

Environmental Literacy Among Year 5 Primary School Children In East Coast Division, Sabah, Malaysia

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Abstract: Environmental Literate individuals are those who are able to perceive and interpret the health of the natural environment and take the required action to ensure that the ecosystem is sustained. This is especially crucial in Sabah where the tourism sector relies heavily on its rich natural biodiversity as a source of economic development. This study determined firstly, the level of environmental literacy in terms of ecological knowledge, disposition, competency and pro-environmental behaviour and secondly, the general level of environmental literacy of Year 5 students. A quantitative questionnaire which included four environmental literacy domains, was used to collect data from 1025 Year 5 students from 17 National Primary schools. Interviews with head teachers and observations were carried out to collect data on the general background of each school and its students. Our findings indicate that the Year 5 students have a moderate level of ecological knowledge, a high level of disposition, a low level of competency and a high level of pro-environmental behaviour. Furthermore, the mean EL score of the Year 5 students are at a moderate level. Based on these findings, implications to current educational policy and practice arise including the need to introduce issue identification and action strategy training into formal primary curriculum and involving students with regular hands-on activities with nature.

Key words: Pro-environmental behaviour • Environmental Education • Ecological knowledge • Primary school

INTRODUCTION

Environmental Literacy is the goal of Environmental Education (EE) [1] and creating a society that possesses high levels of Environmental Literacy (EL) will result in citizens who exhibit pro-environmental behaviour (PEB). This is because PEB is the goal of Environmental Literacy. According to Disinger [2], EL is one's capacity to perceive and interpret the relative health of the environmental systems and take appropriate action to maintain, restore or improve the health of those systems. Local communities relying on tourism to provide employment as well as income need to understand the economic impact of tourism in order for effective policy

implementation [3]. This is especially crucial in Sabah where the tourism sector relies heavily on its rich natural biodiversity as a source of economic development. Tourism has been one of the main highlights of the Sabah State Development Agenda. However, scholars have stressed that rapid expansion in tourism would require proper care on the environment, in order for the tourism industry to be sustainable [4]. Other scholars have emphasised that through holistic development and proper use of rural tourism policies, environmental sustainability can be achieved [5, 6, 7]. In the development of nature-based parks, changes made to the natural environment and landscape may have a negative impact on the visitor satisfaction [8]. Consequently, it is through education and

awareness of the ecosystem and the consequences of their actions, that tourists would be more inclined to practice sustainable behaviour and subsequently, enhance their overall experience of the natural environment [9].

EL assessments are important as it provides information on how effective Environmental Education (EE) programs are in achieving its objectives. In the United States of America, the Middle School Environmental Literacy Instrument (MSELI) and the Secondary School Environmental Literacy Instrument (SSELI) were developed based on four components of EL: knowledge; skill; affective; and behaviour [10, 11].

Research Question and Objectives: In Malaysia, numerous efforts to develop a nation that is environmentally literate have been on going. Pudin [12] reported on activities provided by both government and non-government organisations ranging from public talks and radio shows, to clean-up campaigns, seminars and workshops during environmental events. In Sabah, Malaysia, the Sabah Environmental Education Network (SEEN) was established in 2005 to foster cooperation and coordinate the activities of the various EE providers in Sabah. One of the 6 objectives of SEEN is to evaluate the effectiveness of EE programmes and activities. Within national primary schools, the current formal curriculum in national primary schools which was introduced in 1996 incorporates EE across curriculum. After over two decades, it is timely that assessments be carried out to evaluate, to what extent the current EE curriculum has met the aims of the Malaysian Education Ministry, in creating environmentally literate students. However, until recently, the operational definition of EL did not exist. Consequently, research carried out has been on various aspects of EE, instead of all four components of EL. Furthermore, EE assessments and research in Malaysia have been more focused on secondary students [13]. Thus, researchers in EE have not adequately addressed the issues of EL among younger students. This research aimed firstly, to determine the level of EL of Year 5 National Primary School students across the six Districts in the West Coast Division of Sabah in terms of their ecological knowledge, disposition, competency and pro-environmental behaviour. Secondly, it was aimed to determine the general level of environmental literacy of these Year 5 students.

MATERIALS AND METHODS

A Quantitative Questionnaire: Primary School Environmental Literacy Instrument (PSELI) was used to collect data from a sample consisting of 1025 Year 5 students from 17 National Primary schools. These schools were located in the six Districts across the West Coast Division of Sabah. PSELI was developed based on the four environmental literacy (EL) domains: knowledge; dispositions; competencies; and pro-environmental behaviour, in the Framework for Assessing Environmental Literacy [14]. After considering these EL instruments, the Middle School Environmental Literacy Survey (MSELS), which was used in the National Environmental Literacy Assessment Project was studied further and compared to topics covered in the local curriculum.

Finally, the characteristics of the sample were taken into account before adapting and modifying PSELI to suit the local Year 5 students. PSELI included eight parts: Section I. Background of Student; Section II. Ecological Foundations; Section III. Belief, Attitude, Norm, Perception and Intention; Section IV. How I Think about the Environment; Section V. What I Do about the Environment; Section VI. My Positive Feelings toward the Environment; Section VII. My Feelings for the Environment; and Section VIII. Issue Identification, Analysis and Action Planning. These totalled to 68 items, which included multiple choice questions, as well as 5 point Likert scale items. An expert panel was consulted to verify that the instrument reflected a reasonable definition of environmental literacy, is non-biased and appropriate for Year 5 students.

A pilot test of 45 Year 4 primary school students was carried out on PSELI. A reliability test was conducted and Cronbach's alpha value between 0.06-0.80 were obtained for various parts of the instrument. Changes made to the instrument after the pilot test included standardising all open ended EL questions into multiple choice or likert scale type questions. Furthermore, cartoon-like drawings were incorporated into the final section on Issue Identification and Action Planning, to help the Year 5 students better comprehend the main points of the scenario used in PSELI. Prior to data collection, permission to conduct this study in primary schools in the West Coast of Sabah was obtained from the Ministry of Education. In the selection of the sample, the pre-determined criteria that were taken into account were firstly, schools were selected based on the condition that these schools had at least one class of

Year 5 students registered in the school. Secondly, each of the six Districts needed to be represented by at least two schools. As the capital of Sabah, the densely populated district of Kota Kinabalu was represented by 5 schools. These schools included three co-educational schools, two of which were located in different suburban areas, an all girls' school and an all boys' school. Four schools represented the second most densely populated district of Penampang. Seventeen out of the eighteen schools contacted had consented to participating in the research. A schedule was then prepared based on the convenience and availability of the Year 5 students of each school, to administer the survey, as well as to carry out interviews and observation. The surveys were administered between 31 July to 15 September 2015, which allowed the students to advance in their Year 5 curriculum and co-curricular activities.

Description of Sample: The sample of 1025 Year 5 students included 52.8% female and 47.2% male students (Table 1), which meant that there were 5.6% more female students compared to their male counterpart. A majority of 973 Year 5 students had attended pre-school, whereas only 52 or 5.1% of them had no pre-school education. The ethnicity of the Year 5 students comprised 37.9% local natives of Sabah (Kadazandusun), 28.2% Malay, 3.8% Chinese and 1.6% Indian respondents. Respondents of other races totalled 28.6%, which included all other ethnic groups in Sabah, as well as all other races not included in the four main races in Sabah.

Student involvement in after school clubs generally begin at Year 3, however, students may also join other clubs organised for younger children outside of school. Majority of the respondents (87.2%) had between three to four years of involvement in clubs (Table 1), whereas only 5% of the Year 5 students had 5 years of club involvement. Those involved in clubs for a year or two totalled 24 and 40 respectively. Only 16 students had not participated in any club activities in school. Out of all 1025 respondents, 63.2% of them held some form of leadership role in the either in school or in clubs. The total family income of the students was estimated based on interviews with the head teachers of each of the 17 schools. These were categorised into three groups: upper, middle and lower income groups. Based on the data collected, the percentage students from upper income group was 7.8%, whereas 40.4% of the students were from the middle income group. The majority of 51.8% of the students within the 17 schools came from families within the lower income group.

Table 1: Descriptions of the Sample (N=1025)

	Variables	Frequency	Percentage(%)
Gender:	Male	484	47.2
	Female	541	52.8
Attended Pre-school:	Attended	973	94.9
	Did not attend	52	5.1
Race:	Malay	289	28.2
	Chinese	39	3.8
	Indian	16	1.6
	Kadazandusun	388	37.9
	Others	293	28.6
Club Membership Duration:	0 years	16	1.6
	One year	24	2.3
	Two years	40	3.9
	Three years	476	46.4
	Four years	418	40.8
	Five years	51	5.0
Leadership Roles;	No	377	36.8
	Yes	648	63.2
Family Income Group (%)	Upper	125	7.8
	Middle	646	40.4
	Lower	828	51.8

RESULTS AND DISCUSSION

The first research objective aimed to determine the level of environmental literacy of Year 5 National Primary School students across the six Districts in the West Coast Division of Sabah, Malaysia in terms of their ecological knowledge, disposition, competency and pro-environmental behaviour. The Primary School Environmental Literacy Instrument (PSELI) encompassed four environmental literacy components; ecological knowledge (knowledge), disposition (affect), issue identification and action strategy (cognitive skills) and pro-environmental behaviour (behaviour). The mean scores for each component were converted into percent (Table 2). This was carried out as the number of items per component varied.

Based on former studies on environment literacy carried out by McBeth *et al.* [15] and Erdogan [16], the level of each component of EL was set. The ecological knowledge and cognitive skills components were considered high at 68-100%, moderate at 36-67%, or low at 0-35%. The level of pro-environmental behaviour and disposition components were considered high at 73-100%, moderate at 46-72%, or low at 20-45%.

Ecological Knowledge Level: Ecological Knowledge of the students was measured based on 16 questions. None of the students were able to answer all the questions correctly and only 2 students were able answer 14 questions correctly. This meant that the highest score

Table 2: Levels of Environmental Literacy Components

Components of EL	No. Items (Range)	N = 1025	Low	Moderate	High	Mean score (%)	Level
Ecological Knowledge	16 (0-16)	Range F %	(0-5) 238 23.2	(6-10) 703 68.6	(11-16) 84 8.2	7.25 (45.3)	*Moderate
Issue Identification	1 (0-1)	Range F %	0 852 83.1	n/a	1 173 16.9	0.17 (16.9)	*Low
Action Plan Strategy	2 (0-2)	Range F %	0 591 57.7	50 417 40.7	100 17 1.7	0.44 (22)	*Low
Disposition Intention	12 (12-60)	Range F %	(12-28) 6 0.6	(29-45) 573 55.9	(46-60) 446 43.5	8.76 (73.0)	**High
Positive Disp.	11 (11-55)	Range F %	(11-24) 32 3.1	(25-39) 565 55.1	(40-55) 428 41.8	7.62 (69.3)	**Moderate
Env. Feeling	2 (2-10)	Range F %	(2-3) 7 0.7	(4-7) 256 25.0	(8-10) 762 74.3	1.73 (86.3)	**High
Pro-environmental Behaviour	12 (12-60)	Range F %	(20-32) 64 6.2	(33-46) 531 51.8	(47-60) 430 42	8.86 (73.8)	**High
Environmental Literacy	56 (37-204)	Range F %	(10-40%) 0 0	(41-70%) 503 49.1	(71-100%) 522 50.9	39.54 (70.6)	**Moderate

Note: *High = 68-100%, *Moderate = 36-67%, *Low = 0-35%

**High = 73-100%, **Moderate at 46-72%, **Low = 20-45% n/a = not applicable

Table 3: Year Five Students Ecological Knowledge Score

N	Valid	1025
	Missing	0
Mean*		7.25
Median*		7.00
Mode* (n=180)		7
Std. Deviation		2.314
Variance		5.354
Minimum* (n=3)		1
Maximum* (n=2)		14

*Note: Possible Points = 16

attained by the Year 5 respondents was 14. Table 3 shows the mean score out of the 16 items was 7.25 (SD = 2.314, Range = 0-14) which reflects a moderate level of environmental knowledge according to the criteria set by Mc Beth *et al.* [15]. On the whole, 23.5% of the Year 5 students scored a low level in this section, 68.6% were at a moderate level and 8.2% of the students achieved a high level in their level of ecological knowledge.

Competency Level: Table 2 shows that low level scores were found under the competency section, which included issue identification and action planning. Over 83% of respondents were unable to identify the environmental issue, while 57.7% of the Year 5 students were unable to select suitable action plan strategies. These findings are consistent with studies by McBeth and Volk [17], whereby Issue Identification and Analysis and Action Planning yielded the lowest scores among Grade 6 and Grade 8 students. Research on the effects of Issue Investigation and Action Training (IIAT) on Years 7 and 8 students [18] show significant improvement in PEB, skills and perceived knowledge of environmental action strategies. Therefore, there is a strong indication that the students need the opportunity to be trained in Issue Investigation and Action Training (IIAT).

Disposition Level: A total of 25 five point Likert scale items encompassed the disposition variable in the instrument (PSELI) used. Year 5 students in this study

scored a moderate level of 69.3% (Table 2) on their positive disposition score. High levels of 73.0% and 86.3% were scored in their intention to act pro-environmentally and environmental feelings, respectively. These high scores reflect the Year 5 student's high regards and positive feelings towards the environment. McBeth and Volk [17] also reported similar findings whereby students scored highest for environmental feelings (81% and 78%), compared to their intention to act pro-environmentally (73% and 68.5%).

Pro-Environmental Behaviour Level: The mean score for pro-environmental behaviour was 73.8% (Table 2), which indicated a high level of pro-environmental behaviour. A total of 430 students or 42% scored a high level score of between 47 to 60 points, indicating strong pro-environmental behaviour. A moderate level score between 33 to 46 points was achieved by over 51% of the Year 5 students, while only 6.2% of the students scored a low level of between 20 to 32 points. Findings by other EL and EE researchers generally report that students had higher scores for their verbal intention to act pro-environmentally compared to the actual behaviour. These excellent pro-environmental behaviour scores are in line with the Theory of Planned Behaviour [19], whereby the disposition variable of the Year 5 students, which include the intention to act pro-environmentally, positive disposition and feelings towards the environment, lead to a greater level of pro-environmental behaviour.

Environmental Literacy Score: The second research objective aimed to determine the general level of environmental literacy of Year 5 students. The EL score per respondent was calculated by obtaining the total points scored for all EL questions associated with the four major conceptual variables: ecological knowledge, cognitive skills, affect and pro-environmental behaviour. This EL score was then converted into percentage, after which the mean EL score was calculated for each school (Table 4).

Table 4: Levels of Environmental Literacy

School Code	No. of Respondents	School Category	Urban/ Rural School	District	Mean EL (%)	Rank	Rank Level	EL Level
KK1	70	B	Urban	Kota Kinabalu	69.54	13	III	Moderate
KK2	77	B	Urban	Kota Kinabalu	70.10	10	III	Moderate
KK3	52	A	Urban	Kota Kinabalu	68.51	16	IV	Moderate
KK4	104	B	Urban	Kota Kinabalu	72.63	4	I	High
KK5	90	A	Urban	Kota Kinabalu	70.19	8	III	Moderate
PG1	88	A	Urban	Penampang	69.45	14	III	Moderate
PG2	62	B	Urban	Penampang	67.58	17	IV	Moderate
PG3	80	B	Urban	Penampang	68.74	15	IV	Moderate
PG4	11	SKM	Rural	Penampang	73.84	1	I	High
PP1	9	SKM	Rural	Papar	73.31	2	I	High
PP2	87	B	Urban	Papar	69.84	11	III	Moderate
R1	60	B	Urban	Ranau	70.11	9	III	Moderate
R2	24	B	Rural	Ranau	72.73	3	I	High
T1	73	B	Urban	Tuaran	71.54	5	II	High
T2	58	B	Rural	Tuaran	71.54	5	II	High
KB1	24	B	Rural	Kota Belud	70.32	7	III	Moderate
KB2	56	B	Urban	Kota Belud	69.64	12	III	Moderate
Total	1025				70.57			Moderate

Note: Rank Level I = 73.84-72.28, Level II = 72.27-70.71, Level III = 70.70-69.15, Level IV = 69.14-67.58

Categories: A = >1000 students, B = 999 to 150 students, SKM = <150 students

On the whole, the results for the EL level of the Year 5 students reflect a moderate level, with the mean score of 70.57% (Table 4). 50.9% of the 1025 respondents had a high level of EL with scores between 71 to 100%, whereas 49.1% of the respondents scored between 41 to 70%, indicating a moderate level of EL. Based on the mean EL of the 17 schools, a percentile was then used to compare between mean EL between the 17 schools. Four EL levels were: Level I = 73.84-72.28; Level II = 72.27-70.71; Level III = 70.70-69.15; and Level IV = 69.14-67.58. The top three schools with the highest EL levels were schools with student population of below 200 students. Furthermore, only two of these six schools were urban schools, one of which was situated in the State capital of Kota Kinabalu. Further research is needed to determine the characteristics and possible causes of the high level scores in the top percentile schools, as well as the schools in the lowest percentile.

DISCUSSION AND CONCLUSION

The findings of this research highlighted that the Year 5 students had a moderate level of ecological knowledge, low levels of issues identification and action strategy planning skills, but high levels of pro-environmental behaviour and disposition. The second research objective aimed to determine the general level of environmental literacy of Year 5 students. On the whole, The Year 5 Students had a moderate EL level, reflected in the mean score of 70.6%.

The moderate level of ecological knowledge among the Year 5 students is consistent with findings of other studies with both Year 6 and Year 8 students and Year 5 students [16]. However, unlike these previous studies whereby the students obtained highest scores in knowledge, this study found that students scored higher in the 'pro-environmental behaviour' variable (73.8%) and the 'disposition' variable: 'intention' (73%); 'positive disposition' (69.3%); and 'environmental feelings' (86.3%). The mean for these two variables were much higher compared to the 'ecological knowledge' variable (45.3%).

Low competency scores for issues identification and action strategy planning skills were also consistent with former research carried out among middle school students in the United States of America [17]. However, in order for the EL level of the students to increase, competency scores for issues identification and action strategy planning skills need to be improved. This was evident in several schools that participated in environmental programs such as SERASI and Sekolah Lestari competitions, whereby students played active roles in transforming their school and local environment. This included conducting compost making knowledge sharing programs with neighbouring schools and farmers (Helen Matangiung, Guru Besar, Sekolah Jenis Kebangsaan (C) Cheng Ming, Papar, pers. comm. 20 August 2015).

Implications: Based on the findings of this research, several implications follow. These include implications to

educational policy and practice and implications for future research. The ultimate aim of EE is the development of students who are environmentally literate or who possess pro-environmental behaviour [1, 2]. One of the findings of this study was the low competency level of the Year 5 students. Therefore policy makers need to consider the question of how can issues identification and strategic action skills, which required higher order thinking skills (HOTS), be brought down to Primary school level and incorporated into either the formal or non-formal curriculum. This is indeed timely, as the implementation of HOTS in the Mathematics and Science Primary Curriculum has already been introduced into the Primary School Curriculum.

Hands-on gardening activity need to involve the whole school community. Based on the Theory of Planned Behaviour [19], the students' behavioural intention, or their readiness to act pro-environmentally is also determined by their subjective norms as well as their perceived behaviour control over PEB. Therefore, it is teachers, parents, friends and school community also support the activity. Hungerford & Volk [20] explain that key 'entry-level variables' predispose people to take an interest in nature themselves and later, work for its protection, conservation and sustainable development. These variables would include nature activities in childhood and youth, as well as examples of parents, teachers and other role models who show an interest in nature. These significant individuals strongly influence the PEB of the children to whom they are role models of PEB. Where possible, visits to other garden centres, parks or model schools should be carried out, as a source of exposure, motivation, encouragement and inspiration to the students (Sim Cho Kien, Head Teacher, Sekolah Kebangsaan Saint Francis Convent (M), Kota Kinabalu, pers. comm. 21 July 2015).

In our current society where technology and gadgets are used even by young children as a means to entertain them with virtual games, while parents are engaged with work, children are becoming alienated from nature. Children are becoming more disconnected with nature and are developing ecophobia. The term 'nature-deficit disorder' [21], highlights the seriousness of the problem faced by students in modern times. Due to this, schools need to seriously look into planning environmental activities for students. Clubs that are directly related to outdoor related activities need to plan and carry out outdoor nature related activities for students despite challenges faced.

Based on the results of the data analysis, the competency variable which includes environmental issue identification and strategic action planning had the lowest score among the EL components. In order to address this problem, research on how to effectively introduce issues identification and action strategy training to Primary school students is needed. This is crucial, as it requires students to develop their higher order thinking skills, which may be perceived as being only appropriate for Secondary School students. With special reference to schools with the highest and lowest EL scores in this study, future research should look into the reasons behind the excellent or poor EL level of the schools within this study. Moreover, the antecedents to PEB among students of various age groups, as well as the influence of other variables upon PEB and EL, such as the attributes of Head Teachers and teachers; the attributes of the students' significant others, such as parents, siblings, family; the features and practices of the local community; the characteristics of schools; as well as the EE methods, programs and practices within schools should be investigated. Finally, government bodies such the Ministry of Education, Ministry of Environment, NGOs and local Municipal councils should also work closely with schools to allow more support to be given to students.

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