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An Exploratory Study to Measure the Environmental Literacy Level of Teachers Teaching at Secondary Schools in Punjab, Pakistan

Abstract *This study measured the environmental literacy (EL) level that the secondary school teachers in Punjab (Pakistan) possessed and found mean scores of various groups of teachers, demographically categorized, significantly different when assessed on scales of environmental literacy. Data collection was done by adapting a valid tool titled as Middle School Environmental Literacy Instrument and administered on 1626 teachers randomly selected from five out of 36 districts of Punjab through stratified random sampling technique. The EL level of teachers was assessed according to “environmental knowledge, environmental dispositions, cognitive skills, and environmentally responsible behavior”. The application of descriptive and complex inferential statistics showed moderate composite score of EL. Also moderate scores on individual scales were found with the exception of the scale on issue analysis. On this scale, the scores were high. However, scores of women teachers were higher than those of male instructors. The experience variable had not shown significantly different scores on EL.*

Key Words: Environmental, Education, Literacy, Secondary, School, Teachers.

Introduction

The word environment encompasses all surrounding features of human existence: ranging from all the constituent parts of our ecosystem, all resources naturally and physically available to the conditions related to socio-economic, technological, political, and cultural issues, whether they affect the environment or are affected by changes in climatic features. [Saha, and Maji \(2013\)](#) asserted, “This interdependence between environment and human beings has resulted in unprecedented irreversible damage to both of them in the recent decades as mentioned in Millennium Ecosystem Assessment in 2005.” Human beings are responsible for plundering the natural resources and playing havoc with not only the natural world but also with today’s and coming generations ([Tam, 2013](#); [Appleby, 2015](#)).

Major environmental threats include air and water pollution, rising temperature of the earth, diminishing plantation, unhealthy acidic rain water, biodiversity risks, depleting natural resources, growing infertility of soil, deforestation, industrial accidents, huge heaps of residential and industrial waste etc. hence, greater risks to sustainability of natural environment as well as to human health and life ([Díaz-Sieffer, et al., 2015](#)). [Wynveen, et al., \(2013\)](#) complain against inadequate research focus on environmental literacy (EL).

[Liefländer, \(2015\)](#) said, “It is necessary that we all show sensitivity to the threats to the environment by making people informed about the effects of their activities on the environment. This calls for political, social and economic commitment in implementing environment friendly solutions so that people get convinced for changing their values and life styles.” This great ‘paradigm shift’ cannot take place without linking it to the universally acknowledged role of education in ensuring a large scale participation of people for the campaign of environment protection ([Yavetz, et al., 2014](#); [Herman et al., 2015](#); [Liefländer, et al., 201](#); [Liefländer, & Bogner, 2014](#); [\(Olivos, et al., 2011\)](#)).

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[Heidari, and Heidari, \(2015\)](#) suggested, “Educating very young children and nurturing their minds with environmentally responsible attitudes and behavior could solve this problem because when they grow up, they will act as responsible citizens and motivate others to be the same in their attitude to environment.” This entails that environmentally literate and actively involved citizens can accelerate progress towards cleaner environment ([Hobart, 2010](#); [Perkins, & Brown, 2012](#); [Arsat, et al., 2011](#)).

Environmental education comprises four necessary elements: knowledge, related skills, attitudes, motivation and a commitment to solve the existing problems as well as preventing emergence of the new ones both at the individual and collective levels ([Omoogun, & Omoogun, 2013](#); [Rozcen, et al., 2014](#)).

Environmental literacy (EL) is the key component of a broader term – environmental education ([Dresner, et al., 2015](#); (Olivos, & Aragonés, 2011; ([Borg, et al., 2014](#); [Otto, & Kaiser, 2014](#)). . Ecological knowledge, a clear and firm stance on environmental problems, the ability to analyze the nature and causes of these problems, and accordingly modifying behaviors can help to limit the impact of unfriendly individual and social practices on the natural surroundings ([Liu, et al., 2015](#); [Hogden, 2012](#); [Hovarth, 2013](#); [Halkos, et al., 2018](#); [Halkos, 2015](#)).

So far, the traditional K-A-B model (Knowledge-Attitude-Behavior) has been used for imparting environmental education that asks for adopting healthy attitudes to environment by developing awareness about problems related to environment, and a better ecological sense ([Mandrikas, et al., 2013](#); [Boubonari, et al., 2013](#); [Cincera, & Krajhanzl, 2013](#)). People would show more responsible and cautious behavior in the utilization of natural resources and maintaining a better quality of environment ([Geng L, et al., 2015](#); [Altanlar, 2011](#); [Brügger, et al., 2011](#)).

Developing environmental literacy (EL) is an important part of teachers’ job, but before performing this job, the question arises: How well are teachers themselves equipped with this literacy? The present study intended to assess the EL level of secondary school teaching faculty and the effect of demographic factors i.e. gender, nature of institution, qualification both academic and professional, subjects they teach, training for environmental education, and community might have on their literacy. Environmental literacy largely depends on availability of teachers who become environmentally literate by being properly trained and made competent to develop these skills in their respective learners, and accordingly supported by education policies, budget allocation, and political sincerity of the governing authorities ([Graziani, et al., 2013](#); [Braus, et al. 2014](#); [Collado, et al., 2013](#)).

Just like other countries, Pakistan also started educating people about environmental problems. As mentioned earlier, the first ever initiative was taken in 1980s. Then in 1991, Coordinated Environmental Education Project recommended incorporation of few elements of environmental education in the syllabi of different subjects in the national curriculum for all levels of school education (Qutub, 1991). In addition, a special curriculum based on environmental education was also introduced at grades 9 and 10 in 2009.

Unfortunately, these initiatives have not been much successful in Pakistan. It is assumed that teachers of limited competence in this area of study, is the main hurdle that impedes development of the environmental literacy, values, caring attitude and skills in school students. Teachers lack knowledge about the processes and practices with which learners could actively participate in an environment friendly activity ([Sadik, & Sadik, 2014](#)). At present, school learners miss out on the experience and exposure to the conditions in which they could exercise knowledge, actions and practices. Regretfully, there is not much realization that these practices develop smart consumers with a lifelong ability to use environmental education more responsibly. In this backdrop, environmentally educated and trained teachers in Pakistani schools are much needed. In order to cater for this need, the number of environmental education training program is fairly low with insufficient human and logistic resources to train a large number of school teachers.

Problem Statement

The study was carried out to measure the environment literacy level of teachers teaching at secondary schools in Punjab, Pakistan.

Research Questions

The study tried to present possible responses to the following research questions:

- 1) What environmental literacy level teachers do of secondary schools of Punjab, Pakistan have in relation to environment literacy variables selected for the study?
- 2) How significantly different is the mean score of each of the demographic variables on environmental literacy scale?

Method and Procedure

The EL level of teachers at secondary schools in Punjab, Pakistan was investigated in this research. For this, nine environmental literacy scales were selected. On the one hand, the study measured differences of total score of environment related literacy and on the other, the differences of scores of each of the demographic variables such as teaching experience and gender. For measuring environmental literacy, the four broad conceptual components selected were: “environmental knowledge, environmental dispositions, cognitive skills, and responsible environmental behavior.” There were nine conceptual scales in all.

Research Design

Descriptive design of research was chosen for assessing the level of environment related to literacy of the teachers teaching at secondary schools with cultural and geographic differences. The data were collected through survey method.

Subjects

Population for this research comprised of secondary school teachers (SSTs) of Punjab, Pakistan. Through stratified random sampling method, a sample of 1500 SSTs from five out of 36 districts of Punjab namely: Bhakhar, Faisalabad, Chiniot, Lahore, and Jhang were selected. The overall response rate was 52 percent.

Research Instrument

An adapted version of the Environmental Literacy Instrument for Middle School Students” (MSELI) version nine designed by [McBeth, Hungerford, Marcinkowski, Volk, and Meyers \(2008\)](#) was used to collect data after getting due permission. Respecting the cultural requirements, the instrument was pilot tested on seventy SSTs to measure its time of completion and validity. Reliability Overall Cronbach alpha was $r = 0.85$.”

Data Analysis

Table 1. Demographic Characteristics of SSTs of Punjab

Characteristics	n	%
Gender		
Male	645	43
Female	855	57

As table 1. shows (M= 38.47, SD = 10.32), the respondents were more or less of middle age. The sample had forty-three percent male and fifty-seven percent female teachers.

Table 2 Experience-based Distribution of Subjects

Teaching Experience in years	n	%
0-5	432	28.8
5-10	270	18
11-15	21514.3	
16-20	204	13.6
21-25	235	15.7
26-30	70	4.7

Teaching Experience in years	n	%
31-35	72	4.8
35-more	2	0.1
Total	1500	100

Environmental literacy (EL) level

The assessment of EL level of the secondary school teachers was done through nine variables. The collected data were analyzed by applying descriptive statistics. Table 4.9 shows a summary of the results. Generally, the means of high range are between 67% - 100% whereas low means fall within zero % to 33%. The range between 34% and 66% is considered medium means.

Environmental Literacy Scores and Demographic Differences

Independent samples t-test was used for demographic variable i.e. gender. The mean scores differences of all of the EL variables were observed.

Table 3 Comparisons of Mean Scores between Male and Female Teachers

Environmental Literacy Variable	Male			Female			Independent sample t-test			
	N	M	SD	N	M	SD	df	t	P	D
REB	645	43.42	19.13	855	43.40	16.97	1477	0.03	.980	0.00††
ES	645	3.38	1.62	855	3.47	1.45	1528	-1.19	.234	0.06††
FAMISU	645	7.06	5.89	855	7.85	5.97	1594	-2.64	.008*	0.13†
ECOFFOUND	645	9.38	3.24	855	10.69	2.94	1492	-8.39	.000*	0.43††
KNOW	645	7.24	2.68	855	7.00	2.61	1594	1.80	.073	0.09†
SKILL	645	7.17	2.73	855	6.61	2.60	1594	4.20	.000*	0.21†
ISUSTAT	645	3.28	1.92	855	3.44	1.84	1557	-1.71	.087	0.09†
ISUAN	556	10.79	5.09	628	12.99	4.12	1067	8.22	.000*	0.50††
ACTPLAN	645	9.09	4.90	855	9.57	5.64	1624	-1.81	.068	0.09††
Total Score	645	95.66	29.87	855	100.73	26.92	1535	-3.57	.000*	0.18††

Note. *significant at $p < .05$

† Cohen's d is calculated by using means & standard deviations of two groups

††Cohen's d is calculated by using t-test value & degrees of freedom

"The table 4.10 shows $M = 95.67$, $SD = 29.87$ of 757 male teachers and $M = 100.73$, $SD = 26.92$ of 869 female teachers were significantly different in their total scores as $t[1534.98] = -3.569$, $p < .05$ because female teachers scored higher. Also, there was ($p < .05$) as significant difference in the variables of ecological foundations as well as familiar issues. Female teachers scored higher in the issue analysis skill than males whereas a significant gender effect i.e. $t(1596) = 4.202$, $p < .05$ in male teachers was recorded higher in perceived skill for citizenship action strategies compared to female teachers. Among other variables, the scores of familiar issues (FAMISU) and of perceived skills for citizenship action strategies (SKILL) and total score had small effect size (i.e. $d < 0.3$) while issue analysis skill (ISUAN) and ecological foundations (ECOFFOUND) had medium effect sized = 0.3–0.6, for gender. Nevertheless, no variable had significant difference for gender like large effect size as $d \geq 0.6$. Variables other than these i.e. environmental sensitivity (ES) responsible environmental behavior (REB), issue identification skill (ISUSTAT), perceived knowledge of citizenship action strategies (KNOW), and action planning skill (ACTPLAN) revealed no significant difference owing to gender at $p < .05$."

Discussion and Conclusion

It can be said that moderate EL level was observed on eight variables while skill variable showed a high score of respondents. The descending order of moderate scores on eight variables is: 1) ecological foundations, 2) issue identification skill, 3) action planning skills, 4) perceived knowledge

of citizenship action strategies, 5) environmental sensitivity, 6) responsible environmental behavior, and 7) perceived skill in using citizenship action strategies and, 8) familiar issues.

A study conducted by using MSELs, version nine assessed EL level of middle school students and reported sixty seven percent combined score of students from sixth and ninth grade ([McBeth, et al., 2008](#)). The ecological foundations variable scale was the same as used for this study. A higher score of students was measured on the scales of environmental feeling and intention to act. Scores for two variables i.e. action planning and issue analysis skills were comparatively low. Studies of similar kind report individuals' level of knowledge as medium. This knowledge is mainly about ecological foundations and familiar issues ([Nastouas et al., 2017](#); [Davis, et al., 2011](#)).

Skill for political action strategies and knowledge variable scored the lowest. However, the highest scores of teachers on responsible environmental behavior pertaining to eco-management then by the scores on the consumer action and persuasion with political action recorded as least. The mean scores, according to findings, of total EL and its different variables indicated significantly different view with respect to different demographic variable categories of teachers measured by applying Independent samples t-test. This revealed SSTs, both male and female showed a significantly different total mean scores where female teachers scored higher having small effect size than the male teachers. Ozturk (2013) also observed similar results favoring females response in studies conducted in the past ([Dawson, 2012](#); [De Leeuw, et al., 2014](#); [Fielding, & Head, 2012](#); [Gatersleben, et al., 2012](#); [Hine, 2013](#)). This tendency might be owing to the gender-specific roles individuals play in their everyday life.

Amidst all the survival efforts Pakistan is making as a developing country on socio-economic and political fronts, environmental education receives comparatively less attention.

Predominant evidence was reported regarding the impact of classroom interventions on action and issue investigation training. Students' knowledge and skills for environmental action strategies along with responsible environmental behavior were positively affected. There has not been much evidence of research about environmental education, environmentally sensitive curriculum and teachers' environmental literacy in Pakistan.

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