INVESTIGATION OF SECONDARY SCHOOL STUDENTS' ENVIRONMENTAL LITERACY LEVELS[i]

Murat Şahin[1],
Naim Uzun[2ii]
[1]Science Teacher, T.H.K. Gazi Middle School, İstanbul, Turkey
[2]Department of Science Education, Aksaray University, Aksaray, Turkey

Abstract:

The current research investigated the secondary school students' environmental literacy levels and the effects of various variables on their environmental literacy levels. The study was carried out with the participation of 525 secondary school students (5th, 6th, 7th and 8th grades) selected from 6 different secondary schools in the city of Bitlis in Turkey in 2013-2014 school year. In order to collect the data in the study, "Elementary School Environmental Literacy Scale" was administered and in the analysis of the gathered data, descriptive statistics, Mann Whitney U-Test and Kruskal Wallis H-Test were employed. At the end of the study, it was concluded that the students' environmental literacy level is medium in general. While variables such as gender, wondering about news about the environment and nature and visit to natural areas in the last two years lead to significant differences among the students' environmental literacy levels, grade level was found to be not leading to a significant difference among the students' literacy levels.

Keywords: environment, environmental education, environmental literacy, environmental problems, environmental knowledge, environmental sensitivity, environmental behavior

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[ii] **Correspondence: email** naimuzun@yahoo.com

1. Introduction

The environment we are living in is continuously being polluted and thus environmental problems are steadily increasing. Unconscious exploitation of natural resources and discharging of the waste produced into the environment without purification result in many environmental disasters. Wastes dumped into seas, lakes and rivers cause the extinction of living organisms residing in these aquatic environments. In addition to this, consumption of fossil fuels instead of environmental friendly alternative energy resources results in many serious environmental problems such as increasing air pollution, global warning and acid rains.

Given that human beings have been living on the earth only for a few million years, it can be logical to ask why especially in recent years the human activities pose serious threats to the environment. Up to Industrial Revolution, the effect of human beings on the environment was very limited but then human activities have become more and more influential on the environment and have come to life-threatening level. With Industrial Revolution, machines gained greater importance in people's lives and thus, wider areas started to be exploited by humans (Doğan, 1997). With increasing environmental problems, the importance attached to environmental education is also increasing every day. Therefore, educational institutions are expected to give environmental education effective enough to reduce or prevent environmental problems. To do so, students' environmental information and attitudes need to be determined and then suggestions for solutions to environmental problems need to be made (Uzun, 2007).

If rapid increase in population, excessive depletion of natural resources, insensitive pollution of the environment, human beings' greed to consume and their living patterns go on as they have been, the power of science and technology will not be enough to prevent irrecoverable destruction of the environment and hunger and poverty that will affect many parts of the world. Elimination of environmental problems is directly connected with the enhancement of human knowledge and value systems (Keleş, 2007).

One of the methods of communication between humans is literacy skill making use of shapes and symbols. When it first appeared, literacy was defined as the co-existence of reading and writing skills. Then, this definition was enhanced with the addition of thinking, evaluation, interaction and speaking skills (O'Brien 2007, Wright 2006). Environmental literacy is the unity of habits such as comprehension, skills, attitudes and opinions related to the environment. Such habits enable individuals to create a strong and positive relationship with their environment and help them to turn their sustainable relationships with biosphere into daily and permanent actions. On the

basis of environmental literacy lie the questions we ask to get informed about our world and answers we give to understand our relationship with the world (Roth, 2002).

One of the purposes of environmental literacy is to make individuals develop new behavioral patterns towards the environment. The basic principle of environmental literacy is to impart the skill to understand environmental problems and to find reasonable solutions to these problems. Though learning and responsible behaviors are related to reading and writing skills, they are not expressed as an important principle (Daudi, 2008).

Individuals should be knowledgeable about the environment and renewable resources, should be in close interaction with the environment, should be sensitive towards environmental issues and problems and should have positive attitudes and behaviors towards the environment. In addition to this, they should seek for new information about the environment, share this new information with people around, research environmental issues, look for solutions to environmental problems, should be ready to make sacrifices from their lives and if necessary, should change them and should actively participate in environmental activities. (Loubser et al., 2001). In order to acquire these qualifications, one of the requirements is to be environmentally literate.

1.1 Purpose and research questions

The purpose of the present study is to determine the environmental literacy levels of the secondary school students (5th, 6th, 7th and 8th graders) and whether their environmental literacy levels vary significantly depending on some variables. For this purpose, answers to the following questions were sought;

1. What are the environmental literacy levels of the secondary school students (5th, 6th, 7th and 8th graders)?
2. Do the students' environmental literacy levels vary significantly depending on gender, grade level, wondering about news and information about the environment and nature and frequency of visiting natural areas in the last year?

2. Method

2.1 Research Model

In the present study, descriptive survey model was used.

2.2 Study Group

The study group of the current research consists of 525 secondary school students from randomly selected 6 different secondary schools in the city of Bitlis-Turkey in 2013-2014 school year. Of the participants, 239 are girls (45.5%) and 286 are boys (54.5). Moreover,

135 of the students are 5th graders (25.7%), 124 are 6th graders (23.6%), 129 are 7th graders (24.6%) and 137 are 8th graders (26.1%).

2.3 Data Collection Instruments

In order to collect the data in the current study, "Elementary School Environmental Literacy Scale" (ESELS) developed by Erdoğan (2009) was used. This scale is comprised of a "Personal Information Form", "Environmental Information Form" consisting of 19 multiple-choice questions and 3 true-false questions, "Environmental Affective Tendencies Scale" consisting of 14 statements and "The Scale of Responsible Behaviors towards the Environment" consisting of 26 statements. Reliability and validity studies of the components making up the environmental literacy questionnaire were conducted both in the original and current study. In the present study, reliability coefficient of The Environmental Information Scale calculated through Kuder-Richardson 21 (KR-21) formula was found to be .62, Cronbach's alpha reliability coefficient of The Environmental Affective Tendencies Scale was found to be .92 and Cronbach's alpha reliability coefficient of The Scale of Responsible Behaviors Towards The Environment" was found to be .91.

2.4 Data Analysis

In the analysis of the collected data, SPSS (Statistical Package for Social Sciences) was used. Whether the data exhibit normal distribution was tested with Kolmogorov-Smirnov test and it was found that the data do not show normal distribution (p<.05). Therefore, out of the non-parametric tests, Mann Whitney U-Test and Kruskal Wallis H-Test were employed.

The number of items and the total scores of the components of environmental literacy (environmental information, environmental affective tendencies towards the environment and responsible behaviors towards the environment) vary. For the clear and understandable determination of the students' environmental literacy levels, the data were rearranged through the standardized scoring method used by McBeth et al. (2008). For this purpose, first, the highest score to be taken from the scale was determined to be 60 (McBeth et al., 2008). The highest score to be taken from the Environmental Information Scale is 22, the highest score to be taken from Environmental Affective Tendencies Scale is 56 and the highest score to be taken from The Scale of Responsible Behaviors Towards the Environment is 156. In order to conduct a better evaluation of the students' environmental literacy levels, these scores were multiplied with a multiplier and thus turned into standard scores. After the operation of turning into the standard score, the highest score to be taken from each component of the environmental literacy scale became 60. By summing up the scores

taken by the students from the components of environmental literacy scale, their environmental literacy scores were calculated. The students' scores were found to be ranging from 15 to 180.

3. Findings

In this section, the findings are presented parallel to the research questions.

Sub-problem 1: What are the secondary school students' environmental literacy levels?

By summing up the scores taken from the sub-dimensions of the environmental literacy; that is, environmental information, environmental affective tendencies and responsible behaviors towards the environment, environmental literacy score for each student was found. Descriptive statistics for the students' environmental literacy scores are given in Table 1 below.

Table 1: Descriptive statistics for the environmental literacy scale

Statistic		Std. Error
Mean	119,36	1,101
Std. Deviation	20,214	
Minimum	53,79	
Maximum	169,09	
Range	115,30	
Variance	408,619	

The highest score to be taken from The Environmental Literacy Scale administered to the students was determined to be 180.00 and the lowest score was determined to be 15.00. The environmental literacy scores were graded as "low", "medium" and "high". A score between 15.00 and 70.00 is considered to be low, between 70.1 and 125.00 is considered to be medium and between 125.1 and 180.00 is considered to be high.

The mean of the students' scores taken from The Environmental Literacy Scale was calculated to be 119.36. This mean value shows that the students' environmental literacy level is medium in general. The lowest score taken from the scale by the students is 53.79 and the highest score is 169.09 (Range=115.30). While the variance belonging to the scale was found to be 408.619, the standard deviation was calculated to be 20.214.

Sub-problem 2: Do the students' environmental literacy levels vary significantly depending on gender?

The female students' environmental literacy mean score (M=124.93) was found to be higher than that of the male students (M=114.83) (Table 2).

Table 2: Descriptive statistics related to the students' scores taken from the environmental literacy scale depending on gender

Gender	N	M	SD
Male	151	124,93	17,916
Female	186	114,83	20,879
Total	337	119,36	20,214

Whether the students' scores taken from The Environmental Literacy Scale vary significantly depending on gender was tested by using Mann-Whitney U Test.

Table 3: Mann-Whitney U Test results related to students' environmental literacy scores in relation to gender

Gender	N	Mean Rank	Sum of Ranks	U	Sig.
Male	151	197,58	29834,00		
Female	186	145,80	27119,00	9728,000	,000
Total	337				

As can be seen in Table 3, the difference detected between the mean score of the male students and that of the female students was found to be statistically significant in favor the female students (U=9728.00; p<.001).

Sub-problem 3: Do the students' environmental literacy levels vary significantly depending on grade level?

It was found that the mean environmental literacy score of the 8th graders is the highest (M=121.67) and the mean score of the 6th graders is the lowest (M=115.46) (Table 4).

Table 4: Descriptive statistics related to the students' scores taken from the environmental literacy scale depending on grade level

Grade level	N	M	SD
5th grade	76	118,40	20,658
6th grade	76	115,46	19,415
7th grade	81	120,95	21,336
8th grade	104	121,67	19,360
Total	337	119,36	20,214

Whether the students' scores taken from The Environmental Literacy Scale vary significantly depending on grade level was tested by using Kruskal Wallis H Test.

Table 5: Kruskal Wallis H Test results related to students' environmental literacy scores in relation to grade level

Grade level	N	Mean Rank	df	x^2	Sig.
5th grade	76	167,19			
6th grade	76	147,78			
7th grade	81	179,29	3	5,388	,145
8th grade	104	177,82			
Total	337				

As can be seen in Table 5, the differences detected among the students' environmental literacy scores depending on grade level were not found to be significant as a result of Kruskal Wallis H Test (x^2=5.388; p>.05).

Sub-problem 4: Do the students' environmental literacy levels vary significantly depending on the state of whether wondering about environmental news and information?

It was found that while the environmental literacy mean score of the students stating that they wonder very much about the news and information about the environment and nature is the highest (M=122.65), the mean score of the students stating that they wonder about the news and information about the environment and nature very little is the lowest (M=109.57) (Table 6).

Table 6: Descriptive statistics related to the students' scores taken from the environmental literacy scale depending on the state of whether wondering about the environmental news and information

The state of whether wondering the environmental news and information	N	M	SD
I wonder very little	55	109,57	18,363
I moderately wonder	122	122,65	19,585
I wonder very much	159	120,40	20,289
Total	336	119,44	20,180

Whether the students' scores taken from The Environmental Literacy Scale vary significantly depending on the state of whether wondering about the news and information about the environment was tested by using Kruskal Wallis H Test.

Table 7: Kruskal Wallis H Test results related to students' environmental literacy scores in relation to the state of whether wondering about the environmental news and information

State of whether wondering about the environmental news and information	N	Mean Rank	df	x^2	Sig.	Between-groups difference
I wonder very little	55	117,40				* I moderately wonder > I wonder very little
I moderately wonder	122	184,31	2	18,970	,000	
I wonder very much	159	174,04				*I wonder very much > I wonder very little
Total	336					

As can be seen in Table 7, the environmental literacy mean score of the students stating that they wonder about the news and information about the environment moderately or very much is significantly higher than that of the students stating that they wonder about the environmental news and information very little (x^2=18.970; p<.001).

Sub-problem 5: Do the students' environmental literacy levels vary significantly depending on the frequency of visiting natural areas in the last one year?

While the environmental literacy mean score of the students stating that they have sometimes visited natural areas in the last one year was found to be the highest (M=123.18), that of the students stating that they have never visited natural areas in the last one year was found to be the lowest (M=107.98) (Table 8).

Table 8: Descriptive statistics related to the students' scores taken from the environmental literacy scale depending on the frequency of visiting natural areas in the last one year

Frequency of visiting natural areas in the last one year	N	M	SD
Never	57	107,98	18,096
Rarely	40	122,73	20,921
Sometimes	176	123,18	19,749
Frequently	63	116,77	19,172
Total	336	119,35	20,243

Whether the students' scores taken from The Environmental Literacy Scale vary significantly depending on the frequency of visiting natural areas in the last one year was tested by using Kruskal Wallis H Test.

Table 9: Kruskal Wallis H Test results related to students' environmental literacy scores in relation to the frequency of visiting natural areas in the last one year

Frequency of visiting natural areas in the last one year	N	Mean Rank	df	x^2	Sig.	Between-groups difference
Never	57	109,09				*Sometimes > Never
Rarely	40	184,41				*Rarely > Never
Sometimes	176	188,56	3	30,930	,000	*Frequently > Never
Frequently	63	156,10				
Total	336					

As can be seen in Table 9, a significant difference was found between the environmental mean score of the students stating that they have sometimes, rarely and frequently visited natural areas and that of the students stating that they have never visited natural areas in the last one year favoring those visiting (x^2=30.930; p<.001). The score differences between the groups of students stating that I have rarely visited, I have sometimes visited and I have frequently visited were found to be not significant (p>.05).

4. Results, Discussion and Suggestions

The findings of the current study conducted to investigate the secondary school students' environmental literacy levels were interpreted in light of literature and they are presented below.

The analyses conducted revealed that the students' environmental literacy level is medium. In a similar study, Erdoğan (2009) found that the environmental literacy level of the 5th graders is also medium. Güler (2013) also reported that the environmental literacy level of the 8th graders is medium and this is not the desired level. Sontay (2013) investigated the environmental literacy levels of gifted children and their peers and found that the environmental literacy level of the gifted children is high and that of their normal peers is medium. McBeth et al. (2008) conducted a study with the participation of 6th and 8th graders from 48 different schools in America and reported that the environmental literacy level of the students is medium. In many other studies (O'brien, 2007; Owens, 2000; Kışoğlu et al, 2009; Altınöz, 2010; Timur, 2011; Karatekin, 2011), it was found that the students' environmental literacy level is medium. Kibert (2010) worked with university students and found that their environmental literacy level is low. The environmental literacy level of the female students was found to be significantly higher than that of the male students. The environmental literacy mean score of the eight graders was found to be the highest and that of the 6th grades was found to be the lowest but the difference was not found to be significant.

The analysis conducted to see the effect of the state of wondering the news and information about the environment revealed that the environmental literacy levels of the students wondering about the news and information about the environment moderately and very much are significantly higher than that of the students wondering very little.

A significant difference was found between the environmental mean score of the students stating that they have sometimes, rarely and frequently visited natural areas and that of the students stating that they have never visited natural areas in the last one year favoring those visiting. Güler (2013) also found that the students wondering the news and information about the nature and visiting natural areas more frequently have higher levels of environmental literacy. Karatekin (2011) reported that the pre-service teachers frequently visiting natural areas and participating in environmental activities have higher levels of environmental literacy.

In light of the findings of the current research, the following suggestions were made to enhance secondary school students' environmental literacy level.

- As the environmental literacy levels of female students and higher graders are higher, activities to be conducted to improve students' environmental literacy levels should primarily focus on male students and low graders.

- Given that the environmental literacy levels of the students wondering about the news and information about the environment, students should be encouraged to wonder about environmental issues and motivated to gain more information.

- As the environmental literacy levels of the students spending more time in natural areas were found to be higher, while giving environmental education, students should be taken to natural areas and provided with opportunities to make observations there. Such field trips should be frequently organized by both schools and non-profit organizations.

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