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Examination of Primary School Teachers' Environmental Literacy Levels*

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Abstract

In this study, it is aimed to determine the environmental literacy of primary school teachers in terms of some variables. In this study which employs a descriptive method, the study group is composed of 371 primary school teachers working in state primary schools in the province of Afyonkarahisar, Turkey in the academic year of 2016-2017. Environmental behavior scale, attitude scale towards environmental problems and environment knowledge test were used as data collection tools in the study. The data obtained were analyzed by using the SPSS 20 statistical program. Independent-samples t-test, one-way analysis of variance and simple linear correlation statistics were used in the analysis of results obtained from this study. As a result of the research, it can be argued that the environmental literacy levels of the primary school teachers are at moderate level. In addition, the findings of the research show that both primary school teachers' environment behavior levels and their environmental knowledge levels are moderate and their attitudes towards about environmental problems are high. Finally, it was concluded that there was a positive and significant relationship between attitude and behavior, a positive and significant relationship between attitude and knowledge, and a positive and significant relationship between knowledge and behavior.

Key words: Environmental literacy, Primary school teacher, Seniority, Educational status

Introduction

People have constantly affected the environment from past to present directly or indirectly. People have obtained the necessary needs for their life and have taken the opportunity to shape the environment with the knowledge and technology they have acquired during this time. As a result of this unconscious and uncontrolled shaping, environmental problems began to occur. Especially with the industrialization which has been developing rapidly since the second half of the 20th century, nature has been seen as an inexhaustible resource and the balance in nature has been damaged. Due to the deterioration of this balance, environmental problems such as global warming, pollution, loss of living diversity, reduction of agricultural areas, depletion of energy resources and drought have started to occur. Also, the last report of the Living Planet Report, published by the World Wide Fund for Nature (WWF) in 2016 confirms the emergence of these environmental problems. In the report, it is emphasized that the populations of natural life in the past decade have shown an alarming decrease by an average of 67 percent and it is becoming increasingly difficult to protect the environment with all its forms and functions (WWF, 2016).

People have started to pay attention to environmental problems, which were not included in the agenda of the people in the beginning, due to reasons such as reducing of the resources, the inability to obtain the requirements, the environmental pollution reaching to the level that endangers the human health; hence, solutions to these problems are being search. According to Yıldız, Sipahioğlu and Yılmaz (2000), especially after 1960s, the seriousness of the subject and the borderless of environmental problems have been understood; therefore, efforts shown have been increased to protect the environment and to resolve the existing problems at national and international level. For this purpose, many meetings were organized, reports were published and ways to protect the environment were tried to find. The first United Nations Conference on the Human Environment, which was conducted in Stockholm, Sweden in 1972, is important because it is the first evaluation on a global scale in this issue and the universality of environmental problems is accepted at this conference. Moreover, 1979 the First World Climate Conference, 1990 the Second World Climate Conference, 1992 the Rio

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Summit and the Second United Nations Conference on Environment and Development are other important meetings on environment and ecology.

Although it is important for governments and international organizations to prevent environmental problems, it is the duty of all humanity. Due to the universality of environmental problems, they affect all individuals without discriminating language, religion, race or color. According to Erten (2003), environmental problems will continue to exist unless people's usual thinking and behavior change. Therefore, a fundamental change in people's understanding of the environment is needed. This change is only achieved through an effective and efficient environmental education.

Kıyıcı (2009) stated that environmental education is important to increase awareness levels of people about environment, to increase positive attitudes and behaviors of people about environment, to protect the natural life and to restore the damaged environment. According to Gough (2002), environmental education is a form of education that works against the degradation of the environment and the reduction of the quality of life and takes these issues to the center of education. The roots of environmental education are based on the education of conservation of nature and natural resources. Peyton, Campa, Winterstein, Peyton and Peyton (1995) claimed that in the course of time, environmental education, rather than informing all individuals about environmental education, aimed to educate enthusiastic and talented participants in environmental management. As Mangas, Martinez and Pedauyé (1997) indicated, the main objective of environmental education is to evaluate environmental problems, find solutions to the problems identified, and create positive behaviors towards the environment. Environmental education has an important role since all members of society have attitudes, values, behaviors and necessary information about environmental protection. In summary, the main purpose of environmental education is to educate individuals with respect to environmental literacy.

McBeth and Volk (2010) stated that the earliest expression of environmental literacy was in an article by Charles Roth (1968) in *Massachusetts Audubon*. Todt (1995) emphasized that environmental literacy was revealed by politicians during explaining the purpose of environmental education. As cited Liu et al. (2015), although the term "environmental literacy" is used as the most important objective for environmental education, little agreement has been reached between educators on the definition of terms. Meuth (2010) mentions that environmental literacy includes knowledge, skills and motivation to contribute to environmental needs and sustainable development. In recent years, environmental literacy is thought to be the most important component of environmental education (Saribaş, Teksoz and Ertepinar, 2013: 3664). There is a profound but remarkable distinction between environmental education and environmental literacy. While environmental education is based on the process, the objectives of environmental literacy are based on more results (Karimzadegan and Meiboudi, 2012: 405). Achieving environmental literacy is an objective that requires extensive effort as well as traditional education. Owens (2000) states that environmental literacy supports broad-based environmental education, including knowledge, attitudes, skills and active participation in society.

There is no consensus on the components of environmental literacy. It is seen that the researchers listed different numbers of components. According to Roth (1992: 9), environmental literacy has six components: environmental sensitivity, knowledge, skills, attitudes and values, individual responsibility and active participation. By combining these six components, Roth has addressed environmental literacy in four parts: knowledge, skills, affective domain and behavior. Hsu (1997: 34-35) listed the components of environmental literacy as knowledge, sensation, skill and behavior. On the other hand, it is generally accepted that environmental literacy consists of three elements: knowledge, attitude and behavior (Johnson, Smith ve Nicholas, 2000; Kibert, 2000; Murphy, 2002; White, 2006).

Considering the importance of environmental education in the creation of environmental awareness and prevention of environmental problems, it is necessary to start this education during the early ages for all individuals. In addition, environment education starting in the family continues at school. Mosothwane (1992) states that the introduction of environmental education into schools early provides attitudes towards a quality environment, that children learn especially by observing adult behaviors, that young children are in a very sensitive stage in creating learning and attitudes; therefore, instead of trying to change the attitudes of adults, it is easier to develop correct environmental attitudes of children at an early age. Considering the importance of early ages in the formation of attitudes, values and behaviors, the importance of primary school teachers that children encounter in their school life after their families is better understood. The qualifications of teachers who will provide environmental education in schools will determine the effectiveness of education. For elementary school children, the primary school teacher is one of the people that children take the most models. Hence, it is important for primary school teachers to be environmentally friendly, environmentally conscious and environmentally friendly, shortly environmental literate individuals for the formation of the child's environment-

oriented personality. Therefore, it is necessary to determine the level of environmental literacy of the primary school teachers and to maximize this level.

Research purpose

The aim of this study is to investigate the environmental literacy of primary school teachers in terms of some variables. For this purpose, the environmental literacy levels of teachers were determined using the Environmental Behavior Scale, the Attitude Scale Towards Environmental Problems and the Environmental Knowledge Test. Since environmental literacy has been dealt with in three dimensions as knowledge, attitude and behavior by many researchers (Johnson, Smith & Nicholas, 2000; Kibert, 2000; Murphy, 2002; White, 2006), these three dimensions have been examined in this study. In addition, the differentiation of environmental literacy levels according to gender, seniority, working place, education level, membership to environmental non-governmental organization and environmental project work was investigated. Answer is searched in the research for the following sub-questions:

- What is the level of environmental literacy of primary school teachers?
- Is there a significant difference in environmental literacy levels of primary school teachers according to gender, seniority, place of residence, educational status, membership of environmental non-governmental organizations, and whether or not environmental project work is carried out?
- Is there a significant relationship between environmental literacy components like behavior, attitude, knowledge?

Significance of Research

It is considered important to investigate these questions because it is important to raise environmental literacy generations with an effective environmental education in order to prevent the increasing environmental problems. In order to change the ongoing understanding of the environment, the importance of environmental education is increasing in order to raise environmental literacy for individuals who are sensitive to environmental problems, have environmental problems and can work to solve environmental problems. To be able to provide environmental education suitable for this purpose is only possible with teachers who have environmental literacy. Considering the importance of early childhood education, the fact that primary school teachers who play a significant role in shaping the personality and thoughts of children is an environmental literate will be an important determinant of the attitudes and behaviors of children who will have a say about the future of environment in the future. When the literature on the subject is reviewed, it is seen that many studies (Altınöz, 2010; Cheng and Wu, 2015; Dibgy, 2010; Esa, 2010; Timur, 2011; Varışlı, 2009+) have been done in the field of environmental literacy. When we investigate these studies in which environmental literacy is considered, it is generally seen that the components of knowledge, attitude, behavior and perception of literacy are examined separately; however, it is seen that environmental literacy as a whole is not examined according to some variables. In this study, environmental literacy of the class teachers is considered as a whole and examined in terms of various variables.

Methods

Research Model

This study, which aims to examine the environmental literacy of primary school teachers in terms of some variables, is a descriptive study in the survey model. Karasar (2015, p. 79) indicated that survey models, generally, are arrangements on a whole group or sample taken from the population in order to make a general judgment about the population. In addition, Karasar (2015, p. 77) states that the survey models are research approaches aimed at describing a situation that exists in the past or the present, as they exist.

Participants

The population of the study consists of primary school teachers working in primary schools in Afyonkarahisar province in 2016-2017 academic year. The sample group of the study is composed of 371 class teachers working in state primary schools in the province of Afyonkarahisar in the academic year of 2016-2017. The study group was determined according to maximum diversity sampling from maximum variation sampling methods.

Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz and Demirel (2014, p. 90) stated that the maximum variation is determined by determining the different situations related to the problem examined in the population and working on these situations. In determining the teachers to be reached, the diversity was aimed by choosing schools with different socio-economic characteristics. The information about the primary school teachers who compose of sample of research is shown in Table 1.

Table 1. Distribution of the study group by demographic variables

Variable		F	%
Gender	Female	197	53.1
	Male	174	46.9
	Total	371	100.0
Vocational Seniority	0-5 years	109	29.4
	6-10 years	96	25.9
	11-15 years	55	14.8
	16-20 years	46	12.4
	21 years and above	65	17.5
	Total	371	100.0
Working Place	Province	135	36.4
	District	121	32.6
	Town-Village	115	31.0
	Total	371	100.0
Education	Bachelor's	323	87.1
	Master's	48	12.9
	Total	371	100.0
NGO Membership	Yes	34	9.2
	No	337	90.8
	Total	371	100.0
Project	Yes	61	16.4
	No	310	83.6
	Total	371	100.0

As seen in Table 1, 53.1% of the teachers who participated in the research were female and 46.9% were male.

Data Collection Tools

In order to determine literacy levels of teachers, Environmental Behavior Scale, Attitude Scale Towards Environmental Problems and Environmental Knowledge Test were used. Specifying the statement that the data collection tool will be used for the purposes of confidentiality and academic purposes, various questions like gender, seniority, work place, educational status, status of membership to environmental NGOs and environmental studies were asked in order to learn the demographic information of the participants. Below is information about the scales used in the research.

Environmental Behavior Scale: Timur and Yılmaz (2013) conducted the Turkish adaptation study of the environmental behavior scale developed by Goldman, Yavetz and Pe'er (2006). The scale was applied to 208 science and technology teachers to determine its validity and reliability. The Cronbach Alpha reliability coefficient was found to be 85 for the scale consisting of 20 items in five Likert type (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = General, 5 = Always). The obtained results showed the scale can also be used in Turkey (Timur & Yılmaz, 2013). In our study, the Cronbach alpha reliability coefficient of the test was found to be 0.74.

Attitude Scale for Environmental Problems: The scale was developed by Aksu (2009). The scale was applied to 100 science and technology classroom teachers to determine its validity and reliability. Factor analysis was performed to investigate the form validity. As a result of the analyzes, attitude scale that consist of a total of 11 items, with load values ranging from 0,433 to 0,747 and collected under one factor, were obtained. The Likert-type attitude scale was rated 5-4-3-2-1 for positive expressions and 1-2-3-4-5 for negative expressions. High score indicates positive attitude towards environmental problems, low score indicates negative attitude towards environmental problems. The lowest score that can be taken from the scale is 11 and the highest score is 55 (Aksu, 2009). In our study, the Cronbach alpha reliability coefficient of the test was found to be 0.84.

Environmental Knowledge Test: Test is developed by Altinoz (2010). Initially, a pilot study was carried out with 115 teacher candidates for the reliability study consisting of 20-items and as a result of the analysis, final version was created by making necessary adjustments. The final version of the environmental knowledge test consists of 15 multiple choice items. In the test, each item has five options and the value of each problem is set to 1 point. The maximum score that can be taken from this test is 15 and the minimum score is 0. The reliability coefficient Cronbach's alpha coefficient of the Environmental Knowledge Test, which was analyzed, was calculated as 0.63. (Altinöz, 2010). In our study, the Cronbach alpha reliability coefficient of the test was found to be 0.68.

Data Analysis

The data obtained from the study were analyzed with SPSS 20.0 (Statistical Package for Social Science for Staff Computer). In order to make the data more comprehensible, tables were created and the data in the tables were interpreted. The normality of data distribution was examined with Skewness and Kurtosis values. The coefficient of skewness and kurtosis of the data in the study is between +1 and -1 values. As a general rule, Morgan, Leech, Gloeckner and Barrett (2004, p. 49) propose to accept the + 1, -1 values of the skewness coefficient as the normal distribution measure. In the study, parametric statistics based on the normal distribution were made as one of the prerequisites. The total scores of teachers from literacy variable were calculated. The t-test was used for unrelated groups in order to determine whether the scores of the teachers of environmental literacy vary according to gender, educational status, membership of environmental NGOs and the environment of the project. One-way analysis of variance (ANOVA) test was used to determine whether teachers' scores in environmental literacy were statistically significant according to seniority and workplace variables. Levene test results were obtained for the equality of the variance of the groups and no significant difference was found between the variances of the groups. In order to see that the significant differences in the ANOVA test are among between which groups, Scheffe test was preferred because of the equality of variances and the difference in the number of samples in the groups. Sipahi, Yurtkoru and Çinko (2008: 128) emphasized that when the assumption is made that the group variances are equal, Scheffe test is preferred if there is a difference between the number of samples in the groups. In addition, a simple linear correlation test (Pearson Product-Moment Correlation) was applied to determine whether there is a significant relationship between environmental behavior, environmental attitudes and environmental knowledge scores which are components of environmental literacy.

In order to determine environmental literacy levels of teachers, environmental behavior scale, attitude scale towards environmental problems and environmental knowledge test were utilized. Firstly, the average of the total scores obtained by the teachers in these 3 scales was calculated and their levels were determined. Then, environmental literacy levels of teachers were determined using a method developed by Mcbeth, Hungerford, Marcinkowski, Volk and Meyers (2008). According to this method, a standardized maximum score (60) that teachers will take from all scales is determined, then according to this standardized score multipliers have been determined in order to calculate maximum scores that can be taken from each scale.

The multiplier values used to transform teachers' raw score to corrected score in determining environmental literacy levels are shown in Table 2.

Table 2. Multiplier values and maximum scores

Environmental Literacy components	Number of questions	Rating Range	Multiplier	Maximum Points that can be taken
Behaviour	20	20-100	0.6	60
Attitude	11	11-55	1.09	60
Knowledge	15	0-15	4.0	60
Total Points	46	31-170		180

As can be seen in Table 2, the highest score that can be taken from each scale is 60. According to this, in order that a teacher from the environmental behavior scale consisting of 20 items can take full points (60), the correct number must be multiplied by a factor of 0.6. Additionally, in order that a teacher from the attitude scale consisting of 11 items can take full points (60), the correct number must be multiplied by a factor of 1.09. Furthermore, in order that a teacher from the environmental knowledge test consisting of 11 items can take full points (60), the correct number must be multiplied by a factor of 4.0. According to the standardized score, the highest environmental literacy level is 180 points and the lowest environmental literacy level is 24 points. Then,

the environmental literacy level is divided into three categories that are low, medium, high in between the lowest and the highest point. Accordingly, between 24-76 points show a low level of environmental literacy, between 77-128 show the medium level of environmental literacy, between 129-180 points show high level of environmental literacy.

In statistical studies, when the difference between the groups is examined, the significance level is accepted as 0.05. It is stated that in the case of $p < 0.05$ there is a significant difference between the groups and in the case of $p > 0.05$ there is no significant difference between the groups. In addition, the results obtained from data collection tools are shown in the tables and interpreted accordingly.

Results

In this chapter, environmental behaviors, environmental attitudes, environmental knowledge and environmental literacy levels of teachers were determined based on the data obtained from data collection tool. In addition, with the help of these data, the answers to the research questions were stated.

Findings on Teachers' Environmental Literacy Levels

The model developed by McBeth et al. (2008) was applied to determine the environmental literacy levels of teachers. According to this model, environmental literacy level is evaluated in 3 categories (low, medium, high). Teachers' environmental literacy levels are shown in Table 3 based on this model.

Table 3. Environmental literacy levels of teachers

		Low	Medium	High	\bar{X}	S
Behaviour	Range	12-27	28-44	45-60		
	f	5	215	151	43.01	6.60
	%	1.3	58.0	40.7		
Attitude	Range	12-27	28-44	45-60		
	f	0	110	261	48.70	6.96
	%	0	29.6	70.4		
Knowledge	Range	0-20	21-40	41-60		
	f	54	222	95	34.18	11.21
	%	14.6	59.8	25.6		
Total Points	Range	24-75	76-128	129-180		
	f	3	197	171	125.90	18.70
	%	0.8	53.1	46.1		

As shown in Table 3, environmental behavior, environmental attitudes and environmental knowledge scales were used to determine teachers' environmental literacy level. The level of teachers, the average and standard deviation of the total points received by teachers from these scales were determined separately. The maximum and minimum scores that teachers can take from these three scales are divided into three categories based on the method developed by McBeth et al. (2008). The highest score that teachers can get from these three scales is 180. According to the standardized score, it is determined that between 24-75 points are low, between 76-128 points are medium and between 129-180 points are high environmental literacy level. Accordingly, the ratio of teachers in the range of 24-75 points was 0.8% (3), the ratio of teachers in the range of 76-128 points was 53.1% (197) and the ratio of teachers in the range of 129-180 points was 46.1% (171). The mean score of the teachers in three scales was calculated as 125.90 and the standard deviation was calculated as 18.70. According to this value, it can be said that teachers' level of environmental literacy is moderate.

Findings on the Difference Between the Levels of Environmental Literacy Based on the Gender of Teachers

Independent samples t-test were performed in order to determine whether the average scores of teachers' scores on the environmental literacy scale differ according to gender are shown in Table 4 below.

Table 4. Difference between environmental literacy levels by gender

	Gender	N	\bar{X}	S	sd	t	P
Environmental Literacy	Female	197	127.26	17.50	369	1.494	0.136
	Male	174	124.35	19.90			

As can be seen in Table 4, the average environmental literacy score of female teachers ($\bar{X}=127.26$) is higher than the average score of environmental literacy of male teachers ($\bar{X}=124.35$). However, according to the results of the analysis, teachers' environmental literacy levels did not show a significant difference according to their gender ($p>0.05$). According to this finding, it can be said that teachers' environmental literacy levels did not change according to gender.

Findings on the Difference Between Environmental Literacy Levels of Teachers based on their Seniorities

According to the seniority of the teachers, the information on the scores obtained from the environmental literacy scale is shown in Table 5.

Table 5. Environmental literacy according to the seniorities

Group	Seniority	N	\bar{X}	S
1	0-5 year	109	121.90	20.13
2	6-10 year	96	124.80	16.84
3	11-15 year	55	131.31	20.52
4	16-20 year	46	126.67	16.99
5	21 and above year	65	129.07	17.12

As shown in Table 5, the average of teachers with 0-5 years of professional experience in terms of environmental literacy scores is the lowest ($\bar{X}=121.90$) and the average of teachers with a professional seniority of 11-15 years is highest ($\bar{X}=131.31$). The results of the one-way analysis of variance that aimed to determine whether the average of scores that are taken by the teachers on the environmental literacy scale differ according to their seniority are shown in Table 6 below.

Table 6. Difference between environmental literacy according to seniorities

Source of Variance	Total of Squares	sd	Average of Squares	F	P	Mean Difference
Between Groups	4150.267	4	1037.567	3.032	0.018	1-2
Within Groups	125253.314	366	342.222			
Total	129403.581	370				

As seen in Table 6, a statistically significant difference was observed between at least two of the environmental literacy scores of teachers according to their seniority [$F(4-366) = 3.03, p<0.05$]. The effect size calculated by the test result ($\eta^2 = 0.03$) indicates that this difference is low. As a result of the multiple comparison test, it is seen that the significant difference is between the teachers having 0-5 years professional seniority and the teachers who have vocational seniority between 11-15 years. According to this finding, it can be said that the teachers who have vocational seniority between 11-15 years have higher environmental literacy levels than the teachers who have vocational seniority between 0-5 years.

Findings Related to the Difference Between the Levels of Environmental Literacy According to the Teachers' Working Place

Information on the scores of the teachers on the environmental literacy scale according to the working place is given in Table 7 below.

Table 7. Environmental literacy scores according to the working place

Group	Settlement	N	\bar{X}	S
1	Province	135	129.40	16.68
2	District	121	125.82	18.44
3	Town-Village	115	121.87	20.46

As can be seen in Table 7, the average of the teachers working in the provincial center with respect to environmental literacy scores (\bar{X} =129.40) is the highest and the average of the teachers working in the district center (\bar{X} =125.82) is the lowest. The results of the one-way analysis of variance conducted in order to determine whether the average scores of the teachers' scores on the environmental literacy scale differ according to residential area are shown in Table 8 below.

Table 8. Difference between environmental literacy according to working place

Source of Variance	Total of Squares	sd	Average of Squares	F	P	Mean Difference
Between Groups	3520.823	2	1760.412			
Within Groups	125882.758	368	342.073	5.146	0.006	1-3
Total	129403.581	370				

As seen in Table 8, a statistically significant difference was observed between at least two of the scores of the teachers on the environmental literacy scale according to the working place [$F(2-368) = 5.15, p < 0.05$]. The effect size ($\eta^2 = 0.02$) of the test result shows that this difference is low. As a result of the multiple comparison test, significant difference was found between the teachers working in the city center and the teachers working in the town or village. According to this finding, it can be said that the teachers who work in the provincial center have higher environmental literacy levels than the teachers working in towns or villages.

Findings on the Difference Between the Levels of Environmental Literacy According to the Educational Status of Teachers

Independent samples t-test was conducted in order to determine whether the mean scores of the teachers on the environmental literacy scale differ according to the educational status are shown in Table 9 below.

Table 9. Difference between environmental literacy according to the educational status

	Education	N	\bar{X}	S	sd	t	p
Environmental Literacy	Bachelor's	323	125.93	17.26			
	Post graduate education	48	125.68	26.66	53.01	.064	.949

As can be seen in Table 9, the average of teachers who has bachelor's degree (\bar{X} =125.93) is higher than the average of teachers who graduate from post graduate education (\bar{X} =125.68) in terms of environmental literacy scores. However, according to the results of the analysis, teachers' environmental literacy levels did not show a significant difference according to their educational status ($p > 0.05$). According to this finding, it can be said that teachers' environmental literacy levels did not change according to their educational status.

Findings Regarding the Difference Between the Levels of Environmental Literacy According to Teachers' Membership to the Environmental Non-Governmental Organization

Independent samples t-test was conducted in order to determine whether the average scores of the teachers on the environmental literacy scale differ according to the membership status of the non-governmental organization are shown in Table 10 below.

Table 10. Difference between environmental literacy according to membership to the NGO

	Membership	N	\bar{X}	S	sd	t	p
Environmental Literacy	Member	34	129.83	19.49			
	Non-member	337	125.50	18.60	369	1.287	0.199

As it is seen in Table 10, the average of the teachers who are a member of an organization (\bar{X} =129.83) is higher than the average of non-member teachers (\bar{X} =125.50) according to the membership status of the environmental Non-governmental organization in terms of environmental literacy scores. However, according to the results of the analysis, the environmental literacy levels of the teachers did not show a significant difference according to the membership status of the environmental Non-governmental organization ($p > 0.05$). According to this finding, it can be said that teachers' environmental literacy levels did not change according to the membership status of non-governmental organizations.

Findings Regarding the Difference Between Environmental Literacy Levels According to the Situation of Doing Project Studies on Environmental Education of Teachers

Independent samples t-test was carried out in order to determine whether the average scores of the teachers on the environmental literacy scale differ according to the environmental project studies are shown in Table 11 below.

Table 11. Difference between environmental literacy according to the situation of doing project

	Project	N	\bar{X}	S	Sd	t	p
Environmental Literacy	Yes	62	134.92	18.32	369	4.214	0.000
	No	309	124.12	18.28			

As seen in Table 11, it is seen that there is a significant difference [$t(369)=4.21$, $p<0.05$] between the average of the teachers doing project studies on environmental education ($\bar{X}=134.92$) and the average of the teachers who do not ($\bar{X}=124.12$). According to this finding, it can be said that doing environmental project work has a significant effect on environmental behavior.

Findings about the Relationship Between Environmental Literacy Components (Behavior, Attitude, Knowledge)

The results of the Linear Correlation analysis that was conducted to determine whether the relationship between the scales used to determine the environmental literacy levels of teachers (environmental behavior, attitude towards environment problems and environment knowledge) are significant are shown in Table 12 below.

Table 12. The relationship between environmental literacy components

Parameters		Attitude	Behaviour	Knowledge
Attitude	r	1	.387**	.420**
	p		.000	.000
	N	371	371	371
Behaviour	r	.387**	1	.235**
	p	.000		.000
	N	371	371	371
Knowledge	r	.420**	.235**	1
	p	.000	.000	
	N	371	371	371

** Significance at correlation 0.01 level (bidirectional)

As seen in Table 12, there is a positive, medium-level and significant relationship ($r=.387$, $p<.01$) between environmental attitude and environmental behavior. Again, there is a positive and medium level relationship ($r=.420$, $p<.01$) between the environmental attitude scale and the environmental knowledge scale. In addition, there is a positive and low-level relationship ($r=.235$, $p<.01$) between the environmental attitude scale and the environmental knowledge scale.

Discussion

In order to determine the environmental literacy level of teachers, environmental behavior scale, attitude scale towards environmental problems and environmental knowledge tests were utilized. Accordingly, teachers' environmental behaviors and environmental knowledge were at a moderate level and their attitudes towards environmental problems were found to be high. At the end of the study, it was determined that the teachers' level of environmental literacy was moderate, that is, not at the desired level. When the literature is reviewed, there are very a few studies that aim to directly determine the environmental literacy of teachers. Cutter (2002) stated that primary school teachers have low environmental literacy. Similarly, Owens (2000) in his study with urban secondary school teachers in the United States concluded that teachers' environmental literacy is low. Altınöz (2010), Karatekin (2011), Kayalı (2018), Kışoğlu (2009) and Timur (2011) concluded that environmental literacy of teacher candidates is medium level. In addition, Erdoğan (2009) determined that the 5th grade students in the primary school have medium level of environmental literacy. Güler (2013) also stated that the 8th

grade primary school have medium level of environmental literacy. Moreover, Yavetz, Goldman and Pe'er (2009) concluded that students' environmental literacy is insufficient.

Although the attitudes of teachers towards environmental problems are high, environmental behaviors and environmental knowledge at an intermediate level can account for the reason of environmental literacy's being medium level. Considering that the attitudes of teachers on a specific subject affect the quality and permanence of the subject taught, it can be considered positive that their attitudes towards environmental problems are high. However, it can be said that the study findings show that teachers have difficulty in transforming these positive attitudes into behavior. Studies show that high attitudes towards the environment and high environmental knowledge are not sufficient for people who show harmful behaviors to the environment (Erten, 2005). Morrone, Mancl and Carr'a(2001) stated that a literate person is someone who is not just equipped with knowledge but also who can combine knowledge with values that lead to actions. Although the attitudes of the teachers who will raise the environmentalists of the future are at a high level, the environmental knowledge is not at the desired level yet. It can be shown that the reason for this is the inadequate environmental education of teachers during their undergraduate education. As a matter of fact, there are studies supporting this view in the literature. In the studies of Tuncer Teksöz, Boone, Yılmaz Tuzun and Öztekin (2014), teacher candidates do not have an acceptable level of knowledge; in other words, they have determined that they are not capable of identifying, analyzing, examination and evaluating environmental problems and the relationships between natural and social systems. Maskan, Efe, Gönen and Baran (2006) state that the the majority of prospective teachers in higher education institutions in Turkey have no adequate environmental education courses and said that the content of existing courses is not designed to improve the good behavior about the environment. As a result of Aydemir's (2007) study, it was found that teachers did not take an adequate environmental education in their higher education and after graduation. Teksöz, Şahin and Ertepinar (2010) concluded that the environmental knowledge of the prospective teachers is insufficient and explained this situation with the insufficiency of the environmental education. In addition, Erdoğan (2009) stated that approximately 23% of the participants were insufficient in terms of environmental knowledge, and he interpreted this as an alarming result, and recommended teacher training programs to be reviewed and improved with providing more time for environmental education with a comprehensive curriculum. Moreover, it has been demonstrated that a sufficient and qualified environmental education has led to a positive increase in attitudes and behaviors at the level of knowledge, thus to improve environmental literacy (Bradley, Waliczek & Zajicek 1999; Deniz & Genç, 2007; Güven, 2011; Kızıl, 2012; Yavuz, 2006).

When the environmental literacy of the teachers was investigated in terms of various variables, it was found that there was no significant difference according to gender, education status and membership of non-governmental organization related to environment. However, it was found that there was a significant difference in terms of environmental literacy between teachers who have vocational seniority between 11-15 years and teachers who have a seniority between 0 and 5 years. This difference is in favor of teachers with a professional seniority of 11-15 years. In addition, it was found that there was a significant difference between the teachers working in the province center and the teachers working in the town or village in terms of environmental literacy. This difference is in favor of teachers working in the city center. The reason for the high environmental literacy scores of teachers living in the province may be that environmental problems are felt more in cities than villages. Moreover, it was found that there was a significant difference between the teachers working on the project and the teachers who did not carry out project work about environmental in terms of environmental literacy. This difference is in favor of teachers who make project work. It is expected that the project studies on the subject will have a positive effect on teachers' environmental literacy. When the related literature is examined, it is seen that the number of studies that investigate environmental literacy as a whole is very low, rather studies which investigate the components of environmental literacy separately are preferred. Looking at these few studies, Owen (2000), in his study with secondary school teachers, found that male teachers had significantly higher scores in terms of total environmental literacy compared to female teachers; however, according to seniority, teachers did not find a significant difference. Kahyaoğlu (2011), in his study with Science and Technology teachers, stated that educational level and location differences do not have any effect on environmental literacy, but that gender and seniority have a significant effect on environmental literacy.

Looking at the relationship between scores obtained from environmental literacy subscales, it was seen that there was a positive, moderate and significant relationship between attitude and behavior. Hsu and Roth (1998); Kaiser, Wolfing and Fuhrer (1999); Negev, Sagy, Garb, Salzberg and Tal (2008); Yavetz, Goldman and Pe'er (2009) have found a positive, moderate and significant relationship between attitudes and behaviors in their research with different study groups. Bilim (2010) and Timur (2011) found a positive, low level and significant relationship. Chu et al. (2007) found a high level, positive and significant relationship. On the other hand, Esa (2010) and Uzun (2007) found no significant relationship. There was a moderate, positive and significant

relationship between attitude and knowledge. Esa (2010); Kaiser et al. (1999); Negev et al. (2008); Pe'er, Goldman and Yavetz (2007) found a similar result. Altınöz (2010); Güler (2013); Karatekin (2011); Kibert (2000); Timur (2011); Yavetz, Goldman and Pe'er (2009) found a positive, low level and significant relationship. There was a positive, low level and significant relationship between knowledge and behavior. Altınöz (2010); Chu et al. (2007) and Esa (2010) found a similar result. Bilim (2010), Hsu and Roth (1998) found a positive, moderate level and significant relationship. However, Karatekin (2011) came up with a negative and low-level relationship. On the other hand, Kaiser et al. (1999); Kibert (2000); Negev et al. (2008); Pe'er, Goldman and Yavetz (2007); Timur (2011); Uzun (2007); Yavetz, Goldman and Pe'er (2009) did not find a significant relationship between knowledge and behavior.

Teachers' knowledge about the environment effect on their environmental attitudes and environmental behaviours positively. In addition, the positive attitudes of the teachers towards the environment can affect their environmental behaviors positively. Makki et al. (2003) stated that environmental decisions and behaviors are influenced by environmental knowledge and attitudes. The attitude of an individual who has knowledge about environmental problems and responsible behaviors towards the environment are different from those who do not have any knowledge. There are theoretical and empirical reasons to support this relationship, although many obstacles arising from the difference between environmental attitudes and pro-environmental behavior have been adopted (Turaga, Howarth & Borsuk 2010). Atasoy and Ertürk (2008) mentioned that based on the definition that attitude is an internal tendency that regularly determines the thoughts, feelings and behaviors of an individual about an object, there is a certain connection between thoughts, feelings and behaviors. Aksu (2009) stated that the stronger the attitude is, the more consistent its relationship with behavior is.

Considering the results obtained in the research, the following suggestions can be made:

- It is important to carry out studies to improve the teachers' environmental literacy levels. In this sense, it can be provided that teachers can take courses related to environmental literacy during their university education or the quality of existing courses can be increased. In addition, in-service environmental education courses can be organized for the teachers.
- Although the attitudes of teachers towards environmental problems are high, it is determined that environmental knowledge and environmental behaviors of teachers are moderate. In order to increase the environmental knowledge of the teachers and to enable them to transform their existing attitudes into behavior, practical in-service trainings can be given in which balanced knowledge, attitude and behavior dimensions are considered.
- As the findings of the study indicate that the attitude and environmental behavior scores of the teachers who work on environmental projects are significantly higher than those who do not work on environmental projects, it is important to ensure that teachers do projects or participate in projects about environment. For this purpose, teachers can be encouraged and rewarded. In addition, environmental projects organized within a program can be provided for them.
- This study is limited to variables such as gender, seniority, working place, educational status, membership to the non-governmental organization and doing project about environment. Investigating the attitudes of teachers towards environmental problems in terms of different variables can be another study to be conducted.

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