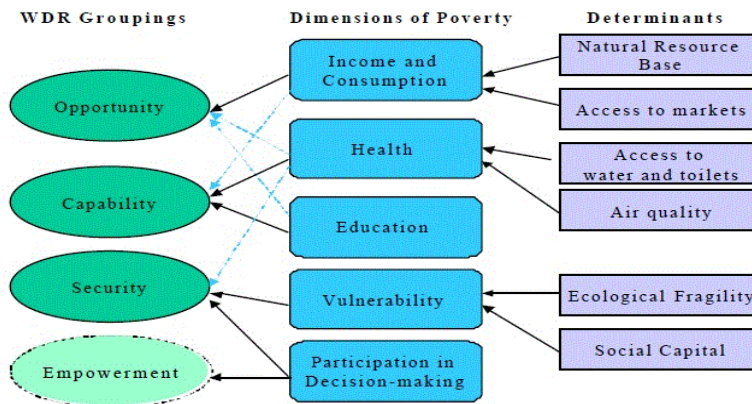
The environment is under increasing pressure from socio-economic factors **Mink**(1993); **Bekalo & Bangey**(2002); **Bolton**(1998). People with higher income may care less about their surroundings. Likewise poor people do not know how to protect the environment effectively **Digby**(2010); **O'Brien**(2007). This statement is in agreement with studies on poverty and the environment **Swinton et al.**(2003). Poverty appears from a borderline of income known as the "poverty line". **Watts** (1964) defines the term as follows:

“In the simple terms, the poverty lines represent the level of income that divides the families of a particular size, place, and time into the poor and the non-poor. Hence the set of poverty lines are intended to designate equivalent levels of deprivation. Similar thresholds could be obtained for the more comprehensive constraint measures presented above, and these, again, could be used to divide the population into poor and non-poor”

1.1 Poverty and the Environment

The relationship between poverty and the environment remains blurred where various socioeconomic factors interfere and effect trends against variables **Bucknall et al.**(2000). While environment itself shows an indirect effect on the educational aspects, education provides opportunity for a better contribution to the environment based on proper literacy and adequate funding **Van Liere& Dunlap**(1980). A proper education that serves for sustainability takes the advantage of educational opportunities from both formal and informal education **Pacheco et al.**(2006). It makes the trainee capable of getting involved in decision making process. This is where a less trained individual may contribute less in future. Figure 1 explains the effect of environmental determinants on the dimensions of poverty and subsequent future opportunities. While black arrows show the main result of the poverty dimension, the blue dotted arrows indicate possible scenarios that result from groupings.

Figure 1 diagram education-poverty-environment (After Bucknall et al, 2000)



As **Bucknall et al.** (2000) has stated that poverty is in a very complex and sophisticated relationship with the environment. Poverty can cause several social and health problems. It can be a consequence of the poor quality of the environment. This one-way relationship possibly affects the security of humans as well as their living circumstances **Rovira**(2000). As mentioned earlier, lack of proper education limits the access to future opportunities and capabilities. Moreover, security in various aspects is threatened by vulnerability of a fragile nature. The ecosystems are determinants in this relationship where lack of adequate function affects dimensions of the poverty that result in undesired consequences **Swinton et al.**(2003); **Sachs**(1994); **Jazzairy et al.** (1992). To overcome the problem society needs to produce a quality generation concerned about environmental issues **Peters**(1981). Although **Bucknall et al.** (2000) shows a one-way relationship from nature to humans in society, other scientists believe that a quality environment is highly dependent on public awareness, knowledge and attitude **Mansaray&Abijoye**(1998); **Schulitz&Oskamp**(1996); **De La Vega**(2006). Several scientists believed that environmental awareness has strong correlation with key factors of environmental management **Samalisto&Broson**(2008); **Hausbeck et al.**(1992).

Knowledge is an important key component in studies that address environmental problems **Madsen**(1996); **Mancl**(2003). It is emphasized that providing knowledge at the early stage of children's life has greater influence on their environmental perceptions **Shim**(2008); **Lukman et al.** (2011). Furthermore, knowledge and other components are not effective unless the absorbed idea appears as a part of behavioral performances in the society **Salequzzman&Rickson**(1976); **Bradley et al.** (1999) and **Fien**(1997). However, it was highlighted by scientists that there are always gaps between the actual and the desired behaviors **Zsoka**(2008).

1.2 Environmental Education and Socioeconomic Aspects

There are various factors that, beside environmental education, affect the results such as the socioeconomic status of the students. The main factor appeared on continual basis in environmental education. Short courses would not provide adequate and significant results **Perron et al.**(2006). Moreover, the curriculum is suggested to be efficient, proper and concrete enough to attract trainees' mind **Eagan & Streckewald**(1997). **Villacorta et al.** (2003) believe that three factors affect successful education namely parents, community and the trainees themselves. Parents are important since their encouragement influences the students, ethically, financially and morally. This is emphasized by **Yousef** (1998) where family income and levels of education of parents appeared to affect the pupil's perception of the environment. Furthermore, the level of parents' formal education is important for their own understanding of their daily socioeconomic progress **Liu et al.**(2009). Other scientists believe that financial aid accelerates the concept of education if enough time is provided for both trainees and trainers **Perron et al.**(2006). However, this does not guarantee protection of the environment where wealthier people may consume more and negatively affect the environment. Moreover, other scientists suggest that factors such as media are effective tools for development of environmental literacy among the students **Coyle** (2005); **Arduni**(2000); **Strong**(1998); **Chan**(1998). Environmental educational components are believed to be under the severe influence of public media and entertainment **Karimi**(2006); **Yun**(2002); **Chung & Poon**(2003); **Sehat**(2000).

Malaysia is considered a nation with an upper-middle class income, backed by accredited economic infrastructure where poverty has been significantly reduced in recent years **Asian Development Bank**(2011). It shows an adult literacy rate of 92.1 per cent (2008) while 3.8 per cent of the nation lives below the poverty line. This per cent is less than 2 where household income is below US\$ 1.25 a day (US\$ 1= RM 3). The national definition of poverty line includes income of less than RM 900 (US\$ 300) a month for a Malaysian family, while the unemployment rate remains below 3 per cent of the population **Malaysian Department of Census**(2010).

Several studies on environmental education have been conducted in Malaysia since the beginning of the 21st century to evaluate the public environmental awareness. There have been limited studies that focus on evaluating the public environmental awareness in various socio-economic conditions. Furthermore, there are gaps in the researches on highlight that how these socio-economic conditions of families may possibly affect students. This study elaborates the role of family economic condition on the levels of environmental literacy of 16 years old students who are in "Form Four" by applying a questionnaire as survey instrument. This group of students has great motivation to become potential teachers for younger children of the community, to inculcate them with beliefs and understanding about environment **Madruga et al.**(2003). The research focuses in detail on the levels of environmental awareness, knowledge

and attitude of the students who come from various economic and educational backgrounds. Economic background is defined as their parents' total monthly income that supports the families their children's education. The research is expected to answer questions including 1) how much do they know about the environment topics? 2) Does the formal educational level of parents affect the students' environmental education? 3) Is there significant difference an environmental awareness among students who come from different family economic and educational backgrounds?

In this research, the study team investigates the environmental perception in general and in particular, regardless of their knowledge over other school subjects. We expect to uncover the answers to the above questions to realize whether family income and parents' level of formal education affect teenage students' level of environmental awareness and commitment to the environment.

2. Materials and Methods

2.1 Study Location

Kajang town is located in the eastern part of Selangor State in Malaysia. The town is the capital of Hulu Langat district. The population has rapidly increased in recent years with annual growth of 9percent. The city is knownfor industries with a variety of ethnic groups in the labour force coming from all over the country and overseas **City Council of Kajang**(2011). Moreover, Kajang has other activities such as agriculture, businesses and education. The National University of Malaysia (UKM) is located close to the downtown. The municipalities accommodate thousands of academicians and students. In fact, the city represents a small scale Malaysia. Kajanghas 14 public secondary schools that accommodate students from year 7 to year 11 meaning age groups from 12 to 16.

2.2 Participants

The study has focused on the students of 9 secondary schools at the age of 16 who attend "Form Four" classes in Kajang Town, Selangor, Malaysia. After this stage, elite students have the chance to enroll in university for a 1-year matriculation program. Other students, may go to "Form Six" and later on for university and college enrollment, or approach labor markets. The program, "Form Four", is close to the final destination of secondary school students who gain knowledge from formal educational curriculums.

2.3 Sampling

A total of 9 (out of 14) schools agreed to collaborate in this research in Kajang Town, Selangor, Malaysia. The study needed a minimum number of respondents, (n=300). A total of 600 questionnaires were distributed among the students. The respondents' return rate was calculated as 78.33 percent, where 470 questionnaires were received from the students. The selection of the sample size followed the method was mentioned earlier by scientists **Salant&Dillman**(1994);**Krejcie& Morgan**(1970);**Cochran's Formula**(1977).

2.4 Instrument

The research carried out using a questionnaire as data collection instrument. It included 48 closed-ended questions covering various aspects of the current environmental issues at global and local level. It is believed that closed-ended questions probably limit the responses to the topics **Fraenkel&Wallen**(1996). The instrument has a set of question met fulfill the local authority concerns over environmental problems. The questionnaire consisted of 3 sections:

“Awareness”, “Attitude” and “Knowledge”. The “Awareness” section includes 20 questions that measure perception, influence and concern for the environment. The “Attitude” section has 19 questions to evaluate respondents and classify them from pro-environmentalist to anthropocentric points of view and their social responsibilities towards the environment. The scale of awareness and attitude questions consist of 4 options to evaluate the respondents. Since there is no neutral response, respondents were invited to provide their desirability on each point. This method was reported earlier by **Garland** (1991) among others. The “Knowledge” section includes 9 questions that directly measured the respondents’ knowledge of the environment.

2.5 Reliability and Validity of the Instrument

Reliability and Validity are two necessary factors which must be considered in preparing, establishing and in using instrument.

2.5.1 Reliability

The reliability of questionnaire was tested in a pilot group including 34 students (more than 10 percent). The SPSS (ver. 19.0) was used to assess the reliability of the questionnaire. Cronbach’s alpha standardized reliability coefficient for awareness, knowledge and attitude were included 0.865, 0.731 and 0.837 respectively. Based on Spearman Brown Prophecy formula, those three items (awareness, knowledge and attitude) were assessed.

2.5.2 Validity

The content and face validity were implemented for the instrument by expert evaluation. The evaluation was conducted before implementation of the study in order to test the questionnaire that covers contents that match all relevant matters in its academic discipline. Moreover, the validity of the instrument was evaluated by translation from its original language (English) to Bahasa Malaysia (Malaysian Language) and back to English to check its accuracy. The translation processes were done by English-Malay and Malay-English accredited bilingual translators.

2.6 Scoring/Coding of Responses

The instrument consisted of 3 parts of “awareness”, “attitude” and “knowledge”. The first part included 20 questions that address 3 sub topics of awareness including influence, perception and concern. The first section of awareness included 5 questions (1-5) that measure “influence” where scored by “1=Never”, “2=Seldom”, “3=Often” and “4=Very often”. The questions from 6 to 14 measure the second part of awareness called “perception” where scored “1=Much Worse”, “2=Worse”, “3=Better” and “4=Much better”. The last 6 questions of awareness evaluate “concern” on environmental issues (questions 15-20) scored by “1=Not concerned at all”, “2=Somewhat concerned”, “3=Concerned” and “4=Very concerned”. The next part of questionnaire that included 19 questions focused on “attitude” where employed Likert scale of four rates of “1=Strongly Disagree”, “2=Disagree”, “3=Agree” and “4=Strongly Agree”. The last batch of questions (9 questions) targeted the item of “knowledge” that scored by “True/False” choices. Answers to the knowledge questions were evaluated based on correctness of each choice where either true or false choices may possibly be correct or incorrect. The correct answer was valued as “4” while incorrect answer scored “1”.

2.7 Statistical Analysis

The Statistical Package for the Social Sciences (SPSS version 19.0) was the computer software used to analyse the collected data. The statistical analysis of One-Way ANOVA was applied in this study. One Way ANOVA was applied to compare the mean scores of study groups to

analysis the variance. Since the comparison was conducted between more than 2 groups methods such as t-test was not applicable. The levels of awareness, attitude and knowledge were described using a descriptive statistical approach. Variance analysis was employed to measure the mean scores among groups to present participants' differences on environmental topics. The income groups as an independent variable in this study were evaluated by One Way ANOVA where applied to compare differences between group means. A post-hoc test was conducted where variables showed statistically significant differences ($P < 0.05$). An analysis of test variance identified differences among the independent variable of household income and the score level of awareness, knowledge, and attitude among groups.

3. Results

Descriptive statistical analysis was used to show the mean difference in students' environmental awareness, knowledge and attitude (AKA) between different categories of "Income". The results of descriptive frequency analysis of data from each question are reported in annex I (a, b and c). Moreover, a parametric statistical analysis was made to compare the differences of environmental AKA between respondents.

3.1 Awareness

A total number of 419 students replied to the awareness questions. The details of descriptive analysis are shown in Table 1. The results show similarities of means among the various income groups. It moves slightly from a minimum value of 2.35 (\pm SD 0.394) for students who come from families with an income of more than RM60,000 to the maximum common value of 2.43 (\pm SD 0.293 to 0.337) for income groups above RM15,000. Interestingly, students from families who earn below RM15,000 are placed in between the first two categories.

Table 1 Descriptive Analysis of Students' Awareness in Various Income Groups

Family Income (KRM/pa*)	N	Mean	Std. Deviation
<15	93	2.41	0.315
15-30	115	2.43	0.337
30-45	98	2.43	0.293
45-60	54	2.43	0.302
>60	59	2.35	0.394

*Ringgit Malaysia thousands per annum

The One Way ANOVA test was employed to observe the significant differences of students' awareness among various income groups. The results are shown in Table 2. The results show no significant differences among income groups [$F(4, 414) = 0.707, p = 0.588$]. This value indicates that the income of parents has no significant effect on students' environmental awareness in this study.

Table 2 One Way ANOVA Statistical Results between Income Groups on Awareness among Students

Awareness	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.302	4	0.075	0.707	0.588
Within Groups	44.185	414	0.107		
Total	44.487	418			

3.2 Knowledge

The completed questions were received from 466 respondents (out of 470). The results are shown in Table 3. The mean values for families with lower income showed a lower level (3.07 for RM<15k, and 3.05 for RM 15-30k) and higher in families with income equal to and higher than RM 30k. Considering the standard deviation (\pm SD) as a statistical tool to test the homogeneity of responses to certain questions indicates a wider range of difference among students who come from rich families (\pm SD=0.480 for RM>60k and \pm SD=0.514 for RM 45-60k) than the lower income group (\pm SD=0.448; RM<15k). The group which represents more than 23% of respondents (RM 30-45k) shows a reliable degree of similarity with standard deviation lower than other groups (\pm SD=0.412).

Table 3 Descriptive Analysis of Students' Knowledge in Various Income Groups

Family Income (KRM/pa*)	N	Mean	Std. Deviation
<15	102	1.69	0.154
15-30	129	1.68	0.164
30-45	105	1.75	0.139
45-60	54	1.71	0.163
>60	64	1.75	0.189

Ringgit Malaysia thousands per annum

There was statistically significant difference between income groups when knowledge was investigated [F (4, 461) =2.880, p = 0.022] (Table 4). A supplementary post hoc analysis was employed to identify the difference among groups. The results showed that there were significant differences between students whose parents earn from RM15 to 30k when compared to other groups of RM30-45k (Table 5). This shows that their parents' income affects the students' knowledge.

Table 4 One Way ANOVA Statistic between Income groups on Knowledge among Students

Knowledge	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.367	4	.092	3.589	0.007
Within Groups	11.482	449	.026		
Total	11.849	453			

Table 5 Post Hoc Multiple Comparisons result for Knowledge regarding to Income among students

(I) Socio-economic	(J) Socio-economic	Mean Difference (I-J)	Std. Error	Sig.
Between RM15,000 and RM29,999 per year	Between RM30,000 and RM44,999 per year	.061*	.021	.030

3.3 Attitude

A total of 422 students (out of 470) responded to the questions. The statistical analysis of One Way ANOVA was applied to compare means of different income groups where attitude about environmental topics was concerned. The result of the descriptive analysis is shown in Table 6.

The presented means of income groups show a higher value compared to other environmental education factors (awareness and knowledge), fluctuating from 2.79 (RM15-30k income; SD=0.301) to 2.89 (>RM60k income; SD=0.291).

Table 6 Descriptive Analysis of Students' Attitude in Various Income Groups

Family Income (KRM/pa*)		N	Mean	Std. Deviation
<15		93	2.85	.297
15-30		116	2.79	.301
30-45		104	2.86	.244
45-60		52	2.81	.242
*Ringgit thousands	>60	57	2.89	.291

Malaysia
per annum

The outcome of statistical analysis using One Way ANOVA (Table 7) illustrated that there was no statistically significant difference between income categories when attitude is considered [$F(4, 417) = 1.477, p = 0.208$]. The result shows that income of parents has no effect on students' attitude since they presented almost the same environmental attitude.

Table 7 One Way ANOVA Statistic between Income groups on Attitude among Students

Attitude	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.460	4	.115	1.477	.208
Within Groups	32.442	417	.078		
Total	32.901	421			

Since the study revealed a significant difference in students' environmental knowledge among parent's income categories (Figure 2), an additional test was employed to realize the level of formal education of parents. A cross-tab test was conducted among parents and the results were demonstrated in percentages. Parents were divided into two groups of "university attended" and "not university attended" parents. As is shown, the average of minimum level of formal education in parents was observed in the income group of RM15,000-30,000 per annum. This category that is ranked as the most populated group (N=134) appeared with only 11.5% of university educated parents while this number even for parents with the income lower than RM15,000 per annum was 18.3 percent. It is notable that more wealthy parents with income of more than RM60,000 per annum showing 54.6 percent of university attended parents (Figure 3).

Figure 2 The parents who attended university against non-university attended in percentage

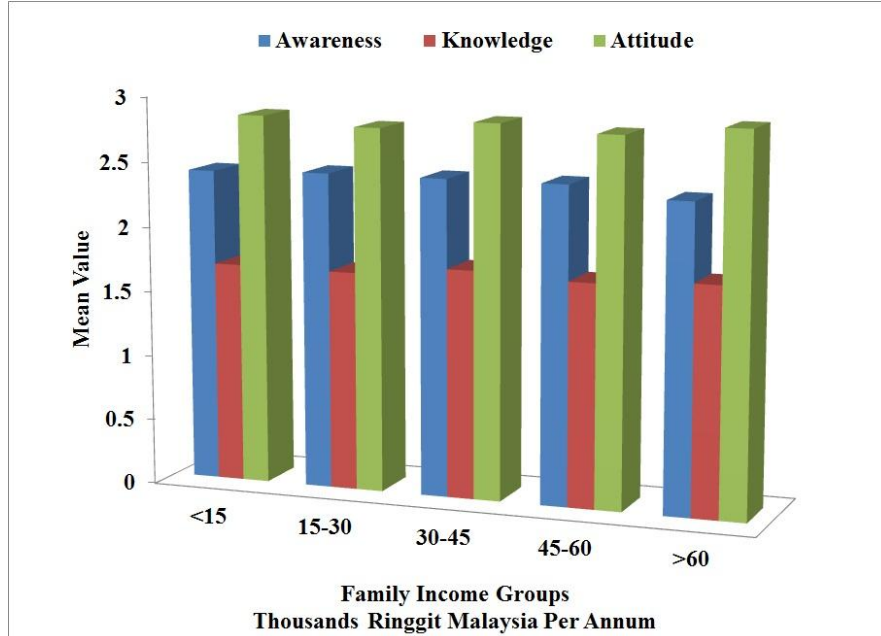
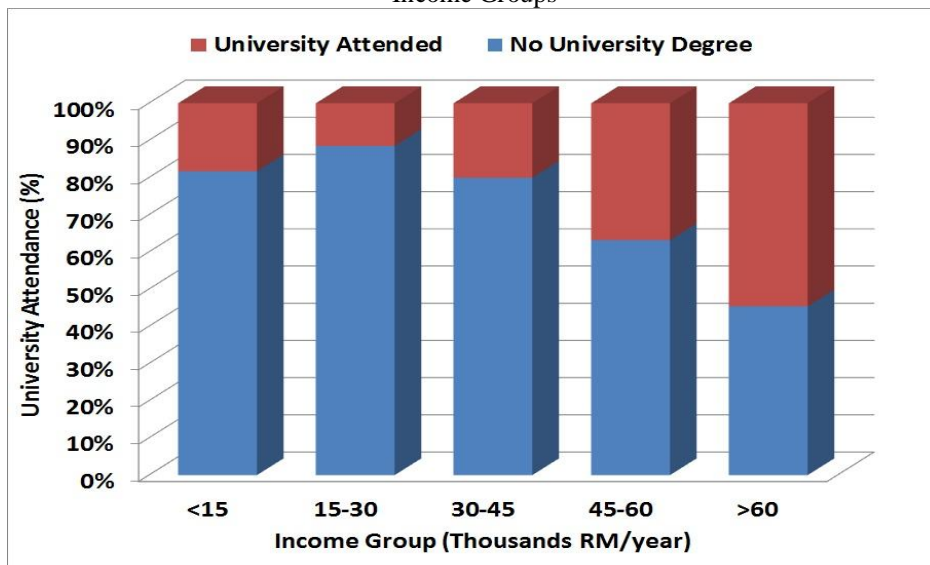


Figure 3 Comparing Mean Values of Awareness, Knowledge and Attitude of Students among Various Family Income Groups



4. Discussion

There are 5 categories of family income to compare students' awareness, knowledge and attitude on environmental topics. In general, environmental knowledge was ranked a maximum while awareness was in minimum range. The Attitude was placed in the middle with the value of 2.84 as the average score. This observation however is different with those reported by Hausbeck et al. (1992) and De le Vega (2006) where knowledge was reported lower due to the different scaling. Figure 3 shows fluctuations of three studied items of awareness, knowledge and attitude among family income groups.

In this figure knowledge had the highest values compared to attitude and awareness. The gap between knowledge and other items suggests a missing venue for adequate plan such as media to influence public in their environmental awareness and attitude **Coyle(2005)**.

4.1 Environmental Knowledge: Poverty vs. Wealth

We still are doubtful about the levels of poverty and the definition of poverty Malaysia. There are various definitions such as the term adopted by the National Bank of Malaysia **Malaysian Department of Census(2010)**, indicating an annual income amount of less than RM12, 000 as the poverty line. There are other definitions such as UK Global (World Bank, 2010) that is partially in agreement with the mentioned Malaysian standards. There is an agreement that right above the poverty line is not assumed as wealth since families still suffer and struggle from the limited income. In this research, we have found that responses to environmental educational items are very similar among groups under and right above the poverty line. However, these are significantly different from the higher income groups. **Bucknall et al. (2000)** emphasized that poverty and environment are in a sophisticated correlation according to the local socioeconomics and macro-economics in larger scales.

The study among various income groups showed no significant difference except for the topic of environmental knowledge. Environmental knowledge has shown to be significantly different among certain income groups. In general, income groups of below RM15, 000 and RM15,000-30,000 per year show similarities with negligible difference in their presented means of the knowledge item. The income group of RM30, 000-45,000per year appeared significantly different from other groups. This result is in agreement with those reported by **De La Vega (2006)** mentioning the effect of family income in certain environmental education topics in the United States. Other studies reported various trends mostly showing limited changes in environmental items. For instance, **De La Vega (2006)** reported these changes only for environmental attitude among students in the United States where their family income is concerned. Income is an important social factor in socio-economic studies where environmental education is measured. **Rovira (2000)** reported that most socio-economic factors such as family income were observed to affect the levels of environmental education in student groups. Furthermore, the level of economic development of societies affects the trend of this understanding about environmental education factors. Poverty and wealth in communities are a dynamic process where change happens in time. This trend might affect the understanding processes among societies where the economy facilitates more environmental involvement. **O'Brien (2007)** emphasized that economic development factors in society may provide a better understanding of the environmental factors among students resulting in a meaningful contribution towards environmental protection. In this research, higher income families showed significant differences when compared with lower income groups. A significant improvement in understanding environmental topics is possible over various family income groups not only for attitude and awareness but also for knowledge where incentive packages encourage them to get themselves involved in related activities **Swinton et al.(2003)**. In general, income has shown a positive correlation with awareness, attitude and knowledge **Digby(2010)**.

Income is an important key component where detrimental environmental effects were reported from imbalanced income distribution of families **Dunn(2002)**. Poverty is in a cause-effect relationship with the environment **Bekalo&Banguey(2002)**. Poor people may cause problems for the environment and likewise a damaged, polluted and/or degraded environment cannot properly support the people's survival. This matter was emphasized by other scientists showing

a meaningful relation between poverty and environmental degradation **Odoemeneet al.**(2011); **Obi**(2000). While lower income groups are potential threat to the environment, they might use less resource (due to poverty) and consequently cause limited environmental damages comparing with wealthy communities. Moreover, the current research has been evaluating the perception factors of students than the actual environmental damages.

4.2 Awareness and Attitude: Public Homogeneity among Income Groups

The study found no significant differences in environmental attitudes and awareness among students who participated in the survey. Both attitude and awareness showed higher levels of mean than the knowledge item (Tables 1 and 6). The mean values for attitude (ranging from 2.79 to 2.89) were significantly greater than mean values for awareness (ranging from 2.35 to 2.43). However there was no significant difference observed among various income groups. There are a couple of reasons for this observation. Firstly, the subject of environmental awareness and attitude appears much easier to understand than the knowledge. Secondly, respondents reply to the questions according to their general feelings and moral viewpoints which make it a public issue rather than a scientific fact. This is why **Madsen** (1996) believes more in environmental awareness and attitude than knowledge for a better future of a sustainable society. Awareness has strong positive correlation with key factors in environmental management system that guarantees sustainability **Sammalisto&Brorson**(2008). For instance, the encouragement of public to recycle and reuse their home appliances is highly influenced by educational program to promote sustainability and mitigate environmental pollution effects **Huang et al.**(2006).

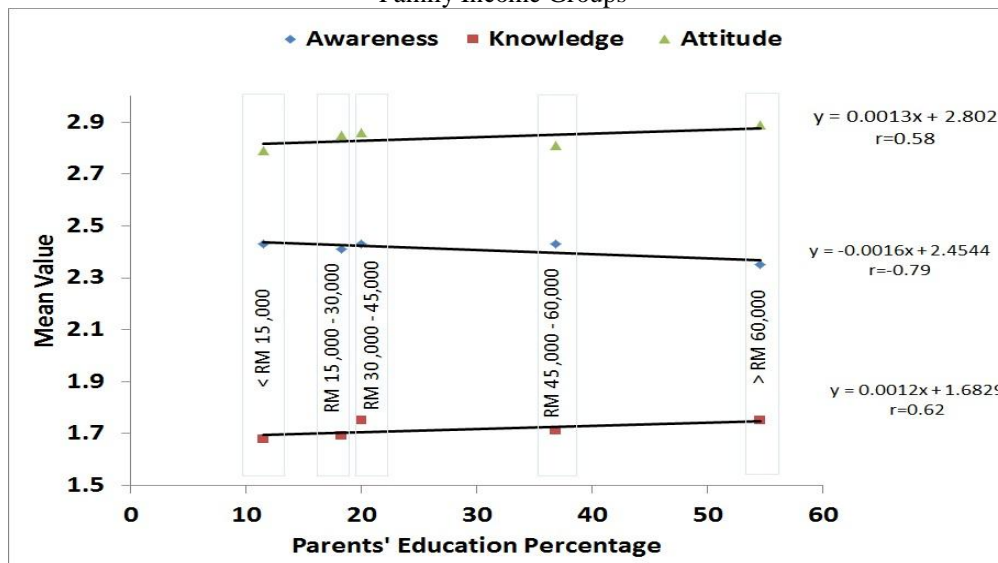
A similar trend to this observation was previously reported from certain group of foreign students in Malaysian universities **Aminrad et al.**(2010). In another report from Minnesota State, **Digby** (2010) demonstrated equal levels of attitude and awareness among adult respondents. Since the topics of awareness and attitude are easy to understand and show a public homogeneity among respondents as well as students from several research studies, it is suggested that environmental education should start from a very early stage of children's formal education **Shim**(2008). As a logical consequence, an environmentally well-educated public generates more environmentally responsible citizens **De Le Vega**(2006).

4.3 Parent's Education: A Possible Influence

Parents were evaluated for their level of formal education. The results are shown in Figure 2. The main results of the study show that students with the lowest environmental knowledge come from families with annual income of RM15, 000-30,000 per year. The study found that, this group includes less educated parents. In this group 88.5 percent of parents have formal education equal to or less than diploma. Only 11.5 percent of them attended some university courses from undergraduate to PhD. The values of parents' level of formal education for higher income groups increases rapidly from 20 (RM 30,000-45,000 per year) to 54.6 percent (>RM 60,000 per year).

The level (percentage) of parents' formal education (X axis) was plotted against the achieved mean values of statistical results in awareness, knowledge and attitude (Y axis) among students. Then a separate set of family income data was merged into the graph for a better understanding of the results. A trend line was plotted individually for each set of mean values (awareness, knowledge and attitude independently). A correlation test was implemented between parents' level of formal education and the mean values (AKA). The graph is shown in Figure 4.

Figure 4 Cross-Plots and Correlation Analysis of Mean Values against Parents' University Degree Percentage and Family Income Groups



This study has found no significant relationship between students' knowledge and parents' level of education at 0.05 (sig=0.13) however it showed a meaningful moderate mathematical correlation (Equation 1).

$$Y = 0.0004x + 3.1002 \quad (r = 0.62) \quad \text{Equation 1}$$

The equation for the students' awareness was negative in both constant number ($a = -0.0016$) of equation and the correlation value ($r = -0.79$). The same trend as knowledge was found in the attitude item. Students' Attitude was shown to be in a positive but moderate correlation ($0.4 < r < 0.7$) with the level of formal education of their parents (Equation 2).

$$Y = 0.0013x + 2.802 \quad (r = 0.58) \quad \text{Equation 1}$$

The Ministry of Education (MOE) Malaysia has not included an independent environmental subject in the formal curriculum of students **Nadson & Shidawati**(2005). Thus, students are not expected to gain this environmental knowledge from their schools and teachers where teachers have independently shown a fair level of environmental concern **Said et al.**(2003). Moreover, **Said et al.** (2003) concluded that teachers have always difficulty understanding the causes of environmental problems. Meanwhile, the public does not depend on formal education to improve environmental decisions of the authorities **Ramsey & Rickson**(1976) and **Chukwuma**(1998). These studies indicate that the main factor resulting indoor environmental quality is poor awareness on the part of citizens. We have realized that the level of parents' formal education contributes to the environmental education of their children. The general public as well as students probably gain this environmental understanding at home either from their parents or other possible sources such as media since it is not provided by the education system.

4.4 Mass Media and Entertainment: A Possible Source of Learning

The impact of media was not reported in this research since it was beyond the objectives of the research. The study has revealed the possibility of impacts on the level of environmental awareness, knowledge and attitude of the studied groups from parents' level of formal

education. The results were consistent with the family levels of income. Both family income and parents' education suggested the same trend of students' progressive levels of environmental understanding. Item such as knowledge has shown higher mean than "awareness" and "attitude". This is however sounds promising but this study suggest a public source of environmental education since formal education does not include much environmental topics at schools. Several studies have highlighted the effects of public media and entertainment on environmental educational topics **Karimi(2006)**; **Arduni(2000)**; **Strong (1998)**; **Yun(2002)**; **Chung & Poon(2003)**; **Sehat(2000)** and **Coyle(2005)**. The mass media was reported to be a leading source of environmental education **Coyle(2005)** to influence the public to become more supportive of environmental actions **Chan(1998)**. This was reported previously by **TKFF (2004)** where public health subjects were concerned. **Mancl (2003)** reported that people with a low level of environmental perception and family income do not take environmental actions. Moreover, they concluded that television is a leading source of environmental education.

5. Conclusion

This study evaluated the role of parents' income and education levels on environmental knowledge, awareness and attitude of students who study in Form Four (16 years old) in Kajang Town, Selangor, Malaysia during 2011. There were 470 students who have been participated in this research. A questionnaire was used as measurement instrument. The data were analyzed using statistical tool of ANOVA. The study concluded that income and education of families were influential components on students' environmental understanding. Government as policy maker is suggested to promote more public wealth in the country. Educational materials and school syllabuses may reveal prominent level of environmental knowledge amongst public. Thus further environmentally oriented subjects in school syllabuses are suggested to provide higher level of environmental knowledge. Both environmental awareness and attitude have shown similarities in various economic and educational groups. Mass media was claimed as a preferred method for public education in the studied groups in this research suggests more involvement of environmental topics in public radio and television programs and newspapers' headlines. The educational secretariats of the country may consider reviewing of essential and compulsory school educational materials. Public with elevated level of environmental perception throughout adequate and wise educational and economic programs may provide cost effective long term sustainability. The study implicates that the components of environmental education (awareness, knowledge and attitude) must be inserted as the added value across current schools' curriculum to promote environmental understanding. These added values may influence public in general as well as students in particular to encourage higher public environmental involvements in the society. As a result, the future decision makers with accompanying of environmentally literate public approach cost-effective sustainable development. This may avoid costs of compensation in nature deterioration and save expenses on fundamental environmental problems such as public wealth improvement and development of environmental infrastructures. The study recommends further researches to investigate the role of educational policies and mass media on public environmental perception.

Acknowledgement

The authors acknowledge Ministry of Higher Education Malaysia for funding (UKM-GGPM-PLW-147-2010) the project. The research is implemented at the Institute of Environment and Development (LESTARI), National University of Malaysia (UKM). We appreciate Ministry of

Education Malaysia (MOE) and its state office of Selangor at Shah Alam for their kind collaboration, facilitating through Kajang district office and respective schools. The authors thank Ms. Helen Morgan for proof reading and helping us to express our work with clarity.

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