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AN INVESTIGATION OF ENVIRONMENTAL LITERACY LEVELS AND ENVIRONMENTAL POLLUTION IMAGES OF 7TH YEAR PUPILS IN PRIMARY EDUCATION [1]

Research article

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Abstract

Environmental education is defined as raising self-sacrificing people with an awareness of all kinds of problems and solutions to create a more sustainable environment. Environmental literacy is essential in environmental education. The concept of environmental literacy means having a good education in the field of the environment and a high level of knowledge about the environment.

This research is a descriptive study examining the environmental literacy levels and environmental pollution images of 7th grade pupils in primary education. The study was conducted with 76 pupils in four classes of a public secondary school in the city of Ankara in the 2018-2019 academic year. 35 (46.1%) female and 41 (53.9%) male pupils participated in the study.

The Environmental Literacy Scale, the Environmental Sensitivity Scale, the Environmental Behaviour Scale, and the Cognitive Skills Interview Form developed by Sontay, Gökdere, and Usta (2015) were used in the study. In addition, the pupils were asked to draw environmental pollution themed pictures in order to explore their images of environmental pollution. The drawing method was used to reveal the pupils' perceptions about environmental pollution.

Keywords: environmental literacy, environmental behaviour, environmental sensibility, environmental problems, environmental education, image of environmental pollution

1. Introduction

The habitat in which humans and other living beings engage in interaction and pursue all their social, cultural, physical, and biological activities throughout their lifespan is defined as the environment (Daştan, 1999; Seçgin, Yalvaç, and Çetin, 2010). Humans having a such an interaction with the nature continually use the resources in the natural environment. Day by day, humans are using up environmental resources more and more rapidly on an incredible scale and, wittingly or unwittingly, causing much damage to the environment in which they live. This rapid increase in the use of environmental resources leads to a wide range of environmental issues (Borden, 1985).

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Environmental pollution is defined as damage caused to the air, water, and soil by pernicious substances that negatively affect the health of all living beings, doing material harm to them and leading to structural damage (Çepel, 2003). The literature in this field makes reference to a great deal of environmental pollution issues such as air, water, and soil pollution, the danger of extinction of animal and plant species, industrial and nuclear waste, food pollution, garbage, noise pollution, the thinning of the ozone layer, climate change, natural disasters, global warming, radioactive pollution, communicable diseases, and chemical pollution (Erten, 2005; Beyhun et al., 2007; Smyth, 1995). Moreover, in line with the world's population growth, these issues are aggravated by the increase in human needs and the senseless use of natural resources.

The damage that we cause to our environment has an impact not only on our own habitat but on the whole universe (Erten, 2005). This highlights the necessity to tackle environmental problems on a more universal scale. For this reason, environmental studies are conducted on the international platform and a common environmental consciousness is targeted. The workshop held as part of the Stockholm Conference organized by the United Nations in 1972 could be an example of this (UNESCO, 1977). Research highlights humans' environmental consciousness as the most basic factor in environmental issues (Kıyıcı et al., 2005). Environmental consciousness is undoubtedly vital for humans protecting their environment and fulfilling their responsibilities in this context. Environmental education is a key element in raising environmentally conscious individuals (Geray, 1992). It has been emphasized on many platforms that environmental problems can be prevented first and foremost through environmental education (Soran, Morgil, Atav, and Işık, 2000; Altınöz, 2010; Pooley and O'Connor, 2000; Stevenson, 2007; Alım, 2006; Dunlap and Liere, 1978; UNESCO, 1979). Environmental education is aimed at raising individuals' environmental knowledge levels and making a positive change in their attitudes towards the environment as well as turning these attitudes into behaviours in the individual (UNESCO-UNEP, 1977). Making humans environmentally sensitive and conscious so that they leave a clean environment to future generations forms the foundation of environmental education (Doğan, 1997; Erten, 2005). Environmental education in the 21st century not only improves environmental knowledge and sensitivity but also supports individuals' environmental attitudes and behaviours (Atasoy and Ertürk, 2008).

Environmental literacy is one of the most important objectives of environmental education (Disinger and Roth, 1992; Hungerford, Peyton, and Wilke, 1994; Iozzi, Laveault, and Marcinkowski, 1990). The concept of environmental literacy was introduced by Charles Roth and defined as an individual's total amount of knowledge about the environment and level of awareness of environmental problems (Roth, 1968). Environmental literacy is currently defined as noticing the present state of the environmental balance, restoring the broken balance in the environmental system, and planning for a better environmental order (Disinger and Roth, 1992; Balkan Kıyıcı, 2009). Environmentally literate individuals are those who are sensitive to the environment and who can also provide solutions to environmental problems (NAAEE; 2000).

Roth (1992) suggests that environmental literacy is based upon four factors – knowledge, skills, sensitivity, and behaviour. In the literature (Harvey, 1976; Hungerford and Peyton, 1994; Roth 1992; UNESCO, 1978), these four factors of environmental literacy are defined as follows:

a. Knowledge in Environmental Literacy: One of the main factors of environmental literacy, knowledge is not just about knowing what environmental literacy means. This aspect also includes all knowledge of environmental problems and solutions, ecological advances, and nature in general.

b. Skills in Environmental Literacy: The solutions that environmentally literate individuals provide for environmental problems.

c. Sensitivity in Environmental Literacy: Environmentally literate individuals' sensitivity to environmental issues and consideration of environmental conditions for the elimination of those issues.

d. Behaviour in Environmental Literacy: Environmentally literate individuals' personal involvement in the solution of environmental problems and engagement in environmental activities (Roth, 1992).

The literature includes many studies on environmental literacy (Cheong, I. P.–A. 2005; Bergman, 1995; Fah, and Sirisena, 2014; Karatekin, 2011; Digby, 2010; Yavetz, Goldman, and Pe'er, 2009; Negev, Sagy, Garb, Salzberg, and Tal, 2008; Murphy, and Olson, 2008; Coyle, 2005; Wang, 2014; Karatekin and Aksoy, 2012; Altınöz, 2010; Teksöz, Şahin, and Ertepınar, 2010; Erdoğan, 2009; Kışoğlu, 2009; Owens, 2000; Marcinkowski and Rehrig, 1995; Simmons, 1995; Roth, 1992). These studies investigate environmental literacy levels with different implements of measurement, from different aspects, and based on different variables.

In the planning of environmental education and the process of environmental consciousness-raising in individuals, it is crucial to identify their existing knowledge of the environment, their levels of environmental literacy, and their perceptions of environmental pollution. The present study investigates the environmental literacy levels of 7th year pupils in primary education and their images of environmental pollution.

2. Method

This research is a descriptive study investigating primary education pupils' environmental literacy levels based on different variables and identifying their environmental pollution images. The research data was collected through quantitative and qualitative techniques. The study was carried out with 76 pupils in four different classes of a public secondary school in the city of Ankara. 35 (46.1 %) female and 41 (53.9 %) male pupils participated in the study. The sampling methods of easy access and maximum variety were used. All classes of a school were examined in the study, including pupils with different levels of knowledge, which ensured variety (Erdoğan, 1998; Yıldırım and Şimşek, 2006).

The Environmental Literacy Scale developed by Sontay, Gökdere, and Usta (2015) was used in the study. This scale is a combination of four different scales about the knowledge, skills, sensitivity, and behaviour components of environmental literacy. The study also made use of the Environmental Sensitivity Scale, Environmental Behaviour Scale, and Cognitive Skills Interview Form, which had their validity and reliability ensured.

The Environmental Sensitivity Scale is a five-step likert type scale of 15 items designed to identify secondary school pupils' inclinations of sensitivity towards the environment. It contains items measuring individuals' sensitivity to the environment and environmental problems as well as their ability to consider social structures in decision-making and responsible behaviour displaying processes. The scale presents respondents with choices between 'Strongly Agree' and 'Strongly Disagree'. The exploratory factor analysis by Sontay et al. (2015) concludes that the scale has a three-factor structure. In line with the sensitivity component, the scale includes the sub-dimensions of environmental responsibility (items 1, 9, 10, 13, 14), environmental sensitivity (items 2, 6, 7, 11, 15), and environmental perception (items 3, 4, 5, 8, 12). Sontay et al. (2015) found that the measurement reliability of the scale was 0.860.

The Environmental Behaviour Scale is a seven-step Likert type scale of 12 items designed to identify pupils' behaviours towards the environment. The pupils were asked to mark how many times they had done the actions stated up until then. The scale has three sub-dimensions of protective behaviour for natural balance (items 6, 8, 9, 13), social behaviour (items 1, 3, 10, 11, 15), and advanced cognitive behaviour (items 2 and 5). Sontay et al. (2015) found that the measurement reliability of this scale was 0.773.

Another data collection tool used in the study was the Cognitive Skills Interview Form composed of three sub-dimensions of pupils identifying environmental issues, pupils analysing these issues and pupils devising an action plan for these issues. In this context, the pupils were asked three open-ended questions. Using the structured open-ended interview approach, this form made it possible to both minimize the interviewer's bias and subjectivity and obtain the opinions of a lot of respondents (Yıldırım and Şimşek, 2008). The inter-coder reliability rate for the interview form was found to be 0.88 (Sontay et al., 2015).

The Environmental Knowledge Test, the Environmental Sensitivity Scale, the Environmental Behaviour Scale, and the Cognitive Skills Interview Form developed by Sontay et al. have been found to be valid and reliable scales that can be used in combination or separately in order to identify 6th to 8th grade secondary school pupils' environmental literacy levels. In this study, 7th year pupils' environmental literacy levels were explored by means of the Environmental Sensitivity Scale, the Environmental Behaviour Scale, and the Cognitive Skills Interview Form. In addition, another form was used to collect the pupils' demographics such as gender and parents' education levels.

In the second part of the study, the pupils' environmental pollution images were identified. To this end, the pupils were given drawing paper and crayons and asked to draw about environmental pollution. The drawing method was used to reveal the pupils' environmental pollution images. Dove, Everett, and Preece (1999) claim that the drawing method can be used to reveal individuals' perception levels. In this process, the pupils' use of drawing paper and crayons was not limited in any way; they were free to use crayons, felt-tipped pens, or pencils as they wished. The pupils were given two class hours for the drawing. They were not led in any way about what they could draw. Their environmental pollution themed drawings were analysed by two assessors. The analyses made use of a theme-specific code list designed by an environmental engineer as a field expert. This code list, which had been designed prior to data analysis, was improved by the researchers, in line with the expert's opinions, during the analyses. Preliminary standardization work was carried out to ensure inter-assessor consistency whereby the same drawings were first analysed by the assessors individually who then came together to discuss the differences in their analyses. The pupils' drawings were independently analysed by two assessors. Following these analyses, those drawings with discrepancy in the coding were re-examined by the assessors who sought to come to an agreement on their coding.

3. Findings

3.1. Study Group

The study group was composed of 7th year pupils in four different classes at a public secondary school in the city of Ankara. The demographics of the participants are presented in Table 1.

Table 1. *Demographics of the Study Group*

		n	%
Gender	Male	41	53,9
	Female	35	46,1
Mother's Education	Primary school	2	2,7
	Secondary school	4	5,3
	High school	15	20,0
	Vocational school	2	2,7
	Bachelor's degree and more	52	69,3
Father's Education	Primary school	-	-
	Secondary school	-	-
	High school	13	17,3
	Vocational school	2	2,7
	Bachelor's degree and more	60	80,0

76 seventh grade pupils took part in the study. Of those, 41 (53.9 %) were male and 35 (46.1 %) were female. In the study group, most of the pupils' mothers were found to hold a bachelor's degree or more (n=52, 69.3%). This was followed by the high school certificate (n=15, 20%). As for the fathers, 60 out of 76 (78.9%) held a bachelor's degree or more, 13 (17.1%) held a high school certificate, and 2 (2.6%) held a vocational school diploma.

3.2. Findings on the Environmental Sensitivity Scale

The pupils' responses to the items in the Environmental Sensitivity Scale, designed to identify pupils' environmental sensitivity inclinations, are presented in Table 2. The Cronbach Alfa reliability factor for the Environmental Sensitivity Scale measurement in this study was found to be 0.801.

Table 2. *Distribution of the Responses to the Items in the Environmental Sensitivity Scale*

	Item	Strongly agree	Agree	Slightly agree	Disagree	Strongly disagree
1	In order to prevent environmental pollution, I warn those who behave in a harmful way to the environment.	39 (%51,3)	23 (%30,3)	14 (%18,4)		
2	I have the necessary sensitivity to the plant and animal species around so that they receive no harm.	49 (%64,5)	23 (%30,3)	4 (%5,3)		
3	I know what measures to take to prevent environmental pollution.	45 (%60)	26 (%34,7)	4 (%5,3)		
4	I consider myself capable of informing people on why natural resources need to be carefully protected.	33 (%43,4)	16 (%21,1)	21 (%27,6)	5 (%6,6)	1 (%1,3)
5	I can make conjectures on potential harm by landslides.	31 (%40,8)	28 (%36,8)	15 (19,7)	1 (%1,3)	1 (%1,3)
6	I believe that more sensitivity is needed towards endangered plant and animal species.	57 (%77)	12 (%16,2)	5 (%6,8)		
7	When buying a product, I check for the recycling logo (♲) to prevent environmental pollution.	17 (%22,4)	17 (%22,4)	25 (%32,9)	8 (%10,5)	9 (%11,8)
8	I consider myself adequately informed on at least one environmental problem.	44 (%57,9)	26 (%34,2)	5 (%6,6)	1 (%1,3)	
9	In cooperation with the relevant authorities, I would like to put forward solutions to environmental problems and engage in such activities.	26 (%34,2)	14 (%18,4)	23 (%30,3)	10 (%13,2)	3 (%3,9)

10	I am willing to engage in more tree-planting activities in order to prevent landslides.	44 (%59,5)	15 (%20,3)	9 (%12,2)	4 (%5,4)	2 (%2,7)
11	I am sensitive to the harmful effects of human activity in the natural habitats of living beings.	44 (%58,7)	22 (%29,3)	9 (%12)		
12	I consider myself as someone who protects natural landmarks and collaborates with others for their permanence for future generations.	32 (%42,1)	24 (%31,6)	13 (%17,1)	6 (%7,9)	1 (%1,3)
13	I am willing to take responsibility to help anyone working towards a solution to environmental issues.	29 (%38,7)	29 (%38,7)	14 (%18,7)	3 (%4)	
14	I would like to persuade people to do something to protect the environment and also do my share.	35 (%46,1)	27 (%35,5)	14 (%18,4)		
15	Whenever I see a polluted water source, walk around in smog, or come upon garbage, I think about the importance of keeping the environment clean and protecting it for our lives.	43 (%56,6)	20 (%26,3)	9 (%11,8)	4 (%5,3)	

The responses suggest that the pupils mostly gave positive answers to the items. For instance, 81.6% of them responded that they warned those who behaved in a harmful way to the environment. 94.8% of them indicated that they had the necessary sensitivity to the plant and animal species around so that they received no harm. 94.7% of them said that they knew what measures to take to prevent environmental pollution.

The minimum score that can be obtained on the Environmental Sensitivity Scale is 15 and the maximum score is 75. As for the sub-dimensions of the scale (environmental responsibility, environmental sensitivity, and environmental perception), the minimum and the maximum scores that can be obtained are 5 and 25 for all sub-dimensions. The average of the total scores that the study group obtained on the items of the scale was 62.91 (min=44; max=75; df=7.37). The average scores for the sub-dimensions of environmental responsibility, environmental sensitivity, and environmental perception were found to be 20.50 (min=11; max=25; df=3.42), 21.25 (min=14; max=25; df=2.45), and 21.16 (min=12; max=25; df=2.88), respectively. The data on the Environmental Sensitivity Scale, both as a whole and in its sub-dimensions, suggests that the pupils who took part in the study are sensitive to the environment and environmental issues, are willing to take responsibility, and also behave responsibly towards the environment.

The Kolmogorov-Smirnov normality test was conducted to check for a normal distribution of the total scores and the sub-dimension scores on the Environmental Sensitivity Scale. The

test results no indicate a normal distribution of the data (p<.05). Therefore, in this study, the non-parametric Mann-Whitney U and Kruskal-Wallis tests were used for data analysis.

The Mann-Whitney U test was conducted to determine whether the pupils' Environmental Sensitivity Scale total scores and sub-dimension scores had any relation to gender. The Mann-Whitney U test results for the Environmental Sensitivity Scale total and sub-dimension average scores in relation to gender are presented in Table 3.

Table 3. *Mann-Whitney U Test Results for the Pupils' Environmental Sensitivity Scale Scores and the Gender Variable*

	Gender	n	$\overline{X}$	Rank average	Rank total	U	z	p
Environmental Responsibility Sub-dimension	Female	35	21,49	44,46	1556,00	509,000	-2,183	,029
	Male	41	19,66	33,41	1370,00			
Environmental Sensitivity Sub-dimension	Female	35	21,54	41,83	1464,00	601,000	-1,225	,220
	Male	41	21,00	35,66	1462,00			
Environmental Perception Sub-dimension	Female	35	21,46	40,89	1431,00	634,000	-,877	,381
	Male	41	20,90	36,46	1495,00			
Environmental Sensitivity Scale Total Score	Female	35	64,49	42,76	1496,50	568,500	-1,555	,120
	Male	41	61,56	34,87	1429,50			

The Mann-Whitney U test results in Table 3 demonstrate a statistically significant difference (p<.05) between the male and female pupils, in favour of the girls, only in the environmental responsibility sub-dimension. No statistically significant difference was detected between the male and female pupils (p>.05) in terms of the Environmental Sensitivity Scale total scores, the environmental responsibility, and the environmental perception sub-dimension scores.

The Kruskal-Wallis test was conducted to determine whether the pupils' Environmental Sensitivity Scale total scores and sub-dimension scores had any relation to parents' education levels. The Kruskal-Wallis test results for the Environmental Sensitivity Scale total and sub-dimension average scores in relation to parents' education levels are presented below (Tables 4 and 5).

Table 4. *Kruskal-Wallis Test Results for Environmental Sensitivity Scale Total Scores and Sub-dimension Average Scores and the Mothers' Education Variable*

	Mother's Education	n	$\overline{X}$	Rank average	Chi square	df	P
Environmental Responsibility Sub-dimension	Primary school	2	19,00	36,75	5,359	4	,252
	Secondary school	4	19,00	25,63			
	High school	15	19,40	29,03			
	Vocational school	2	20,50	36,25			
	Bachelor's degree and more	52	20,92	41,65			
Environmental Sensitivity Sub-dimension	Primary school	2	21,5	39,25	1,301	4	,861
	Secondary school	4	20,5	27,00			
	High school	15	21,13	37,10			
	Vocational school	2	22	44,00			
	Bachelor's degree and more	52	21,31	38,83			
Environmental Perception Sub-dimension	Primary school	2	19	22,75	3,689	4	,450
	Secondary school	4	19,5	22,38			
	High school	15	21,13	36,47			
	Vocational school	2	21,5	40,50			
	Bachelor's degree and more	52	21,40	40,13			
Environmental Sensitivity Scale Total Score	Primary school	2	59,5	34,75	4,751	4	,314
	Secondary school	4	59	22,63			
	High school	15	61,67	31,10			
	Vocational school	2	64	37,75			
	Bachelor's degree and more	52	63,63	41,31			

Table 5. *Kruskal-Wallis Test Results for Environmental Sensitivity Scale Total Scores and Sub-dimension Average Scores and the Fathers' Education Variable*

	Father's Education	n	$\overline{X}$	Rank average	Chi square	df	P
Environmental Responsibility Sub-dimension	Primary school	-	-	-	3,547	2	,170
	Secondary school	-	-	-			
	High school	13	19,38	30,69			
	Vocational school	2	18	19,50			
	Bachelor's degree and more	60	20,77	40,20			
Environmental Sensitivity Sub-dimension	Primary school	-	-	-	2,370	2	,306
	Secondary school	-	-	-			
	High school	13	20,46	30,15			
	Vocational school	2	21	31,50			
	Bachelor's degree and more	60	21,43	39,92			
Environmental Perception Sub-dimension	Primary school	-	-	-	2,395	2	,302
	Secondary school	-	-	-			
	High school	13	21,23	37,85			
	Vocational school	2	18,50	14,75			
	Bachelor's degree and more	60	21,27	38,81			
Environmental Sensitivity Scale Total Score	Primary school	-	-	-	4,558	2	,102
	Secondary school	-	-	-			
	High school	13	61,08	30,12			
	Vocational school	2	57,50	15,75			
	Bachelor's degree and more	60	63,47	40,45			

The Kruskal-Wallis test results in Tables 4 and 5 demonstrate no statistically significant difference ($p>.05$) in the Environmental Sensitivity Scale total scores and the sub-dimension scores in relation to parents' education levels. In other words, parents' education levels are not a variable that affects pupils' environmental sensitivity levels.

3.3. Findings on the Environmental Behaviour Scale

The Environmental Behaviour Scale was implemented with the objective to assess the study group pupils' behaviours towards the environment. The pupils were asked to mark how many times they had realized the statements on the scale. The Cronbach Alfa reliability factor for this measurement was found to be 0.801 and the data from the scale are presented in Table 6.

Table 6. *Distribution of the Responses to the Items in the Environmental Behaviour Scale*

Environmental Behaviours	Never	1	2	3	4	5	More than 5 times
1. Amongst the people close to me, I have warned those who display behaviour that might be harmful to the environment.	3 (%4,3)	3 (%4,3)	1 (%1,4)	11 (%15,7)	14 (%20)	12 (%17,1)	26 (%37,1)
2. I have bought foodstuff bearing the organic product logo.	7 (%9,9)	9 (%12,7)	12 (%16,9)	7 (%9,9)	7 (%9,9)	8 (%11,3)	21 (%29,6)
3. I have planted trees, flowers, or other plants in order to protect the environment and its beauty.	4 (%5,6)	5 (%6,9)	12 (%16,7)	9 (%12,5)	12 (%16,7)	8 (%11,1)	22 (%30,6)
4. I have bought products bearing the recycling logo (♲) on them.	8 (%11)	9 (%12,3)	12 (%16,4)	14 (%19,2)	3 (%4,1)	7 (%9,6)	20 (%27,4)
5. I have volunteered for certain activities to protect the environment (e.g. signing up for membership for the Tema Foundation, taking part in school clubs about the environment).	23 (%31,5)	9 (%12,3)	14 (%19,2)	7 (%9,6)	13 (%17,8)	2 (%2,7)	5 (%6,8)
6. Of the issues threatening our world such as nuclear pollution, acid rain, and sea pollution, I have done research on at least one.	6 (%8,3)	13 (%18,1)	9 (%12,5)	15 (%20,8)	7 (%9,7)	9 (%12,5)	13 (%18,1)

7. In line with the laws and regulations in effect, I have cooperated with the authorities against those causing harm to natural landmarks.	40 (%55,6)	8 (%11,1)	4 (%5,6)	7 (%9,7)	3 (%4,2)	6 (%8,3)	4 (%5,6)
8. I have placed non-recyclable waste in garbage bins.	1 (%1,4)	-	4 (%5,5)	6 (%8,2)	6 (%8,2)	6 (%8,2)	50 (%68,5)
9. I have placed recyclable waste such as paper, glass, and plastic in recycling bins.	1 (%1,4)	1 (%1,4)	4 (%5,6)	3 (%4,2)	8 (%11,1)	11 (%15,3)	44 (%61,1)
10. I have developed practical, useful, and simple methods to keep the environment clean.	14 (%19,4)	14 (%19,4)	8 (%11,1)	12 (%16,7)	7 (%9,7)	8 (%11,1)	9 (%12,5)
11. I have put forward some suggestions to the authorities or my teacher concerning the protection of endangered species.	15 (%20,5)	12 (%16,4)	15 (%20,5)	12 (%16,4)	7 (%9,6)	4 (%5,5)	8 (%11)
12. I have taken measures to protect the living beings in my immediate vicinity.	3 (%4,1)	4 (%5,5)	12 (%16,4)	7 (%9,6)	12 (%16,4)	10 (%13,7)	25 (%34,2)

The responses to the Environmental Behaviour Scale items demonstrate that the most frequently occurring behaviour amongst the pupils is ‘placing non-recyclable waste in garbage bins’ (n=50; 68.5%) followed by ‘placing recyclable waste such as paper, glass, and plastic in recycling bins’ (n=44; 61.1%). More than half the pupils responded ‘never’ to the statement ‘In line with the laws and regulations in effect, I have cooperated with the authorities against those causing harm to natural landmarks’ (n=40; 55.6%) followed by the statement ‘I have

volunteered for certain activities to protect the environment (e.g. signing up for membership for the Tema Foundation, taking part in school clubs about the environment)' (n=23; 31.5%). It is worth noting that almost a third of the pupils have never taken part in any voluntary activities. The defining statistics for the Environmental Behaviour Scale are presented in Table 7.

Table 7. *Defining Statistics for the Environmental Behaviour Scale*

	n	$\overline{X}$	Median	Mode	df	Min	Max
1. Amongst the people close to me, I have warned those who display behaviour that might be harmful to the environment.	70	4,43	5,00	6	1,673	0	6
2. I have bought foodstuff bearing the organic product logo.	71	3,49	4,00	6	2,144	0	6
3. I have planted trees, flowers, or other plants in order to protect the environment and its beauty.	72	3,83	4,00	6	1,914	0	6
4. I have bought products bearing the recycling logo (♲) on them.	73	3,32	3,00	6	2,121	0	6
5. I have volunteered for certain activities to protect the environment (e.g. signing up for membership for the Tema Foundation, taking part in school clubs about the environment).	73	2,05	2,00	0	1,892	0	6
6. Of the issues threatening our world such as nuclear pollution, acid rain, and sea pollution, I have done research on at least one.	72	3,15	3,00	3	1,962	0	6
7. In line with the laws and regulations in effect, I have cooperated with the authorities against those causing harm to natural landmarks.	72	1,43	0,00	0	1,992	0	6
8. I have placed non-recyclable waste in garbage bins.	73	5,21	6,00	6	1,384	0	6
9. I have placed recyclable waste such as paper, glass, and plastic in recycling bins.	72	5,13	6,00	6	1,404	0	6
10. I have developed practical, useful, and simple methods to keep the environment clean.	72	2,61	2,50	0[a]	2,053	0	6
11. I have put forward some suggestions to the authorities or my teacher concerning the protection of endangered species.	73	2,38	2,00	0[a]	1,919	0	6

12. I have taken measures to protect the living beings in my immediate vicinity.	73	4,07	4,00	6	1,858	0	6

The data from Table 7 suggests that placing non-recyclable waste in garbage bins (X =5.21; df=1.384) and placing recyclable waste in recycling bins (X = 5.13; df=1.404) are the most frequently occurring behaviours. Warning those causing harm to the environment (X= 4.43; df= 1.673) and taking measures to protect the living beings in the environment (X= 4.07; df=1.858) are also frequent behaviours. Amongst the least frequent behaviours is cooperating with the authorities against those causing harm to natural landmarks (X =1.43; df=1.992).

The minimum score that can be obtained on the Environmental Behaviour Scale is 0 and the maximum score is 90. As for the sub-dimensions of the scale, the minimum and maximum scores are 0 and 30 for the sub-dimensions of behaviour protecting the natural balance (items 6, 8, 9, 13, and 14) and social behaviour (items 1, 3, 10, 11, and 15). The minimum and maximum scores are 0 and 12 on the advanced cognitive behaviour sub-dimension (items 2 and 5). The average scores that the study group obtained on the items of the scale are as follows:

- Total average score on the Environmental Behaviour Scale: 39 (min=0; max=68; df=14.69)
- Average for the sub-dimension of behaviour protecting the natural balance: 11.08 (min=0; max=27; df=7.37)
- Average for the sub-dimension of social behaviour: 21.47 (min=0; max=30; df=7.20)
- Average for the sub-dimension of advanced cognitive behaviour: 6.45 (min=0; max=12; df=3.77)

The data on the Environmental Behaviour Scale, both as a whole and in its sub-dimensions, suggests that the pupils who took part in the study exhibit environmental behaviours with mid-level frequency.

The Kolmogorov-Smirnov normality test was conducted to check for a normal distribution of the total scores and the sub-dimension scores on the Environmental Behaviour Scale. The test results indicate a normal distribution of the data (p>.05) for the environmental behaviour total scores and the sub-dimensions" of behaviour protecting the natural balance and advanced cognitive behaviour but a non-normal distribution (p<.05) for the sub-dimension of social behaviour. Therefore, in this study, both parametric and non-parametric tests were used for data analysis.

The Mann-Whitney U test and the t-test were conducted to determine whether the pupils' Environmental Behaviour Scale total scores and sub-dimension scores had any relation to gender. The t-test results for the Environmental Behaviour Scale total and sub-dimension average scores in relation to gender are presented in Table 8.

Table 8. *T-test Results for the Pupils' Environmental Behaviour Scale Scores and the Gender Variable*

	Gender	N	$\overline{X}$	sd	t	df	p
Protecting Natural Balance Sub-dimension	Female	35	11,69	6,86	0,66	74	,051
	Male	41	10,56	7,83			

Advanced Cognitive Behaviour Sub-dimension	Female	35	7,14	3,70	1,49	74	,138
	Male	41	5,85	3,76			
Environmental Behaviour Scale Total Score	Female	35	42,97	12,49	2,23	74	,028
	Male	41	35,61	15,69			

The t-test results demonstrate a statistically significant difference ($p<.05$) between the male and female pupils, in favour of the girls, in the Environmental Behaviour Scale total score. No statistically significant difference was detected between the male and female pupils ($p>.05$) in terms of the protecting the natural balance and advanced cognitive behaviour sub-dimension scores. The Mann-Whitney U test was conducted for the social behaviour sub-dimension average scores, which showed a non-normal distribution. The sub-dimension average scores for the female and male pupils were found to be 24.14 (df=6.20) and 19.20 (df=7.28), respectively. The Mann-Whitney U test results suggest a statistically significant difference between the male and female pupils, in favour of the girls, on this sub-dimension (*rank average* $_{female}$= 47.63; *rank average* $_{male}$= 30.7; U=398; z=-3.34; $p<.05$).

The statistical analyses also demonstrated no statistically significant difference in the Environmental Behaviour Scale total scores and the sub-dimension scores in relation to parents' education levels.

3.4. Findings on the Cognitive Skills Interview Form

By means of the Cognitive Skills Interview Form, the study aimed to get the pupils to identify environmental issues, analyse these issues, and put forward suggestions for the solution of these issues. In this context, the pupils were asked three open-ended questions. The responses on the interview forms were independently coded by the researchers, the results were compared, and agreement was reached where discrepancies arose.

The pupils were asked to write down five environmental problems that they considered important. The data on the responses are presented in Table 9.

Table 9. *Environmental Problems That Pupils Consider Important*

Environmental problems	Frequency (f)	%	Environmental problems	Frequency (f)	%
Water pollution	61	80,26	Nuclear waste	4	5,26
Air pollution	56	73,68	Industrial waste	3	3,95
Soil pollution	29	38,16	Natural disasters	3	3,95
Environmental pollution	23	30,26	Depletion of natural resources	2	2,63
Global warming	18	23,68	Poaching / Illegal hunting	2	2,63
Littering the environment	16	21,05	Radiation waste	2	2,63

Noise pollution	12	15,79	Waste of water	2	2,63
Drought	11	14,47	Unplanned urbanisation	2	2,63
Wildfires / Deforestation	11	11,84	Light pollution	2	2,63
Extinct species	9	11,84	Unrenewable energy sources	2	2,63
Landslides	9	7,89	Unnecessary constructions	1	1,32
Felling of trees	6	7,89	Harmful gases	1	1,32
Insensitive generations	5	6,58	Natural gas	1	1,32
Disuse of recycling bins	4	6,58	Space pollution	1	1,32
Greenhouse effect	4	5,26	Famine	1	1,32

Water and air pollution were cited as important environmental problems by a large majority of the pupils. These were followed by soil pollution, global warming, and littering the environment. The pupils mentioned a variety of problems and their responses suggest an awareness of a great deal of environmental issues. On the Cognitive Skills Test, the pupils were asked which one of their five environmental problems they considered to be the most serious and the causes of that problem. The responses revealed air pollution (n=16, 21.62%) and water pollution (n=13, 17.57%) as the most important environmental issues followed by global warming (n=9, 12.16%).

The pupils mentioned

-Unfiltered factory chimneys / Harmful gases released by factories,
-Unnecessary use of deodorants and fragrances,
-Polluting gases from the exhaust pipes of cars,
-Felling of trees,
-Fossil fuels,
-Tobacco smoke

as the causes of air pollution, the most serious environmental issue for them.

The pupils were asked to make suggestions for solving the problem of air pollution, the most serious according to them. Their suggestions were:

-Factory chimneys should be fitted with filters,
-Car use should be reduced,
-Use of deodorants and fragrances should be reduced,
-Harmful gases should not be emitted,
-Public transport should be more commonly used,
-More trees should be planted,
-Trees should not be harmed,
-Penalties should be enforced,
-Renewable fuels should be used instead of fossil fuels,
-More and more recycling bins should be put up,
-People should gain awareness.

Some of the pupils mentioned water pollution as the most serious environmental problem, with the following as its causes:

-Insensitivity / Lack of education,
-Industrial waste waters,
-No measures taken by authorities,
-Littered waters,
-Oil-polluted waters,
-Pouring household oils down the sink,
-Nuclear waste in waters.

Their suggestions for solution were:

-Manhole covers should be fitted with filters,
-Awareness-raising work should be carried out (posters, presentations, training etc.)
-Industrial waters should be treated,
-Authorities should take necessary steps,
-More penalties should be enforced,
-Household oils should be put in oil collection containers,
-Recycling facilities should become more common,
-Litter should be placed in bins.

Global warming was also cited amongst the most serious environmental problems, with the following as its causes:

-Unplanned use of natural resources,
-Exhaust gases from cars,
-Use of deodorants and fragrances,
-Harmful gases from factory chimneys,
-Population increase.

The pupils were asked to make suggestions for solving the problem of global warming. Their suggestions were:

-People should gain awareness,
-People should be sensitized towards the environment,
-Renewable energy sources should be used,
-Air pollution should be reduced,
-Global warming should be fought globally,
-A system should be put in place where each family gets no more than one car unless absolutely necessary,
-Oils that result from the activity of microalgae should be used instead of fossil fuels,
-Use of deodorants should be reduced,
-Relevant projects should be initiated,
-Population increase should be controlled,
-Use of public transport should be increased,
-Factory chimneys should be fitted with filters,
-Use of natural energy sources should be increased,
-Recycling facilities should become more common,
-Green spaces should be protected.

Overall, the findings on the Cognitive Skills Interview Form suggest that the pupils are conscious of environmental issues, cognizant of the causes of these issues, and capable of making suggestions as to functional solutions to these issues.

3.5. Findings on Environmental Pollution Drawings

It was aimed in this study to reveal the pupils' perceptions of environmental pollution. To this end, they were asked to draw environmental pollution themed pictures. Samples of the pupils' drawings are presented in Figure 1.

Figure 1. Samples of 'Environmental Pollution' Themed Pictures by the Pupils

The findings from the analyses of the pupils' drawings intended to uncover their environmental pollution images are summarized in Table 10. The code lists and themes used in the picture analyses, together with the frequency of these codes, are presented in the table.

The data from the picture analyses suggests a prevalence of 'dark coloured natural landscapes (dark grey skies, brown lakes, etc.)' under the theme of environmental pollution in general (n= 52, 68.42%). Another frequent visual was found to be pictures of 'garbage left in open spaces' under the theme of soil pollution (n=42, 55.26%).

Table 10. *Findings from Analyses of Environmental Pollution Themed Drawings*

Theme	Code	Frequency (f)	%
Environmental Pollution in General	Pictures with 'hazardous waste' symbols	2	2.63
	Pictures of dry, felled trees with fallen leaves / Barren soil	26	34.21
	Pictures of people in a polluted environment / polluting the environment	14	18.42
	Unplanned urbanization / Concrete everywhere	6	7.89
	Dark coloured natural landscapes (dark grey skies, brown lakes, etc.)	52	68,42
Air Pollution	Exhaust gases released by cars / aircraft / motor vehicles	11	14.47
	Gases from factory and/or house chimneys (black, grey)	27	35,53
	People wearing face masks and/or with mouths covered / unhappy people	8	10.52
	Global warming	2	2.63
Water Pollution	Pictures of rivers, lakes, or sea with solid waste (refuse) in them	30	39.47
	Surface waters (streams, lakes, rivers) mixed with waste waters (coloured brown, grey, etc.)	25	32,89
	Dead fish and/or other animals on water surface	19	25
	Air bubbles on water surface (water coloured green, brown, or dark yellow)	11	14.47
Soil Pollution	Garbage left in open spaces	42	55,26
	Pictures of irregular solid refuse storage (hazardous waste storage) spaces (also with vectors such as flies and rats about)	3	3.94
	Pictures of solid refuse storage spaces with leaking water (water leakage coloured dark brown and pictured towards soil or water surfaces)	1	1.31

Noise Pollution	Visuals of heavy traffic / heavy machinery / sound of horn	2	2.63
	Listening and dancing to loud music / pictures of loudspeakers	2	2.63
Light Pollution	Too brightly illuminated surroundings	1	1.31
Environmental Consciousness	Protests / concerned messages / slogans	14	18.42
	Clean environment contrasted with dirty environment	18	23,68

Visuals of ‘rivers, lakes, or sea with solid waste (refuse) in them’ under the theme of water pollution were found in 30 drawings (39.47%) while visuals of ‘gases from factory and/or house chimneys (black, grey)’ under the theme of air pollution were found in 27 drawings (35.53%). Besides, visuals of ‘dry, felled trees with fallen leaves / barren soil’ under the theme of environmental pollution in general were found in 26 drawings (34.21%).

The least frequent visuals in environmental pollution drawings were ‘pictures of irregular solid refuse storage (hazardous waste storage) spaces’ (n=3, 3.94%) under the theme of soil pollution, ‘listening and dancing to loud music / pictures of loudspeakers’ (n=2; 2.63%) and ‘heavy traffic / heavy machinery / sound of horn’ (n=2; 2.63%) under the theme of noise pollution, and ‘pictures with “hazardous waste” symbols’ (n=2; 2.63%) under the theme of environmental pollution in general. The visual of light pollution was found in only one of the environmental pollution drawings (1.31%).

It could be argued that the pupils’ drawings are mostly concerned with environmental pollution in general and water and air pollution in particular. The environmental pollution drawings include fewer visuals of light and soil pollution. The pupils’ environmental pollution images are consistent with the findings from the Cognitive Skills Interview Form. When the pupils were asked to draw pictures on environmental pollution, they preferred to draw the most serious environmental problem for them. There were no visuals of space pollution amongst the pictures drawn.

4. Conclusion

The present study reveals pupils’ environmental literacy levels and the relation between these environmental literacy levels and different variables. The Environmental Sensitivity Scale, Environmental Behaviour Scale, and Cognitive Skills Interview Form given to the pupils, together with their drawings, demonstrate that the pupils have, in general, an environmental awareness on behaviour and sensitivity scales.

The results of the Environmental Sensitivity Scale administered to find out the pupils’ inclinations of sensitivity towards the environment suggest that the pupils are sensitive to the environment and environmental problems, willing to take responsibility, and display responsible environmental behaviour. The Environmental Sensitivity Scale results show that the female pupils have a higher responsibility rating than the male pupils. These findings are consistent with many studies in the literature (Alp, Ertepinar, Tekkaya, and Yılmaz, 2008; Değirmenci, 2013; Deniş and Genç, 2007; Fortmann and Kusel, 1990; Gezer, Çokadar, Köse,

and Bilen, 2006; Iozzi, 1989; Kaya, Akıllı, and Sezek, 2009; Öcal, 2013). This study has found no relation between the parents' education levels and the pupils' environmental sensitivity levels. Köse (2010), however, argues that the higher the parents' education levels are, the more positively the pupils' environmental perceptions and attitudes will be affected.

The data from the Environmental Behaviour Scale administered to find out the pupils' behaviour towards the environment suggests that the pupils avoid behaviours that might cause harm to the environment, warn those who behave in this way, and display necessary behaviours to prevent environmental pollution. The results show that the female pupils have a higher total environmental behaviour score than the male pupils. Alerby (2000) attempted to elicit pupils' thoughts about the environment through drawings and observed that girls displayed higher environmental behaviour than boys in order to have a cleaner environment.

This study has found no link between the parents' education levels and the pupils' environmental behaviours. However, some of the studies in the literature conclude that the higher the parents' education levels and income are, the more positively the pupils' environmental knowledge and perceptions will be affected (Uzun, 2007; Altın, 2001; Arcury and Christianson, 1993; Ekici, 2005).

The Cognitive Skills Interview Form shows that the pupils are aware of many environmental problems. The pupils made reference to various environmental problems and demonstrated high levels of awareness of these problems. The most serious environmental issues cited by the pupils were water and air pollution, followed by global warming. Sadık, Çakan, and Artut, (2011); Çobanoğlu, Er, Demirtaş, Özan, and Bayrak, (2006); Littledyke, (2008) hold that, in pupils' drawings, the most dominant issue is air pollution, illustrated through factory chimneys and exhaust gases, followed by water pollution, illustrated through piles of rubbish on water.

The pupils' awareness of the causes of the environmental problems in question and their capability of making functional suggestions to solve these problems are evidence of high levels of environmental literacy. These findings are really encouraging. The environmental pollution images in the environmental pollution themed drawings made by the pupils and intended to reveal their environmental pollution perceptions are consistent with the findings from the Cognitive Skills Interview Forms. Water and air pollution drawings are the most frequent, with space, light, and noise pollution drawings rather in the background.

Environmental literacy, environmental consciousness, and environmental awareness in pupils can be ensured through effective environmental education. In addition to the educational processes at schools, parents will be the role models for pupils with their attitudes and behaviours. It should be remembered that the family factor occupies a crucial place in environmental education.

5. Conflict of Interest

The authors declare that there is no conflict of interest.

6. Ethics Committee Approval

The authors confirm that the study does not need ethics committee approval according to the research integrity rules in their country.

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