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Preservice Science Teachers' Attitudes Toward Environment

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Introduction

Although human activities on environment have caused the irreversible damages, humans continue to exhibit environmental damage behaviors at the individual, corporate, governmental, and societal levels (Makki, Abd-El Khalick, & Boujaoude, 2003). Therefore, the need for citizens who exhibit pro-environmental behaviors and take an active role in solution of environmental

ABSTRACT

The purpose of this study was to determine preservice science teachers' attitudes toward environment and to investigate whether their environmental attitudes differ in terms of gender and grade level. A total of 197 preservice science teachers participated in the study. Personal Information Form and the Environmental Attitudes Inventory (EAI) developed by Milfont and Duckitt (2006) were utilized as data collection tools in the study. The data were analyzed using the PASW Statistics 18 (SPSS Inc.). According to the results, preservice science teachers displayed moderately favorable attitudes toward environment. Furthermore, a significant gender difference favoring female preservice teachers was found in terms of total and environmental movement activism, environmental threat, support for population growth policies dimensions of EAI. In addition, according to grade level, significant differences were found in favor of senior preservice teachers in total and human utilization of nature, support for population growth policies dimensions of EAI. Results were discussed based on the findings obtained from the study.

KEYWORDS
Environmental attitudes; environmental education; preservice science teachers; science education, teacher training

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problems with sense of responsibility has increased. To change environmental behaviors, to understand the nature of the environmental problems, and to propose solutions are only possible with environmental education (EE). Numerous problems affecting our daily lives including energy conservation, limited natural resources, ecosystem management, air/water quality, and global warming require informed decisions about possible solutions, thereby the importance of EE has become more realized (Carrier, 2007).

EE has matured over the past 60 years. From addressing early concerns over pesticides and pollution to the current threats from climate change, loss of biodiversity, and human population growth, EE is up to the task (NEEF, 2015 p. 95). In Turkey, environmental issues are integrated into notably science and social studies curriculums. However, in recent years, EE has been started to be taught as also an elective course in elementary schools due to the extensity and interdisciplinarity of the EE that made it necessary to be taught as a separate course. In this new context, EE curriculum aims to increase students' environmental awareness and developing the life skills for sustainable development (MEB, 2015). Similarly, in Finnish EE, an important aim is to foster environmental sensitivity and interest in nature, and to promote a responsible lifestyle. Besides, supports the belief that an individual can participate and influence on the solution of environmental problems (Jeronen, Jeronen, & Raustia, 2009). Because the main goal of EE is to change behavior, it would be useful first to understand the basis of environmental attitudes to facilitate changing environmental behaviors (Pooley & O'Connor, 2000). As environmental programs are overwhelmingly cognitively based, studies concerning environmental attitudes have shown increases in recent years (Fernández-Manzanal, Rodríguez-Barreiro, & Carrasquer, 2007; Johnson & Manoli, 2008; Kennedy, Beckley, McFarlane, & Nadeau, 2009; Pooley & O'Connor, 2000).

Environmental attitudes "are a psychological tendency expressed by evaluating the natural environment with some degree of favor or disfavor" (Milfont & Duckitt, 2010, p. 80). Also, Erten (2012) defines environmental attitudes as all of the fear, anger, concern and value judgments arising from environmental problems and individuals' positive or negative attitudes and thoughts for commitment to environmental behaviors. In other words, environmental attitudes are general feelings toward the environment, feelings and concern for specific environmental issues, and feelings toward developing solutions for environmental problems (Pe'er, Goldman, & Yavetz, 2007).

Numerous theoretical frameworks have been developed to explain the relationship between the holding environmental attitudes and environmental knowledge, and exhibiting pro-environmental behavior. Traditional models based on a linear progression assume that environmental knowledge leading to environmental attitudes, which in turn was thought to lead to pro-environmental behavior. These models have lost validity, because in many cases, increases in knowledge and attitude did not lead to pro-environmental behavior (Kollmuss & Agyeman, 2002). Therefore, instead of traditional framework, most studies have selected the theory of planned behavior (TPB) supposed that attitudes do not determine behavior directly, rather they influence behavioral intentions which in turn shape our actions (Ajzen & Fishbein, 1980 as cited in Kollmuss & Agyeman, 2002) as a baseline. Also, an alternative approach is

Stern and Dietz's (1994) value-belief-norm (VBN) theory of environmentalism that links value theory, norm-activation theory, and the new environmental paradigm (NEP) perspective through a causal chain of five variables leading to behavior: personal values (especially altruistic values), NEP, awareness of adverse consequences (AC) and ascription of responsibility to self (AR) beliefs about general conditions in the biophysical environment, and personal norms for pro-environmental action (Stern, 2000).

Overall, many researchers refer the importance of attitudes and values that influence the commitment to environmental behaviors (Dillon & Gayford, 1997; Fernandez-Manzanal, Rodriguez-Barreiro, & Carrasquer, 2007; Hines, Hungerford, & Tomera, 1987; Makki, Abd-El Khalick, & Boujaoude, 2003; Tikka, Kuitunen, & Tynys, 2000). In addition, the role of interests, attitudes and values in EE has been considered as important field for future research and the development of new approaches in science education (Uitto, Juuti, Lavonen, Byman, & Meisalo, 2011).

Environmental Attitudes and Gender

Upon examining the literature, in most studies, gender has a dichotomous pattern on environmental values and beliefs (Boeve-de Pauw, Jacobs, & Van Petegem, 2014; Carrier, 2009; Zelezny, Chua, & Aldrich, 2000). Bogner and Wiseman (2004) revealed that boys tend to score higher in the utilitarian domain that supports the mastering nature and value nature as it satisfies human needs. Girls, on the other hand, tend to score higher in the preservational domain with a commitment to value nature for its own sake. Also, Tikka, Kuitunen, and Tynys (2000) stated that female students have more favorable attitudes toward nature and the environment than do male students. There are many studies overlap with these results (Bergman, 2015; Carrier, 2007; Eagles & Demare, 1999; Fremerey & Bogner, 2015; Milfont & Duckitt, 2006; Sutton & Gyuris, 2015; Tuncer, Ertepinar, Tekkaya, & Sungur, 2005; Uitto, Juuti, Lavonen, Byman, & Meisalo, 2011). On the other hand, in few studies, environmental attitudes were not differ in terms of gender (Larson, Castleberry, & Green, 2010; Levine & Strube, 2012; Lieflander & Bogner, 2014; Okur-Berberoglu, 2015). Besides, in rare studies compared to females, males have more favorable attitudes toward environment (Carrier, 2009; Shen & Saijo 2007).

In general, the gender differences have been explained based on gender roles and socialization. Socialization theory postulates that individuals are shaped by gender expectations within the context of cultural norms (Zelezny, Chua, & Aldrich, 2000). Females have traditionally been responsible for looking after the home and children, and males have concentrated on hunting and resource provision (Gilligan, 1982 as cited in Tikka, Kuitunen, & Tynys, 2000). In fact, while females have more favorable value and beliefs about conservation of nature, males have stronger beliefs regarding the existence of nature for human use. In addition, gender differences in environmental attitudes may stem not only from environmental values and beliefs, but also perceived vulnerability. Bord and O'Connor (1997) state that in response to items that imply specific risks, no matter how uncertain or unlikely, females express greater perceived vulnerality by choosing the option indicating greater concerns.

Overall, having regard to the gender differences, effective EE should meet the needs of both females and males to improve environmental attitudes. Such a learning environment might enable females and males to gain favorable value and beliefs in opportunities for spending time in nature, searching out the current environmental problems, and attempt to propose solution toward the relevant problems.

Environmental Attitudes and Grade Level

There are many studies have examined the relationship between grade level (in some studies age was accepted as a proxy for year in school) as a demographic variable and environmental attitudes and behaviors (Makki, Abd-El Khalick, & Boujaoude, 2003; Alp, Ertepinar, Tekkaya, & Yilmaz, 2006; Fernandez-Manzanal, Rodriguez-Barreiro, & Carrasquer, 2007; Ozden, 2008; Ulucinar Sagir, Aslan, & Cansaran, 2008; Oguz, Cakci, & Kavas, 2010; Levine & Strube, 2012; Bergman, 2015; Sutton & Gyuris, 2015). The results of many studies conducted with students revealed that pro-environmental attitudes decreased by grade level. For instance, Alp, Ertepinar, Tekkaya, and Yilmaz (2006) found significant differences between 6th and 8th (in favor of 6th graders), 6th and 10th (in favor of 6th graders), 8th and 10th (in favor of 8th graders) grade level students with respect to environmental attitudes. Likewise, in research undertaken by Lieflander and Bogner (2014), it was also found that younger students (9-10 years) held more pro-environmental attitudes than the older ones (11-13 years). Lieflander, Frohlich, Bogner, and Schultz (2013) argue that the beginning of adolescence that increases the feeling of independence may explain the decrease of the connectedness with nature. Nevertheless, the results of study conducted by Bergman (2015) revealed that the students' eco-learning/behavioral intentions did not vary by grade level. On the other hand, many studies conducted with adults showed that environmental attitudes increase significantly with grade level. Ozden (2008) found that senior preservice teachers had more positive attitudes toward environmental issues than did freshman preservice teachers. Similarly, Levine and Strube (2012) revealed that older undergraduate students had more favorable environmental attitudes. These differences may result from contributions of EE experiences in number of years. Accordingly, the results of study undertaken by Sutton and Gyuris (2015) showed that students in their third-year of university had significantly stronger positive beliefs about the benefits of spending time in nature than did first-year students and also the third-year student had significantly stronger eco-centric concern for the natural environment than did first-year students. Nonetheless, in the study carried out by Oguz, Cakci, and Kavas (2010), students' environmental awareness and attitudes did not depend on their grades. Also, Fernandez-Manzanal, Rodriguez-Barreiro, and Carrasquer (2007) found that first year students' value and beliefs regarding the importance of field trips, conservational aspects, and willingness to enact environmental protection actions did not change significantly throughout their university years. These results may imply that EE which students were exposured not adequate for improvement of environmental attitudes.

Environmental Attitudes and Teacher Education

The increase in the number of schools integrating EE into their curricula has emphasized the lack of teachers adequately trained to effectively implement

environmental education (Pe'er, Goldman, & Yavetz, 2007). Because personal and professional experiences influence teachers' instruction on environmental science curricula, attention to preservice science teachers' self-efficacy and beliefs is essential. Moreover, preservice formal and informal EE experiences have a significant effect on quality and quantity of EE instruction carried out by teachers in the future classrooms (Trauth-Nare, 2015). Unfortunately, the past decade has not brought large improvement in preparing teachers as environmental educators. Hence, more and more teachers will need to be expert in EE (NEEF, 2015). In this direction, recently, there is an increase in the studies with preservice and inservice teachers on EE (Ahi & Ozsoy, 2015; Cutter & Smith, 2001; Desjean-Perrotta, Moseley, & Cantu, 2008; Ernst & Tornabene, 2012; Genc, 2015; Ozden, 2008; Pe'er, Goldman, & Yavetz, 2007; Tikka, Kuitunen, & Tynys, 2000; Trauth-Nare, 2015; Tuncer, Sungur, Tekkaya, & Ertepinar, 2007). Because science education has an important part in developing understanding of concepts that form basis for environmental issues, leading potentially to pro-environmental behavior and offers many opportunities to support environmental awareness (Littledyke, 2008), science teachers who are role-models for their students play a key role in EE. We believe that the science teachers lacked of environmental consciousness and favorable environmental attitudes will be insufficient in raising individuals who have favorable value and beliefs about conservation of nature. Indeed, the teachers' favorable environmental attitudes and awareness would influence their students' environmental attitudes and awareness in a positive manner (Ahi & Ozsoy, 2015; Ozden, 2008). Therefore, preservice science teachers who will start to serve in near future must have highly favorable attitudes toward environment. Studies attempt to assess preservice teachers' environmental awareness and attitudes would initiate an important data for EE (Ozden, 2008). Only after understanding the relationships between the environmental attitudes and the factors that influence these attitudes, it will be able to comprehend and improve the individuals' attitudes toward nature (Tikka, Kuitunen, & Tynys, 2000). In this context, one of the objectives of this study was to bring out the relationships between preservice science teachers' environmental attitudes and the demographic factors such as gender and grade level that are crucial.

Purpose

The purpose of the study was first to examine the attitudes of preservice science teachers toward environment and then to investigate whether their attitudes differ in terms of gender and grade level. The answers for the following questions were sought for these objectives:

What are the preservice science teachers' environmental attitudes?

Is there a significant difference among the preservice science teachers' environmental attitudes in terms of gender?

Is there a significant difference among the preservice science teachers' environmental attitudes in terms of grade level?

Methods

Research Design

This study is descriptive in nature and the survey method was used to determine the environmental attitudes of preservice science teachers within the

quantitative research approach. In particular, survey method is a research approach that aims to describe a situation that existed in the past or still existing as it is (Cohen & Manion, 1994).

Sample

The sample of this study consisted of 197 preservice teachers enrolled in the undergraduate program of science teaching in a large public university in the nortwestern Turkey. About, 48 (24.36 %) of them were freshmen, with 57 (28.93 %) sophomores, 41 (20.81 %) juniors, and 51 (25.89 %) seniors. Also, the sample consisted of 163 (82.74 %) female and 34 (17.26 %) male preservice science teachers ranged in age from 18 to 25 years with mean age of 20.33 ± 1.41 years.

Data Collection

Data for the study were collected by utilizing the Personal Information Form, and the Environment Attitudes Inventory. Data collection lasted approximately 25 minutes and was performed in a classroom environment. All preservice science teachers participated in the study on a voluntary basis and were assured that their responses to the instruments would be anonymous and confidential.

Instruments

Personal Information Form (PIF)

The PIF was used the collect detailed information about preservice science teachers concerning age, gender, grade level and science background so that their responses to the Environment Attitudes Inventory could be better comprehended.

Environment Attitudes Inventory (EAI)

The EAI developed by Milfont and Duckitt (2006) and adapted into Turkish by Oznur, Ak, and Keser (2008) was used to determine the environment attitudes of preservice science teachers. The original EAI consists of 12 dimensions and 120 items (Milfont & Duckitt, 2006). Revision and adaptation of the EAI into Turkish carried out with 937 participants and the inventory was reduced to 6 dimensions and 53 items. For the dimensions Cronbach's alfa coefficients ranged from 0.69 (Environmental Movement Activism) to 0.87 (Enjoyment of Nature) have a sufficient reliability (Ak, 2008). Cronbach's alfa coefficient for the EAI was calculated as 0.83 for the data obtained from the study. In particular, for dimensions Cronbach's alfa coefficients ranged from 0.70 (Environmental Threat and Human Utilization of Nature) to 0.94 (Enjoyment of Nature). The EAI dimensions and their construct definitions are shown below (Milfont & Duckitt, 2006):

Enjoyment of Nature: Belief that enjoying time in nature is pleasant, and it is preferred to spending time in urban areas, versus belief that enjoying time in nature is dull, boring and not enjoyable and a preference for spending time in urban areas.

Environmental Movement Activism: Personal readiness to actively support or get involved in organized action for environmental protection, versus

disinterest in or refusal to support or get involved in organized action for environmental protection.

Environmental Threat: Belief that the environment is fragile and easily damaged by human activity, and that serious damage from human activity is occurring and could soon have catastrophic consequences for both nature and humans, versus belief that nature and the environment are robust and not easily damaged in any irreparable manner, and that no damage from human activity that is serious or irreparable is occurring or is likely.

Human Utilization of Nature: Belief that economic growth and development should have priority rather than environmental protection, versus belief that environmental protection rather than economic growth and development should have priority.

Confidence in Science and Technology: Belief that human ingenuity, especially science and technology, can and will solve all environmental current problems and avert or repair future damage or harm to the environment, versus belief that human ingenuity, especially science and technology, cannot solve all environmental problems.

Support for Population Growth Policies: Support for policies regulating the population growth and concern about overpopulation, versus lack of any support to such policies and concern.

The participants who agree with enjoyment of nature, environmental movement activism, environmental threat, support for population growth policies and disagree with human utilization of nature and confidence in science and technology items were accepted as have favorable environmental attitudes. Therefore, human utilization of nature and confidence in science and technology dimension was reverse scored to have the same score direction as other dimensions. Responses to each item were coded from 1 to 7 (1= Strongly disagree, 2= Disagree, 3= Partially disagree, 4= Neutral, 5= Partially agree, 6= Agree and 7= Strongly agree). Reverse scoring was done for the negative items. The raw scores obtained from each of the dimensions divided by the numbers of their items and transformed into standardized scores as the lowest 1 and 7 can receive the highest value.

Data Analysis

In order to determine environmental attitudes of preservice science teachers descriptive statistical analysis was applied. In particular; mean, standard deviation, independent samples t-test, one-way analysis of variance (ANOVA) and Tukey's test were calculated. Statistical analyses of the study were performed using the PASW Statistics 18, a statistical package from SPSS Inc., California, USA. For all of the statistical decoding, the significance level was determined as .05.

Results

The descriptive statistics for the EAI scores are presented in Table 1. As seen in Table 1, preservice science teachers' environmental attitudes were found high in terms of total mean score ($\overline{X} = 5.15$). According to dimensions, while preservice science teachers' mean scores obtained from enjoyment of nature ($\overline{X} = 6.11$), environmental movement activism ($\overline{X} = 5.31$), and environmental threat ($\overline{X} = 6.17$) were found high, scores obtained from human utilization of nature

($\overline{X} = 4.14$), confidence in science and technology ($\overline{X} = 4.68$), and support for population growth policies ($\overline{X} = 4.29$) were found medium level.

Table 1. Descriptive statistics for the EAI

EAI and Dimensions	N	Min	Max	$\overline{X}$	SD
Enjoyment of Nature	197	1.33	7.00	6.11	.84
Environmental Movement Activism	197	2.33	7.00	5.31	.89
Environmental Threat	197	2.30	7.00	6.17	.76
Human Utilization of Nature	197	2.90	5.50	4.14	.47
Confidence in Science and Technology	197	1.75	7.00	4.68	1.00
Support for Population Growth Policies	197	1.00	6.86	4.29	1.18
EAI Total	197	3.15	6.34	5.15	.46

In order to investigate the differences between gender of the preservice science teachers and their scores obtained from the EAI, a t-test was applied for independent groups and the results are presented in Table 2.

Table 2. Independent sample t-test results of EAI scores in terms of gender

EAI and Dimensions	**Gender**	**N**	**$\overline{X}$**	**SD**	**t**	**df**	**p**
Enjoyment of Nature	Female	163	6.16	0.86	1.745	195	.082
	Male	34	5.88	0.70			
Environmental Movement Activism	Female	163	5.42	0.84	3.800		.000*
	Male	34	4.80	0.94			
Environmental Threat	Female	163	6.25	0.68	3.351		.001*
	Male	34	5.78	0.98			
Human Utilization of Nature	Female	163	4.13	0.46	-0.659		.511
	Male	34	4.19	0.53			
Confidence in Science and Technology	Female	163	4.66	1.03	-0.553		.581
	Male	34	4.77	0.88			
Support for Population Growth Policies	Female	163	4.37	1.18	2.199		.029*
	Male	34	3.89	1.07			
EAI Total	Female	163	5.21	0.45	3.238		.001*
	Male	34	4.93	0.46			

*p< .05

As seen in Table 2, when comparing female and male preservice science teachers' total EAI scores, a statistically significant difference was found in favor of female preservice science teachers ($t_{total(195)}= 3.238$; p= .001; d= .615). This finding may indicate that female preservice science teachers have more favorable attitudes toward environment than male preservice science teachers with a moderate effect size. Similarly, considering the environmental movement activism, environmental threat, and support for population growth policies dimensions, female preservice science teachers have higher scores than male preservice science teachers ($t_{environmental\ movement\ activism\ (195)}= 3.800$, $t_{environmental\ threat\ (195)}= 3.351$, $t_{support\ for\ population\ growth\ policies\ dimensions\ (195)}= 2.199$; p< .05). Besides, male preservice science teachers' mean scores were found higher than female preservice science teachers in human utilization of nature ($\overline{X}_{females}= 4.13$, $\overline{X}_{males}= 4.19$) and confidence in science and technology ($\overline{X}_{females}= 4.66$, $\overline{X}_{males}= 4.77$) dimensions, despite the fact that there was no statistically significant difference.

Furthermore, it was determined that the total EAI scores obtained by female preservice science teachers were found high, and male preservice science teachers were found medium level ($\bar{X}_{females}$= 5.21, $\bar{X}_{males}$= 4.93). Upon examining the dimensions, female and male preservice science teachers were obtained the high scores in enjoyment of nature ($\bar{X}_{females}$= 6.16, $\bar{X}_{males}$= 5.88), environmental threat ($\bar{X}_{females}$= 6.25, $\bar{X}_{males}$= 5.78), and the medium level scores in human utilization of nature ($\bar{X}_{females}$= 4.13, $\bar{X}_{males}$= 4.19), confidence in science and technology ($\bar{X}_{females}$= 4.66, $\bar{X}_{males}$= 4.77), support for population growth policies ($\bar{X}_{females}$= 4.37, $\bar{X}_{males}$= 3.89). Furthermore, in environmental movement activism dimension female preservice science teachers obtained high, and male preservice science teachers obtained medium level scores ($\bar{X}_{females}$= 5.42, $\bar{X}_{males}$= 4.80). Also, female preservice science teachers were obtained the highest scores from environmental threat ($\bar{X}$ = 6.25), and the lowest scores from human utilization of nature ($\bar{X}$ = 4.13) dimensions. On the other hand, male preservice science teachers were obtained the highest scores from enjoyment of nature ($\bar{X}$ = 5.88), and the lowest scores from support for population growth policies ($\bar{X}$ = 3.89) dimensions. Figure 1 graphically shows the mean scores obtained from EAI in terms of gender.

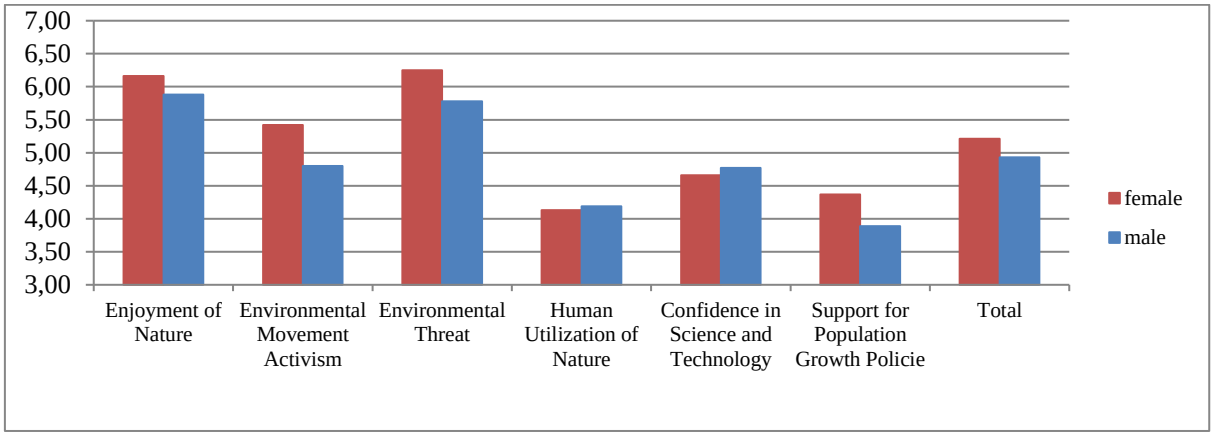

Figure 1. EAI scores in terms of gender

In order to investigate the differences between grade level of the preservice science teachers and their scores obtained from the EAI, a one-way ANOVA test was applied and the results are presented in Table 3.

As seen in Table 3, the highest EAI total score was obtained by senior preservice science teachers ($\bar{X}$ = 5.36). Likewise, in environmental movement activism ($\bar{X}$ = 5.48), environmental threat ($\bar{X}$ = 6.26), human utilization of nature ($\bar{X}$ = 4.35), confidence in science and technology ($\bar{X}$ = 4.93), and support for population growth policies ($\bar{X}$ = 4.90) dimensions senior preservice science teachers obtained the highest scores. Nevertheless, freshman and sophomore preservice science teachers' mean scores ($\bar{X}_{freshmen}$= 6.16, $\bar{X}_{sophomores}$= 6.15) were found higher than juniors and seniors' mean scores ($\bar{X}_{juniors}$= 6.01, $\bar{X}_{seniors}$= 6.09) in enjoyment of nature dimension. Furthermore, freshman preservice science teachers obtained the highest scores in enjoyment of nature dimension ($\bar{X}_{freshmen}$= 6.16), sophomore, junior and senior preservice science teachers obtained in environmental threat dimension ($\bar{X}_{sophomores}$= 6.18, $\bar{X}_{juniors}$= 6.20, $\bar{X}_{seniors}$= 6.26).

Also, the lowest scores were obtained by freshman preservice science teachers in human utilization of nature ($\overline{X}_{freshmen}$= 6.11) and support for population growth policies ($\overline{X}_{freshmen}$= 4.12) dimensions, by sophomore subjects in support for population growth policies ($\overline{X}_{sophomores}$= 4.00) dimension and by junior and senior subjects in human utilization of nature dimension ($\overline{X}_{juniors}$= 4.07, $\overline{X}_{seniors}$= 4.35).

Table 3. One-way ANOVA test results of the EAI scores in terms of grade level

EAI and Dimensions	Grade Level	N	Min	Max	$\overline{X}$	SD
Enjoyment of Nature	1	48	3.56	7.00	6.16	.80
	2	57	4.56	7.00	6.15	.67
	3	41	4.44	7.00	6.01	.76
	4	51	1.33	7.00	6.09	1.08
Environmental Movement Activism	1	48	2.33	6.56	5.07	.87
	2	57	3.00	7.00	5.38	.83
	3	41	2.89	7.00	5.28	.90
	4	51	2.33	7.00	5.48	.94
Environmental Threat	1	48	3.10	7.00	6.02	.78
	2	57	3.80	7.00	6.18	.72
	3	41	4.00	7.00	6.20	.73
	4	51	2.30	7.00	6.26	.79
Human Utilization of Nature	1	48	3.20	5.40	4.11	.46
	2	57	3.10	5.10	4.04	.45
	3	41	2.90	5.50	4.07	.48
	4	51	3.20	5.30	4.35	.47
Confidence in Science and Technology	1	48	2.12	7.00	4.69	1.08
	2	57	1.75	7.00	4.53	1.04
	3	41	1.75	6.88	4.57	1.09
	4	51	3.62	6.25	4.93	.75
Support for Population Growth Policies	1	48	1.43	6.29	4.12	1.20
	2	57	1.00	6.86	4.00	1.19
	3	41	1.86	6.14	4.12	.99
	4	51	2.57	6.86	4.90	1.10
EAI Total	1	48	4.02	6.04	5.07	.41
	2	57	4.19	5.96	5.10	.40
	3	41	4.11	6.02	5.09	.43
	4	51	3.15	6.34	5.36	.55

Figure 2 graphically shows the mean scores obtained from EAI in terms of grade level.

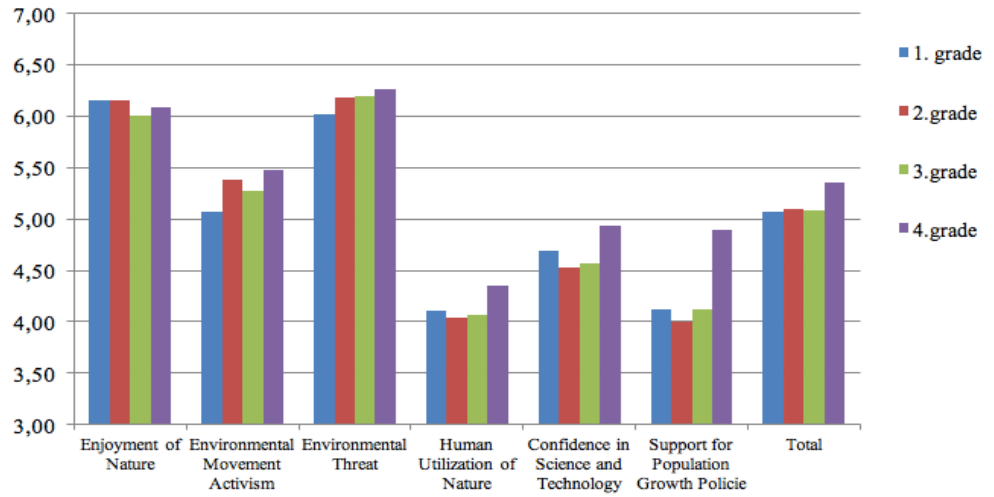

Figure 2. EAI scores in terms of grade level

ANOVA and Tukey's tests results of the EAI scores in terms of grade level of preservice science teachers are shown in Table 4.

Table 4. ANOVA and Tukey's tests results of the EAI scores in terms of grade level

EAI and Dimensions	Source of variance	Sum of squares	df	Mean squares	F	p	Sig. dif.
Enjoyment of Nature	Between-Group	.619	3	.206	.290	.832	-
	Within-Group	137.201	193	.711			
	Total	137.819	196				
Environmental Movement Activism	Between-Group	4.562	3	1.521	1.949	.123	-
	Within-Group	150.600	193	.780			
	Total	155.162	196				
Environmental Threat	Between-Group	1.575	3	.525	.911	.437	-
	Within-Group	111.266	193	.577			
	Total	112.841	196				
Human Utilization of Nature	Between-Group	3.016	3	1.005	4.695	.003*	1-4 2-4 3-4
	Within-Group	41.332	193	.214			
	Total	44.348	196				
Confidence in Science and Technology	Between-Group	4.825	3	1.608	1.607	.189	-
	Within-Group	193.125	193	1.001			
	Total	197.950	196				
Support for Population Growth Policies	Between-Group	26.193	3	8.731	6.861	.000*	1-4 2-4 3-4
	Within-Group	245.618	193	1.273			
	Total	271.811	196				
EAI Total	Between-Group	2.759	3	.920	4.507	.004*	1-4 2-4 3-4
	Within-Group	39.377	193	.204			
	Total	42.136	196				

*p< .05

As seen in Table 4, a statistically significant difference was determined between senior preservice science teachers and all other grade levels in favor of seniors in terms of total EAI scores ($F_{(3-193)}$ = 4.507; p= .004; η^2= .065). This finding may reveal that senior preservice science teachers have more favorable attitudes toward environment when compared with all other grade levels. Also, eta-squared value (η^2= .065) indicated that 6.5% of variance of the EAI scores was associated with grade level. On the other hand, no significant differences were detected in enjoyment of nature ($F_{(3-193)}$= 0.832; p > .05), environmental movement activism ($F_{(3-193)}$= .123; p > 0.05), environmental threat ($F_{(3-193)}$= 0.437; p > .05), and confidence in science and technology ($F_{(3-193)}$= .189; p > 0.05) dimensions. Furthermore, considering human utilization of nature ($F_{(3-193)}$= 4.695; p < .05) and support for population growth policies ($F_{(3-193)}$ = 6.861; p < .05) dimensions a statistically significant difference was determined between senior preservice science teachers and all other grade levels in favor of seniors.

Conclusion and Discussion

In this study that aims first to determine the environmental attitudes of preservice science teachers, the environmental attitudes of preservice science teachers were found to be moderately favorable. Such a result was found by Tikka, Kuitunen, and Tynys (2000) that preservice preschool teachers had moderately positive attitudes toward environment. Upon examining the literature, similar results were also obtained in many studies (Ahi & Ozsoy, 2015; Dunlap & Liere, 2008; Esa, 2010; Levine & Strube, 2012; Ozsoy, Ozsoy, & Kuruyer, 2011). Nonetheless, in the study carried out by Erol and Gezer (2006) stated that preservice teachers' attitudes toward environment and environmental problems were poor.

In consideration of the EAI dimensions, it was determined that preservice science teachers had favorable environmental attitudes in enjoyment of nature, environmental threat, environmental movement activism, and they were doubt about human utilization of nature, confidence in science and technology and support for population growth policies. In specific, preservice science teachers enjoy spending time in nature and believe that environment is a fragile and easily damaged by human activities, and that serious damages from human activities are occurring and could soon have catastrophic consequences for both nature and humans. Also, they were willing to actively support or get involved in organized action for the environmental protection. However, they were not decided whether environmental protection should have priority rather than economic growth and development. This finding was found inconsistent with their beliefs regarding nature has easily damaged by human activity in an irreversible manner. It may stem from the lack of willingness to sacrifice advantages coming with economic growth and development, despite their beliefs about the conservation of nature. Hence, it may be concluded that if fragility of environment and actions for environmental protection conflict with economic considerations, preservice science teachers are not sure how they should think or believe. Besides, they were undecided about whether science and technology can solve all environmental problems. The reason of this finding may be that preservice science teachers do not see science and technology as the only solution (Tuncer, Sungur, Tekkaya, & Ertepinar, 2007). Upon examining literature, the relationship between confidence in science, and technology and

environmental attitudes is not clear. The results of study conducted by Freudenburg (1993) showed that respondents with low confidence in science, and technology had higher concern for local nuclear waste. Similarly, Kellstedt, Zahran, and Vedlitz (2008) found that respondents with high confidence in science and technology feel less responsible for global warming, and also show less concern for global warming. Nevertheless, Reyes (2015) found that the majority of respondents from industrialized countries possessed stronger environmental consciousness and positive attitudes toward the role of science, and technology in solving environmental problems. Hence, more researches are needed for deep understanding of the relationship between confidence in science, and technology and environmental attitudes as recommended by Weaver (2002). Also, as the responses of preservice science teachers displayed, they were not sure if they should support for policies regulating the population growth and concern about overpopulation. This may result from the policies for increasing young population in Turkey in recent years.

When the environmental attitudes of preservice science teachers were examined by gender variable, female preservice science teachers had more favorable attitudes toward environment than did male preservice science teachers in general. There are many studies overlap with these results (Bergman, 2015; Carrier, 2007; Eagles & Demare, 1999; Fremerey & Bogner, 2015; Milfont & Duckitt, 2006; Sutton & Gyuris, 2015; Uitto, Juuti, Lavonen, Byman, & Meisalo, 2011). On the other hand, in study of Larson, Castleberry, and Green (2010), Levine and Strube (2012) and Lieflander and Bogner (2014) it was found that environmental attitudes were not differ in terms of gender. Besides, in rare studies males have more favorable attitudes toward environment compared to females (Carrier, 2009; Shen & Saijo 2007). On the other hand, there were found significant differences in favor of female preservice science teachers in environmental movement activism, environmental threat and support for population growth policies dimensions. These gender differences may result from the gender roles and socialization postulates that individuals are shaped by gender expectations within the context of cultural norms (Zelezny, Chua, and Aldrich, 2000). According to Gilligan (1982), females have traditionally been responsible for looking after the home and children (Tikka, Kuitunen, & Tynys, 2000). In fact, females more likely to have favorable value and beliefs regarding conservation of nature. Nevertheless, male preservice science teachers' scores obtained from human utilization of nature (the belief that environmental protection has should priority rather than economic growth and development) and confidence in science and technology (the belief that science and technology cannot solve all our environmental problems) dimensions were found higher than did females, despite the fact that there were no significant differences statistically. This finding is inconsistent with the majority of the previous studies in literature. In previous studies it was found that males tend to score higher in items regarding mastering nature and prioritizing economic growth and development rather environmental protection (Bogner & Wiseman, 2004; Milfont & Duckitt, 2006; Sutton & Gyuris, 2015) and to trust in science and technology for solution of environment problems more than do females (Blocker & Eckberg, 1997; Milfont & Duckitt, 2004; Sutton & Gyuris, 2015).

When the environmental attitudes of preservice science teachers were examined in terms of grade level, a statistically significant difference was

determined between senior and other grade levels in favor of senior preservice science teachers in terms of the total score obtained from the EAI. This difference may result from contributions of EE experiences in number of years. Indeed, "Environmental Science" course is taught in spring term of third year in science teacher training program. Such a result is also found by Ozden (2008), that senior preservice teachers have more positive attitudes toward environmental issues than freshman preservice teachers. Furthermore, Levine and Strube (2012) revealed that older undergraduate students had more favorable environmental attitudes. Instead, there are some studies found that subjects' environmental attitudes did not depend on their grade levels (Oguz, Cakci, & Kavas, 2010; Ozsoy, Ozsoy, & Kuruyer, 2011). For instance, Fernandez-Manzanal, Rodriguez-Barreiro, and Carrasquer (2007) found that freshmen students' value and beliefs regarding the importance of field trips, conservational aspects, and willingness to act did not change significantly throughout their university years. These results may imply that EE, which subjects were exposured, is not adequate for improvement of environmental attitudes. On the other hand, in human utilization of nature and support for population growth policies dimensions senior preservice science teachers have more favorable attitudes toward environment when compared with other grade levels. Furthermore, despite the fact that there were no significant differences statistically, the highest scores were obtained by senior preservice science teachers in environmental movement activism, environmental threat, human utilization of nature, confidence in science and technology, and support for population growth policies dimensions. Nevertheless, freshman and sophomore preservice science teachers' scores obtained from enjoyment of nature dimension were found higher than junior and senior subjects' scores. This result may show that preservice science teachers' experiences in environmental science course influence their environmental attitudes regarding environmental movement activism, environmental threat, human utilization of nature, confidence in science and technology, and support for population growth policies dimensions in a positive manner.

In conclusion, we found some inconsistency in preservice science teachers' attitudes in current study. For instance, despite their beliefs regarding nature has easily damaged by human activity in an irreversible manner, preservice science teachers were not decided whether environmental protection should have priority rather than economic growth and development. Also, they were not sure if they should support for policies regulating the population growth and concern about overpopulation. At this point, further researches are needed for deep understanding of environmental attitudes and investigating the underlying reasons for the inconsistency in their beliefs. Moreover, we believe that these findings have implications for curriculum developers and educators for developing more effective EE curriculum in teacher training programs. Furthermore, the present study revealed that female preservice science teachers had more favorable attitudes towards environment than did male preservice science teachers in total EAI and some dimensions of EAI. More researches are also needed to investigate learning environments for effective EE that meet the needs of both females and males to improve their pro-environmental attitudes. Such a learning environment might enable females and males to gain favorable value and beliefs in opportunities for spending time in nature, searching out the current environmental problems, and attempt to propose solution towards the

relevant problems. Additionally, in present study senior preservice science teachers had more positive attitudes towards environment than all other grade levels in terms of total EAI and human utilization of nature, support for population growth policies dimensions of EAI. Further researches are also required to investigate the effectiveness of preservice science teachers' experiences regarding nature and environmental issues on their environmental attitudes.

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No potential conflict of interest was reported by the authors.

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