

Analysis of Cognitive and Affective Component of Environmental Literacy of Pre-service Teachers from Institute of Teacher Education Malaysia

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Abstract: Environmental problems cannot be solved by law alone. One of the effective ways to overcome environmental crisis is by developing environmentally literate society. Education is claimed to be the most promising measures in developing any society. Thus, teachers themselves have to be environmentally literate and competent enough in producing informed learners who can make environmentally responsible decisions and portrays environmental responsible behavior. In coherent with the need to produce environmentally literate teachers, Environmental Education course was introduced in the Institutes of Teacher Education in 2001 and was fully implemented by 2003. This aim of this paper is to present the preliminary analysis of cognitive and affective component of environmental literacy of pre-service teachers who have undergone the environmental education course. This preliminary research utilizes quantitative research design. The descriptive survey method was used to gather required information from the respondents. The respondents were 254 pre-service teachers enrolled under post-graduate program from 12 Institute of Teacher Education of Malaysia. The findings were tabulated using descriptive statistics.

Key words: Environmental Literacy • Pre-service Teachers • Environmental Education • Environmental Awareness • Environmental Issues

INTRODUCTION

Environmental problems are becoming more complex and difficult to manage. There is an urgent need to educate the public and improve their understanding about the environment. Effective and comprehensive environmental education is said to be one of the promising means in educating the public to make environmentally sound decisions and actions regarding potential solutions in protecting the natural resources. Environmental education should go beyond providing information. Thus the 21st century educational system should inculcate positive environmental attitudes and promote the development of environmental literate citizenry who can actively address the environmental challenges and problems [1, 2].

There are various overlapping dimensions in previous literature in defining the term environmental literacy: environmental sensitivity, knowledge, skills, attitudes and values, personal investment and responsibility and active involvement [3]. Disinger and

Roth [3] proposed four elements of environmental literacy: knowledge, skills, affect and behavior. These elements can be addressed via educational efforts. Enhanced by education as personal development, individual's feelings of responsibility towards the environment may be increased. Coyle [4] claimed environmental literacy depends on sound environmental education that concentrates on the depth of public environmental effort. Being an environmentally literate person goes beyond having the knowledge and awareness while at the same time able to impart the actual skills through responsible environmental behavior. However, the effectiveness of environmental education programs is still in question.

Teachers play an important role in developing environmental literacy in future generations. Teachers teaching practices are greatly influenced by their beliefs [5]. Researchers have highlighted that teachers are not adequately trained to effectively implement environmental education in their classrooms. Insufficient teacher preparation and lack of efficient training was identified as part of the factor that contributes to the weakness of

environmental education efforts [6]. Adequate and effective teacher training program are essential in developing environmental literate future teachers [7, 8].

In Malaysia, environmental education program was introduced in Institute of Teacher Education to train pre-service teachers to incorporate environmental values across the curriculum. This environmental education program, known as the *Dinamika Guru Pendidikan Alam Sekitar* (DG-PAS) is a non examination but compulsory course for pre-service teachers enrolled in the post-graduate level program, *Kursus Perguruan Lepas Ijazah (KPLI)*. Among the outcomes outlined in the objectives of the EE program are the teacher will: (i) be able to apply ecological concepts and knowledge to analyze and solve environmental problems, (ii) have positive attitude and values towards the environment, (iii) be able to take action and participate towards environmental conservation and sustainability and (iv) ultimately become a good environmental citizen [9]. These objectives signify the effort of the ministry in developing literate environmental educators.

This paper does not try to propose any definition for environmental literacy but aims in exploring the status of environmental literacy of pre-service teachers using a set of quantitative instrument to better understand the status of environmental literacy of pre-service teachers after the present environmental education program. Only two components of environmental literacy were addressed in this paper which is the cognitive and affective components. Knowledge alone is not sufficient to be precursors for responsible environmental behavior [10]. Knowledge can only be transformed into responsible environmental behavior when supported with the necessary attitude and values, the affective strand, in developing environmentally literate citizenry.

Methodology: This study, involve 254 participants from 12 Institute of Teacher Education Malaysia located in various regions in Malaysia. It is intended to serve as a preface to a study that focuses on the effect of Project

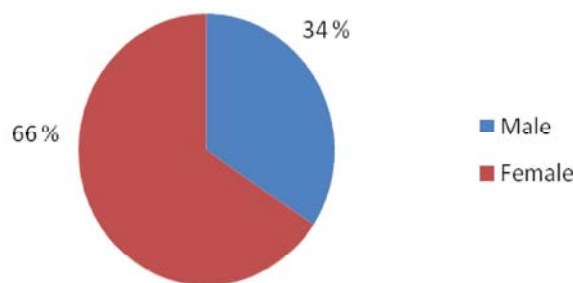


Fig. 1: Gender of Participant

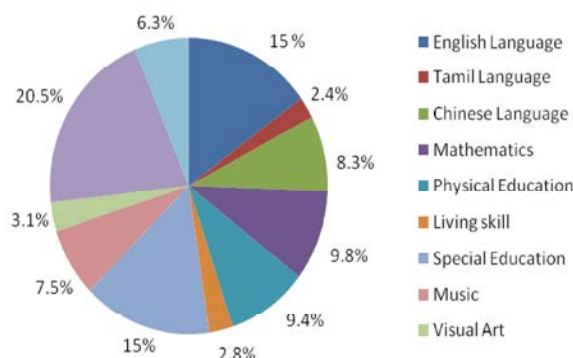


Fig. 2: Subject Major of Participants

Based Learning approach on the pre-service teachers' environmental literacy. Therefore, the intention of this current study is to explore the environmental literacy of pre-service teachers under the present teaching learning strategies as specified by the current standard syllabus. This study also intends to ascertain whether gender has significant effect on the environmental literacy of the pre-service teachers. The relationship between the cognitive and the affective component of environmental literacy is also explored.

Participants: The respondents of this study are students from post-graduate level teacher preparation program for university graduates with a bachelor degree or higher. This is a one-year program from which students graduate with teaching certificates. The majority (66%) of pre-service teachers were women (Figure 1). The students registered under various subject majors (Figure 2).

Table 1: Environmental Literacy Instrument (Cognitive and Affective Components) and scoring rubrics

EL Component	Subsections	Scale	Maximum Score
Cognitive	Knowledge of Ecological Principles	0 / 4	72
	Knowledge of Environmental Problems and Issues		64
	Knowledge of Environmental Issues and Investigation and Action Strategies		20
Affective	Environmental Sensitivity / Awareness	0 - 4	16
	Attitudes and Values for the Prevention and Remediation of Environmental Problems and Issues		76
	Locus of Control		20
	Assumption of Personal Responsibility		8

Instrument: The Wisconsin Environmental Literacy Survey for High School Students was selected for this study. Back translation, validation and reliability procedure were conducted to avoid regional bias. The Cronbach's Alpha for the cognitive and affective component of environmental literacy were determined to be .75 and .89 respectively. Table 1 provides the information regarding the subsections under each component, the scale used to score the items and the possible maximum score for each subsection.

RESULTS AND DISCUSSION

The different sections of the instruments were scored by the authors. The authors used PASW version 18 for descriptive statistics and data analysis. Descriptive statistical analysis for the subtotal and total scores for the two components of EL (cognitive and affective) was performed and will be discussed in this section. Table 2 and table 3 summarize the results of the EL survey. The scores (maximum and minimum) mean and standard deviation for each of subsection as well as the total score for both components were reported. These data is hoped to serve as a point of reference for future studies as similar studies on environmental literacy is very few in Malaysia.

Cognitive Component: The data reveal low scores on all subsections and the overall cognitive component of environmental literacy (Table 2). The mean scores were very low for all subsections: Knowledge of Ecological Principles ($M=36.77$, $SD=11.243$), Knowledge of Environmental Problems and Issues ($M=22.54$, $SD=9.605$) and Knowledge of Environmental Issues and Investigation and Action Strategies ($M=7.72$, $SD=4.749$).

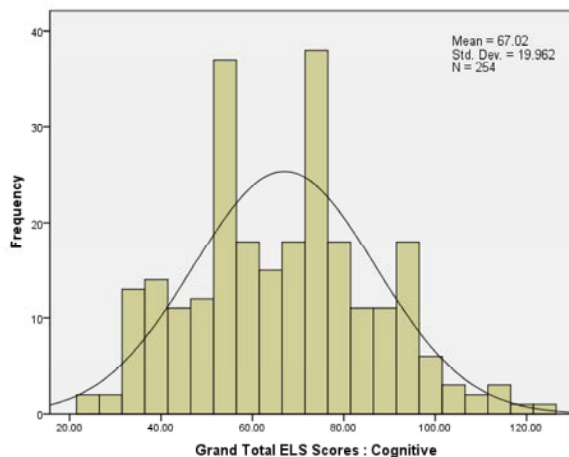


Fig. 3: Frequency Distribution: Grand Total ELS Scores (Cognitive)

The participants failed to reach even half of the total possible scores for The “Knowledge of Environmental Issues and Investigation and Action Strategies” subsection. Participants mean score for Knowledge of ecological Principles show better than the other two subsections by scoring slightly exceeding 50% of the total possible score. Figure 3 shows the frequency distribution of the Grand Total Scores for the affective component of the EL Survey. The majority of the scores fell between 55 to 80.

Affective Component: Table 3 indicates the result for the affective component of the environmental literacy. Result shows that the participants’ scores on this component is comparatively better than the cognitive component. In all the subsection, participants scored more than 60% of the total possible scores. The mean scores were relatively high for all s ubsection: Environmental Sensitivity/

Table 2: Results of the Environmental Literacy Survey (Component: Cognitive)

	Maximum Possible Score	Minimum Score	Maximum Score	Mean	Standard Deviation
Knowledge of Ecological Principles	72	12	64	36.77	11.243
Knowledge of Environmental Problems and Issues	64	0	48	22.54	9.605
Knowledge of Environmental Issues and Investigation and Action Strategies	20	0	20	7.72	4.749
Grand Total	156	24	124	67.02	19.962

Table 3: Results of the Environmental Literacy Survey (Component: Affective)

	Maximum Possible Score	Minimum Score	Maximum Score	Mean	Standard Deviation
Environmental Sensitivity / Awareness	16	8	16	12.18	1.602
Attitudes and Values for the Prevention and Remediation of Environmental Problems and Issues	76	46	83	62.83	6.107
Locus of Control	20	10	25	16.58	2.657
Assumption of Personal Responsibility	8	4	10	8.61	1.239
Grand Total		80	126	100.20	8.108

Table 4: Mean environmental literacy components by gender

	Males		Females	
	M	SD	M	SD
Cognitive	68.18	23.163	66.41	18.118
Affective	100.85	7.927	99.86	8.204

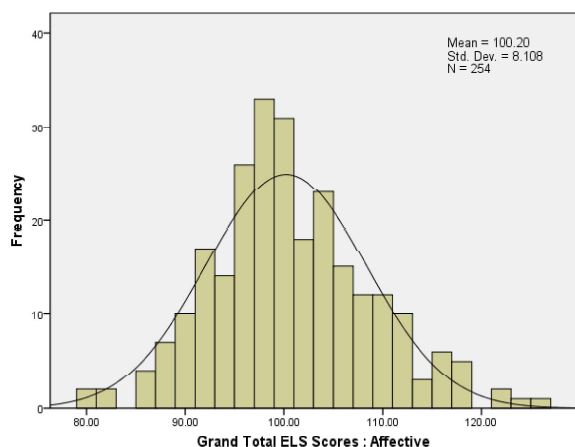


Fig. 4: Frequency Distribution: Grand Total ELS Scores (Affective)

Awareness ($M=12.18$, $SD=1.602$), Attitudes and Values for the Prevention and Remediation of Environmental Problems and Issues ($M=62.83$, $SD=6.107$), Locus of Control ($M=16.58$, $SD=2.65$) and Assumption of Personal Responsibility ($M=8.61$, $SD=1.239$). Participants' mean score for subsection "Assumption of Personal Responsibility" fared best than the others by slightly exceeding 86% of the total possible score. Figure 4 displays a visual presentation of the frequency distribution of the Grand Total of the ELS Scores. These scores indicate a normal distribution where most participants scored between 95 to 105.

Correlation Between Environmental Literacy Components: Cognitive and Affective: Table 4 is a summary of the combined scores for the subsection of the components of environmental literacy that we measured in this study for both males and females pre-service teachers. Pearson correlation coefficients between the two components of environmental literacy were statistically significant ($p < .01$). There is very high and positive correlation between the two component of environmental literacy ($r = .901$, $N = 254$, $p < .01$).

An independent-samples t-test was also conducted to compare the mean scores of both components for male and female pre-service teachers. The inspection revealed

that the differences between the mean scores for cognitive sub (68.18) and affective component (100.85) for male pre-service teachers and mean scores for cognitive component (66.41) and affective component (99.86) for female pre-service teachers are not significant.

Discussion and Implication: The result of this study indicated that pre-service teachers have low cognitive component of environmental literacy but moderate to high level of affective component of environmental literacy. This implies that further training must be provided to enhance pre-service teacher's understanding and knowledge of ecological principles, environmental problems, issues and most importantly environmental issues investigation and action strategies.

On the whole, the pre-service teachers indicated reasonably high scores on all subsection under the affective components. The highest score was for the assumption of personal responsibility whereas locus of control received the lowest score. The high combined score for all the subsections of affective component of environmental literacy indicate that pre-service teachers possess pro-environmental values and attitudes.

Previous research also reported similar findings where limited environmental knowledge parallels with positive environmental attitudes [11, 12]. A probable explanation for this situation may be due to normative influences where attitudes expressed do not reflect true values but are influenced by social desirability [13, 14]. Even though students do not really understand the underlying ecological and environmental concepts related to ecological principles, environmental issues, problems, investigation and action strategies, they do show positive environmental attitude and awareness. However, researchers expect that if the positive environmentally related attitudes are not supported by strong understanding of the ecological principles and environment, the ability of individuals to address environmental problems can be limited. Previous research have also shown that increasing an individual's environmental knowledge via environmental study results in more positive attitudes toward the environment [15, 16].

There remain countless gaps in the literature on pre-service teacher's environmental literacy. Possible factors affecting pre-service teachers' environmental literacy must be studied further. Furthermore, the possible impact of different teaching strategies must be explored. This matter will be examined in subsequent larger study following this preliminary study. Finally, studies such as the current preliminary study should be replicated in other geographical regions in the country with various groups of pre-service teachers to explore whether similar trends occur with other population.

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