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A Survey of Turkish Pre-Service Science Teachers' Attitudes Toward the Environment

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Abstract

Problem Statement: Increasing global population and unrestrained consumption of natural resources has resulted in increasing pollution, poor air and water quality and the extinction of animal and plant species. Today, environmental problems are experienced worldwide and threatening the continuity of human life. For the sake of human beings, environmental problems need to be solved in the near future. Solving environmental problems is only possible with citizens who are knowledgeable about environmental issues, aware of environmental problems, and motivated to work to solve these problems. Environmental education is the most effective way to educate children about these issues. Teachers are the key actors who shape children's interest in and attitudes toward environmental issues. Thus, for environmental education researchers, it is always worth studying in-service and pre-service teachers' environmental attitudes.

Purpose of the Study: The purpose of this study is to investigate Turkish pre-service science teachers' attitudes toward the environment. In addition, it aims to investigate how pre-service science teachers' environmental attitudes change with grade level and gender.

Method: A total of 2015 pre-service teachers enrolled at elementary school science education departments at 13 different universities in Turkey participated in the study. A 45-item Likert-type questionnaire consisting of four dimensions, namely, awareness of environmental problems, general attitudes toward solutions, awareness of individual responsibility, and awareness of national environmental problems, was used to measure pre-service teachers' environmental attitudes. Descriptive statistics; frequency distributions and percentages, and inferential statistics;

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independent samples t-test and analysis of variance, were used to determine pre-service teachers' environmental attitudes.

Findings and Results: The results of the study showed that pre-service science teachers have a high level of environmental attitudes (M = 149.67, SD = 12.10). The results also revealed that there is a statistically significant mean difference ($t_{(2006)}$ = 2.861, p = .004) between males and females in favour of females with a small effect size (η^2= .004). The results also showed that there are no significant differences (F (3, 2011) = 2.466, p = .061) between pre-service teachers enrolling to different grades with respect to their environmental attitudes.

Conclusions and Recommendations: Overall, the results of the study indicated that today's pre-service science teachers have positive attitudes toward the environment. Additionally, it was found that females have more positive attitudes toward the environment than males. The gender difference in favour of females may be due to the cultural roles of males and females. In traditional views of gender roles, females are responsible for looking after their children and males are usually responsible for providing the economic wellbeing of the family. As a result of these gender roles, males become more competitive and females become more protective, and thus may show more positive attitudes toward the environment. Based on these results, it is suggested that environmental education provided through all steps of formal education take gender differences into account.

Keywords: Environmental education, pre-service teachers, attitudes toward the environment, gender difference, grade level difference

Introduction

Human beings are the only species responsible for the current global environmental situation. The world's environmental problems are mostly the consequence of lifestyles in modern society (Gore, 1992; Orr, 1994). Humans are causing global warming by releasing carbon dioxide into the atmosphere faster than the Earth can absorb it, deforesting the Earth by cutting down trees faster than they can grow, converting grasslands to deserts by overgrazing, causing the extinction of plant and animal species by over-harvesting, depleting natural resources by over-using them, and by producing more and more waste, polluting the air, water, and land. In addition, as the human population and its demands on the Earth's resources increase, Earth's ability to absorb the negative consequences of human based activities diminishes. By the 20th century, humans realized that the Earth has limits and forcing these limits will impact the human population negatively. All these environmental problems threaten the quality of human life and the future viability of all species including humans. Such environmental problems urgently call for solutions. To solve the problems, humans need to develop an understanding of the

actions that cause the deterioration of the environment. This can be possible with education and environmental education is the only way to solve the environmental problems that humans are facing (Orr, 1992). As the United Nations Educational Scientific and Cultural Organization [UNESCO] (1977) reported "more than ever, we need citizens with the awareness, knowledge and skills who are active in the stewardship of the natural world" (p.1).

Over the course of the last fifty years, a growing number of environmental education researchers have attempted to produce citizens "who are knowledgeable concerning the biophysical environment and its associated problems, aware of how to solve these problems and motivated to work towards the solution" (Stapp, 1969, p.30). As a component of this effort, inculcating positive environmental attitudes in children becomes an important task to accomplish. Efforts aimed at developing positive attitudes toward the environment should start with pre-school education (UNESCO, 1977) and continue through all levels of formal education. Throughout the course of formal education, teachers play a vital role in shaping the attitudes of children (Said, Ahmadun, Paim, & Masud, 2003). Adequate preparation of pre-service teachers in teacher-training programmes is necessary to effectively implement of environmental education in schools (Goldman, Yavetz & Pe'er, 2006). Thus environmental education researchers have long been interested in pre-service teachers' knowledge about and attitudes toward the environment (Oerke & Bogner, 2010; Taylor, Doff, Jenkins & Kennelly, 2007). In the literature, environmental attitude has been associated with various variables, such as gender, background, religion, ethnicity, and grade level (Bögeholz, 2006; Bord & O'Connor, 1997; Engel & Potschke, 1998; Ewert, Place, & Sibthorp, 2005; Hodgkinson, & Innes, 2001; Hughes & Saunders, 2005). Among previous research studies focusing on environmental attitudes, a respectable number of studies have analyzed the effects of gender upon environmental attitudes. Some of these studies revealed that females have more positive attitudes than males (Davidson & Freudenburg, 1996; Gardos & Dodd, 1995). On the other hand, some studies reported that males are more sensitive to environment (Hes-Quimbita & Pavel, 1996), and some found that gender does not cause a significant difference with respect to environmental attitudes (Eagles & Demare, 1999). Grade level is reported as another important variable linked to environmental attitudes. Researchers pointed out that grade level is positively associated with environmental attitudes (Arcury 1990; Inglehart 1995). People with a higher level of education tended to show more concern about environmental problems and more respect to the environment, thus demonstrating more positive attitudes toward environment than those with a lower level of education (Derksen & Gartrell, 1993). However, there are also a significant number of studies reporting that environmental attitudes either do not change (Şama, 2003) or even decrease with increasing grade level (Wojtewicz, 1995). Although evidence about the influence of gender and grade level has been reported in previous studies, inconsistencies in these findings and as well as the availability of a huge amount of data regarding Turkish pre-service science teachers, directed the researcher to investigate whether gender and grade level affect Turkish pre-service teachers' environmental attitudes. With this respect the study focuses on the following research questions:

(1) What are pre-service science teachers' attitudes toward the environment?

(2) Is there any difference between male and female pre-service science teachers' attitudes toward the environment?

(3) What is the role of grade level on pre-service teachers' environmental attitudes?

Method

Research Design

A survey was used in this study to collect data on the environmental attitudes of pre-service science teachers. A survey is an appropriate research method for this line of inquiry, as it is designed to be used to determine "the attitudes, opinions and perceptions of persons of interest to the researcher" (Borg, Gall & Gall, 1993; p.21).

Sample

There are 102 state and 52 private universities, totaling 154, in Turkey and 45 of them have an education faculty. Among the universities with education faculties, 39 of them have science education programmes. Based on the data obtained from the Student Selection and Placement Centre, every year approximately 4000 students enroll in the elementary school science education departments of education faculties. There are approximately 16,000 pre-service teachers enrolling at such education faculties. Participants of the study consisted of 2,015 pre-service teachers; 812 males and 1,199 females, enrolled in the science education departments of 13 universities in Turkey. There were 640 first year, 586 second year, 496 third year and 293 fourth year students. This study covers approximately 12% of the total population of pre-service science teachers.

Research Instruments

Pre-service teachers' attitudes toward the environment were measured by administering the 'Environmental Attitude Questionnaire' (EAQ) developed by Tuncer, Ertepınar, Tekkaya and Sungur (2005). The questionnaire includes 45 Likert-type questions, which make it easy to use, score, and code for statistical analysis. The EAQ consists of four subscales: awareness of environmental problems (AEP), general attitudes towards solutions (GAS), awareness of individual responsibility (AIR), and awareness of national environmental problems (ANEP). The statements in the questionnaire are designed to determine participants' awareness of environmental problems, their opinion on the effect of environmental problems on their future, participants' opinions on the solutions to environmental problems, their awareness of individual responsibilities for the solutions and the relationships between lifestyles and environmental problems, and their awareness of national environmental problems (Tuncer et.al, 2005). Tuncer et al. reported the internal consistency of item sets to be .58, .65, .77, and .55, respectively, using Cronbach's alpha. In the present study, internal consistency values for each subscale were calculated as .79, .55, .79, and .58.

Participants' responses to 45 Likert-type questions comprise the data set used for analyses. For statements representing positive attitudes toward the environment five points were assigned to 'strongly agree', four points to 'agree', three points to 'undecided', two points to 'disagree' and one point to 'strongly disagree'. For statements representing a negative attitude, the scores were reversed. For the representation of the data the 'strongly agree' and 'agree' responses, 'disagree' and 'strongly disagree' responses were combined to give the proportions of students who affirmed the data.

Procedure

The study was conducted with pre-service science teachers enrolled at 13 different universities during the spring semester of 2009-2010 academic year. At the beginning of the study, the researchers contacted academics in education departments at these universities via e-mail and asked for cooperation to conduct the study. Academics from 13 universities replied positively to the request. The instrument was then sent to these universities along with guidelines explaining how the questionnaire should be conducted. These guidelines, informed participants about the purpose of the questionnaire and procedure for completing it. They were instructed to think about each item and answer as it applies to them. After the questionnaires were completed, academic staff from the 13 universities returned them to the researcher.

Data Analysis

The data gathered were analyzed using the Statistical Package for the Social Sciences (SPSS) version 15.0. Descriptive statistics in the form of frequency distributions and percentages were used to determine pre-service teachers' answers to demographic questions and distributions of responses for four subscales of the EAQ. Inferential statistics were used to find out the relationships between the independent variables of gender and grade level and the scores obtained from the EAQ. The results of the analyses were reported to be significant at the $p<.05$ statistical significance level and medium effect size.

Results

The following results are based on statistical analyses of the data collected by the EAQ. The findings are divided into two sections. The first section represents the results of descriptive statistics, and the second section addresses the results of inferential statistics.

Results of Descriptive Statistics

Research Question 1: What are pre-service science teachers' attitudes toward the environment? To answer the first research question regarding pre-service science teachers' attitudes toward the environment, descriptive statistics for each subscale of the EAQ are reported (see Table1). The questionnaire includes 45 questions. Thus, the minimum score that can be obtained from the EAQ is 45 and the maximum score is 225. The scores obtained from the pre-service teachers' responses had a minimum

score of 83, and a maximum score of 202, with a mean of 149.67, and a standard deviation of 12.10. Overall, the frequency distribution for the 45 items reveals a high level of positive attitudes toward the environment.

Table 1.

Descriptive Statistics for four subscales of EAQ

	N	Min.	Max.	*M*	*SD*
AEP	2015	17.00	54.00	35.08	4.51
GAS	2015	25.00	70.00	52.99	5.80
AIR	2015	21.00	65.00	48.73	5.70
ANEP	2015	8.00	27.00	18.40	2.52
Total	2015	83.00	202.00	149.67	12.10

General Awareness of Environmental Problems (AEP): The first subscale contains 12 questions in total. Thus, the minimum score that can be obtained from the subscale is 12 and the maximum score is 60. Scores below 36 can be considered to indicate low awareness and scores higher than 36 can be considered to indicate high awareness of environmental problems. Scores obtained from pre-service teachers range from 17 to 54 with a mean score of 35.08 and a standard deviation of 4.51. Based on these results, it can be concluded that pre-service teachers have a moderately high awareness of environmental problems. Frequency distributions also support participants' high level of awareness of environmental problems. The results show that the majority of pre-service teachers (72.7%) believe that environmental pollution is not a temporary problem. Additionally, 74.4% of pre-service teachers disagree with the proposition that since the natural sources of energy can never be exhausted, energy will never be scarce on Earth. Similarly 73.7% of them state that they do not think that over the next ten years environmental problems will diminish. Participants also disagree (85.6%) with the statement "mankind is very adaptive so there is no need to be concerned about his survival in a polluted environment." and the majority of pre-service teachers (83.4%) think that humanity is abusing the environment. In addition to these statistics, more than one fifth of pre-service teachers are unsure about whether people are overloading the Earth's natural ability to support life on Earth. Table 2 provides a summary of the frequencies of responses to selected items in this subscale.

Table 2.

Frequencies and percentages of responses to items in AEP

Items	Disagree		Undecided		Agree	
	f	*P*	*f*	*P*	*f*	*P*
3- Environmental pollution is a temporary problem.	1465	72.70	192	9.50	322	16.00
5- Industrialized societies give most people who live in them a high standard of living.	389	19.30	484	24.00	1030	51.10
6- Mankind is very adaptive so there is no need to be concerned about his survival in a polluted environment.	1726	85.60	93	4.60	166	8.20
9- We are overloading the Earth's natural ability to support life on earth.	587	29.10	526	26.10	421	20.90
28- Humanity is abusing the environment.	137	6.80	134	6.70	1681	83.40
37- The natural sources of energy, such as sun, wind and water, can never be exhausted, so energy will never be scarce on earth.	1498	74.40	217	10.80	230	7.50
39- Over the next ten years environmental problems will diminish.	1485	73.70	252	12.50	173	8.60

General Attitudes Toward Solutions (GAS): The results of descriptive statistics reveal that the minimum score obtained from the scale is 15 and the maximum score is 75 with a mean score of 52.99 and a standard deviation of 5.80. Since the mean score obtained is higher than 45 it can be concluded that pre-service teachers have positive attitudes toward solutions. Table 3 summarizes the frequencies and percentages of pre-service science teachers' responses to some GAS items. An examination of the frequency distributions reveals that most of the participants (72.5%) believe in the importance of changing our lifestyles to solve environmental problems. Additionally, the majority of participants (79.1%) state that in dealing with any kind of problem we need to first consider how it will affect the environment. Furthermore, 80.9% believe that society should encourage the conservation of nature. An examination of the frequency distributions also shows that nearly 20% of pre-service science teachers are uncertain about favoring the protection of the

environment over economic growth, the sustainable use of natural resources, and the benefits and harmful effects of technology.

Table 3

Frequencies and percentages of responses to items in GAS

Items	Disagree		Undecided		Agree	
	f	*P*	*f*	*P*	*f*	*P*
7- The ultimate solution for environmental problems depends on drastic changes in our life-style.	325	16.20	163	8.10	1462	72.50
8 Protection of the environment is more important than economic growth.	353	17.60	365	18.10	579	28.70
21- Just as science and technology monitor environmental problems, they also solve them, so such issues will not the points of concern in the future.	1316	65.30	359	17.80	161	8.00
38- In dealing with any kind of problem we need to first consider how it will affect the environment.	182	9.00	188	9.30	1594	79.10
40- Society should encourage the conservation of nature.	118	9.40	130	6.50	1729	80.90
43- The sustainable use of natural resources means the continuous use of them.	585	29	344	17.10	889	23.70

General Awareness of Individual Responsibility and Attitude Toward Changing Lifestyles (AIR): The third subscale consists of 13 statements. Thus, the minimum score that can be obtained from this subscale is 13 and the maximum score is 65. The results show that pre-service teachers' responses range from 21 to 65 with a mean score of 48.73 and a standard deviation of 5.70. Since the calculated mean score is more than 39, it can be concluded that pre-service teachers are aware of their individual responsibilities and they have a positive attitude toward changing lifestyles. Table 4 shows the responses given to selected items of the AIR section. The majority of participants (88.9%) state that the hole in the ozone layer will never stop growing if we continue to operate as we do now. Additionally, almost all of the pre-service teachers (91.5%) agree that individual responsibilities are very important in protecting the environment from pollution. However, a considerable number of the

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participants' responses show that they are not sure about the effects of spending long periods of time in shopping centres and consumption patterns on natural resources, and solving environmental problems.

Table 4.

Frequencies and percentages of responses to items in AIR

Items	Disagree		Undecided		Agree	
	f	*P*	*f*	*P*	*f*	*P*
14- We must conserve our resources for future generations.	160	7.90	41	2.00	1775	88.10
19- If we do not change current consumption patterns, land degradation and topsoil losses will increase to the point where they can no longer support crops.	198	9.80	117	5.80	1632	81.00
24- Individual responsibilities are very important in protecting the environmental pollution	98	4.80	42	2.10	1843	91.50
25- The hole in the ozone layer will never stop growing if we continue to operate as we do now.	119	5.90	68	3.40	1791	88.90
31- Spending long times in shopping centres is a type of life style that has negative effects on both consumption patterns and the exploitation of natural resources.	440	21.80	458	22.70	924	45.80
41- Consumption patterns have nothing to do with the exploitation of natural resources.	1481	73.50	220	10.90	215	8.90
45- Everybody has a part in environmental degradation but the degree of responsibility changes according to individual consumption patterns.	154	7.70	112	5.60	1689	83.80

Awareness of National Environmental Problems (ANEP): The last subscale consists of 6 statements with a minimum score of 6 and a maximum score of 30. The scores obtained from pre-service teachers' responses range from 7 to 27 with a mean score

of 18.40 and a standard deviation of 2.52. This means that pre-service teachers have a moderately positive awareness of national environmental problems. Table 5 represents responses to selected items. Most of the pre-service teachers' (88.7%) are aware that there are many plant and animal species in our country that are at the edge of extinction. Additionally, 79.5% of pre-service teachers think that the solution to the environmental problems in Turkey is closely related to raising environmental awareness. The majority (71.2%) of pre-service teachers disagree with, and 13.60% are undecided about, the statement that "Turkey needs to be industrialized; therefore environmental destruction due to industrialization can be disregarded".

Table 5.

Frequencies and percentages of responses to items in ANEP

Items	Disagree		Undecided		Agree	
	f	*P*	*f*	*P*	*f*	*P*
20- Turkey needs to be industrialized; therefore environmental destruction due to industrialization can be disregarded.	1434	71.20	275	13.60	123	6.10
23- There are many plant and animal species in our country that are at the edge of extinction.	139	6.80	88	4.40	1788	88.70
42- The solution to the environmental problems in Turkey is closely related to raising environmental awareness.	227	11.30	187	9.30	1601	79.50

Inferential Statistics of the EAQ

Research Question 2: Is there any difference between male and female pre-service teachers' attitudes toward the environment? To answer the second research question, of determining whether pre-service teachers' attitudes change with their gender, inferential statistics were conducted. A discussion of the assumptions that underlie parametric tests is necessary before introducing them. For parametric tests, it is assumed that the populations from which the samples are taken are normally distributed (Pallant, 2007). Skewness and kurtosis values are used for normality assumptions. If the distribution is perfectly normal, a skewness and kurtosis value of 0 will be obtained. As with kurtosis, a skewness value ranging from -1 to +1 is considered excellent and values between -2 and +2 are also acceptable. For the present study, the normality analysis reveals that skewness value is -.135 and kurtosis value is 1.774. These values demonstrate that the scores of the sample show

normal distribution. Another assumption of parametric tests is the homogeneity of variances. Parametric tests assume that samples obtained from the population have equal variances (Pallant, 2007). To test this assumption, SPSS performs Levene's test for equality of variances. Obtaining significance values higher than .05, suggests that the variances of two groups are equal, and therefore the assumption is met. In other situations, ANOVA is reasonably robust to violations of this assumption when the size of treatment groups is reasonably similar. Additionally, t-tests provide two sets of results, one for situations where the assumption is violated and one for when it is not. Taking all these situations into consideration, it is appropriate to use parametric tests. To test whether pre-service teachers' attitudes change with gender, independent samples t-test was conducted. The results of the analysis are summarized in Table 6.

Table 6.

Results of t-test analysis run to test whether pre-service teachers' attitude change with gender

Variable	**Gender**	***N***	***M***	***SD***	***t***	***p***
Environmental Attitude	Females	1199	151.91	11.98	2.861	.00
	Males	809	150.18	14.17		

The results show that there is a significant mean difference between mean scores of females (M = 151.91, SD = 11.98) and males (M = 150.18, SD = 14.17) on their attitudes toward the environment ($t_{(2006)}$ = 2.861, p = .00) with a small effect size (η^2= .01). This means that although the mean difference is statistically significant in favour of females, this difference is not practically significant.

Independent sample t-tests were also run for each subscale of the EAQ to determine whether females and males differ from each other. The results reveal that there is a significant difference between males and females for each subscale with small effect sizes. Although this difference is in favour of females for GAS ($t_{(2006)}$ = 6.69, p = .00, η^2= .02) and AIR ($t_{(2006)}$ = 7.55, p = .00, η^2= .03), for the other subscales, AEP ($t_{(2006)}$ = -2.71, p = .01, η^2= .00) and ANEP ($t_{(2006)}$ = -3.89, p = .00, η^2= .00), the difference is in favour of males. The results of the analyses are summarized in Table7.

Table 7.

Results of t-test analyses of pre-service teachers' attitudes by gender run for each subscale of EAQ

Subscales	Gender	*N*	*M*	*SD*	*t*	*p*
AEP	**Females**	1199	34.86	4.38	-2.71	.01
	Males	809	35.42	4.81		
GAS	**Females**	1199	53.71	5.29	6.69	.00
	Males	809	51.96	6.36		
AIR	**Females**	1199	49.52	5.26	7.55	.00
	Males	809	47.59	6.13		
ANEP	**Females**	1199	18.22	2.36	-3.89	.00
	Males	809	18.67	2.72		

Research Question 3: What is the role of grade level on pre-service teachers' environmental attitudes? To test whether there is a significant mean difference between pre-service teachers' attitudes toward the environment one-way ANOVA was run. The ANOVA results reveal that there is no significant mean difference between pre-service teachers enrolled in different grade levels with respect to their attitudes toward the environment (F (3, 2011) = 2.46, p = .06)

ANOVA tests were also run for each subscale to determine whether pre-service teachers from different grade levels differ from each other. The results reveal that pre-service teachers enrolled in different grade levels differ from each other with respect to their attitudes toward solutions (F (3, 2011) = 3.26, p = .02), as well as their awareness of individual responsibility and attitudes toward changing lifestyles (F (3, 2011) = 2.66, p = .04). Despite reaching statistical significance, the actual difference in mean scores between the groups was quite small. The effect size, calculated using eta squared was .02 for GAS and .05 for AIR. Post-hoc comparisons using the Tukey HSD test indicated that for GAS the mean score for 1st year students (M = 53.32, SD = 5.77) is statistically different from 4th year students' mean scores (M = 52.12, SD = 5.85) and 2nd year students' mean scores (M = 53.20, SD = 5.72) are statistically different from 4th years' (M = 52.12, SD = 5.85). Furthermore, for AIR a significant difference is found between first years' mean scores (M = 48.96, SD = 5.57) and 4th years' mean scores (M = 47.90, SD = 5.98). Table 8 summarizes ANOVA results run for each subscale of the EAQ.

Table 8.
ANOVA Results

Subscales	Grade Level	*N*	*M*	*SD*	*f*	*p*
AEP	1	640	35.24	5.02		
	2	586	34.85	4.45		
	3	496	35.03	4.09	1.00	.38
	4	293	35.29	4.11		
	Total	2015	35.08	4.51		
GAS	1	640	53.32	5.77		
	2	586	53.20	5.72		
	3	496	52.83	5.87	3.26	.02
	4	293	52.12	5.85		
	Total	2015	52.99	5.80		
AIR	1	640	48.96	5.57		
	2	586	48.92	5.65		
	3	496	48.70	5.74	2.66	.04
	4	293	47.90	5.98		
	Total	2015	48.73	5.70		
ANEP	1	640	18.37	2.68		
	2	586	18.36	2.55		
	3	496	18.40	2.37	.32	.81
	4	293	18.53	2.32		
	Total	2015	18.40	2.52		

Discussion and Conclusion

Turkey is a rapidly developing country in which young people compose one-third of the total population. In developing countries, increased consumption and population cause pressures on the environment. Considering this situation, it is very important to educate the youth "who have the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions and the prevention of the new ones" (UNESCO, 1975, p.43). Schools are the places where children receive environmental education and teachers have the potential to influence the environmental attitudes of their students (Said et. al., 2003). To do so in a positive manner, teachers should have positive attitudes toward the environment. Thus, in-service and pre-service teachers' attitudes toward the environment are always worth studying. For this reason, the purpose of this study was to investigate Turkish pre-service science teachers' attitudes toward the environment and to explore the effects of gender and grade level on their environmental attitudes.

There are some encouraging outcomes from this research. Descriptive statistics reveal that pre-service science teachers have a high level of positive environmental attitudes (M = 149.67, SD = 12.10). They also have a moderately positive awareness of environmental problems (M = 35.08, SD = 4.51), positive attitudes toward solutions (M = 52.99, SD = 5.80), high awareness of their individual responsibilities (M = 48.73, SD = 5.70), and a moderately positive awareness of national environmental problems (M = 18.40, SD = 2.52). As the frequencies imply, participants are aware that humans affect and are also affected by the environment. Additionally, the results show that the participants agree on the importance of individual responsibility and societal support in protecting the environment. They believe that to solve environmental problems it is necessary to make drastic changes in our lifestyles. On the other hand, undecided responses to several statements indicate that participants seem to be confused about how to change their lifestyles in order to promote more sustainable use of natural resources. Furthermore, they are unaware of the relationships among industrialization, scientific and technological developments, and the environment. They are unsure about the effects of increasing population and consumption on environmental pollution. It is likely that participants' lack of knowledge about sustainable development, renders them unable to draw such connections.

In addition to these findings, the frequencies for several items show that pre-service teachers are not optimistic about the future, and they do not have faith that environmental problems will be solved in the near future. Moreover, they think that scientific and technological developments have the potential to cause environmental problems, thus they are the points of concern in the future. However, they also agree that environmental problems can be solved with increasing environmental awareness. This promising result suggests that teachers will make an effort to train their students as environmentally literate citizens.

Gender and grade level are the two independent variables considered in the study. The results of the present study reveal that although the difference is practically small, there are statistically significant differences between females and males with respect to all subscales of the EAQ. A review of related literature

supports the gender difference. Concerning gender difference several research studies show that, females have more positive attitudes toward and greater concern with regard to environmental issues than males do (Bord & O'Connor, 1997; Eagles & Demare, 1999; Tikka, Kuitunen, Tyns, 2000; Tuncer et al., 2005). In their studies, Bord and O'Conner (1997) claim that if an environmental attitudes survey includes statements that may trigger risk perceptions, females are more likely to get higher scores than males. According to Bord and O'Conner, questions about radioactive and chemical waste, environmental degradation and potential loss of animal and plant species have a high potential to trigger risk perceptions. From this perspective, when the items in the EAQ are examined, it can be concluded that some of the items may trigger risk perceptions. This may be the cause of the gender difference obtained. In addition, gender difference may be due to the traditional cultural roles inhabited by females and males. Women are traditionally responsible for looking after their home and taking care of their children (Gilligan, 1982). On the other hand males are more adventurous, they tend to master nature, focus on hunting, and use natural resources to provide food and meet the other requirements of their families. Based on these gender roles, females are more likely to take an emotional attitude toward nature than males (Caro, Pelkey & Grigione, 1994; Kellert & Berry, 1987), and thus have more positive environmental attitudes.

As far as different grade levels are concerned, the present study indicates that there are no statistically significant differences between pre-service teachers enrolled in different grade levels with respect to their attitudes toward the environment. However, the results also reveal that although the effect size is small, a significant difference exists between grade levels with respect to their attitudes toward solutions, their awareness of individual responsibility and attitude toward changing lifestyles. For the subscales in which a significant difference was obtained, first years and second years differ from fourth years with respect to their attitudes. Attitudes of students toward environmental issues have been measured for a variety of grades (Ma & Bateson, 1999; Musser & Diamond, 1999). Previous research studies suggested that age (in this case, grade level) affects environmental attitudes, and younger students had more positive attitudes toward environmental issues than older students did (Malkus & Musser, 1997). Age difference is a possible explanation for the statistical difference obtained. Although the results are statistically significant, readers should keep in mind that the effect sizes are small. This means that, although statistically significant differences exist between genders and among grade levels, these differences are of little practical significance.

Overall, the results of the study indicate that today's pre-service science teachers have a positive attitude toward the environment. Due to the high number of participants, the researcher believes that these findings can easily be generalized to all pre-service science teachers. Based on the results obtained, it is suggested that gender differences be taken into account in environmental education provided through all steps of formal education. In addition, pre-service teachers, through their vocational training, only take an environmental education course in one semester of the second year. This time period of exposure may not be to develop environmental

attitudes, so it is suggested that several more courses with environmental content be included in pre-service teachers' education curricula. If pre-service teachers are effectively trained during their vocational education, they can effectively change future generations' environmental attitudes. This is the only way to ensure that children are educated to be environmentally aware and attuned to solving the environmental problems that human beings face.

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İlköğretim Fen Bilgisi Öğretmen Adaylarının Çevreye Karşı Tutumları (Özet)

Problem Durumu

İnsanoğlu dünyanın içinde bulunduğu durumdan sorumlu olan tek türdür. Günümüzde yaşanan çevre sorunları modern toplumların yaşam tarzlarının doğal bir sonucudur. Doğal kaynakların bilinçsizce kullanımı ve bu kaynakların bazılarının yenilenemez özellikte olması doğanın dengesinin giderek bozulmasına ve yaşanan çevre problemlerinin giderek artmasına neden olmuştur. Küresel ısınma, bitki ve hayvan türlerinin yok olmaya başlaması, artan nüfus, artan tüketim, doğal kaynakların bilinçsizce tüketimi, hava, su ve toprak kirliliği, nükleer kirlilikler bugün karşı karşıya kaldığımız en önemli çevre problemlerini oluşturmaktadır Yaşanan çevre sorunları insan hayatının devamlılığı için de bir tehdit oluşturmaktadır. Hayatın devamlılığı için çevre sorunlarının biran önce çözümlenmesi, oluşacak yeni problemlerin engellenmesi gerekmektedir. Çevre sorunlarının çözülmesi çevre hakkında bilgili, çevre sorunlarının farkında olan ve bu sorunları çözmek isteyen bireylerle mümkündür. Çevre eğitimi de çocukların bu özelliklere sahip bireyler olarak yetiştirilebilmeleri için en etkili yoldur. Öğretmenler ise çocukların çevreye karşı tutumlarının şekillenmesinde rol oynayan en önemli aktörlerdir. Çevreye karşı olumlu tutum sergileyen bireyler yetiştirebilmek için öğretmenlerin de tutumunun olumlu olması gerekmektedir. Bu yüzden, halen çalışmakta olan öğretmenlerin ve öğretmen adaylarının çevreye karşı tutumları çevre eğitimcileri için her zaman araştırmaya değer bir konu olarak görülmüştür.

Araştırmanın Amacı

Bu kapsamda bu çalışmanın amacı, fen bilgisi öğretmen adaylarının çevreye karşı tutumlarını araştırmaktır. Ayrıca çalışmada, öğretmen adaylarının çevreye karşı tutumlarının cinsiyet ve sınıf düzeyi faktörleri ile nasıl değiştiği de incelenmiştir.

Yöntem

Çalışmaya 13 farklı üniversitenin ilköğretim fen bilgisi öğretmenliği anabilim dallarına kayıtlı toplam 2015 öğretmen adayı katılmıştır. Çalışma 2009-2010 eğitim-öğretim yılı bahar döneminde yürütülmüştür. Öğretmen adaylarının çevreye karşı tutumları dört boyuttan oluşan; çevre sorunları hakkındaki farkındalık, genel çevre sorunlarının çözümüne karşı tutum, bireysel sorumlulukları hakkındaki farkındalık ve ulusal çevre sorunları hakkındaki farkındalık, 45 soruluk Likert tipi ölçekle belirlenmiştir. Çalışmadan elde edilen verilerin analizinde *Statistical Package for Social Sciences (SPSS)15.0* programı kullanılmıştır.

Betimleyici istatistik; frekans ve yüzde dağılımları, demografik sorulara ve ölçeğin dört alt boyutunda bulunan sorulara verilen yanıtların analizi için, çıkarımsal istatistik; bağımsız gruplarda t-testi ve varyans analizi, cinsiyet ve sınıf düzeyi faktörlerinin öğretmen adaylarının tutumlarına etkisini belirlemek için kullanılmıştır. Analiz sonuçları, $p<.05$ istatistiksel anlamlılık düzeyi ve orta etki değeri temel alınarak raporlanmıştır.

Bulgular

Çalışmanın bulguları öğretmen adaylarının çevreye karşı tutumlarının olumlu (M = 149.67, SS = 12.10) olduğunu göstermektedir. Bunun yanı sıra, öğretmen adaylarının çevre sorunlarına karşı orta derecede farkındalık gösterdiği (M = 35.08, SS = 4.51), genel çevre sorunlarının çözümüne yönelik olumlu tutum sergiledikleri (M = 52.99, SS = 5.80), bireysel sorumluluk düzeylerinin yüksek olduğu (M = 48.73, SS = 5.70) ve ulusal çevre sorunları hakkındaki farkındalıklarının orta derecede olduğu (M = 18.40, SD = 2.52) görülmektedir. Cinsiyet değişkeni ele alındığında bulgular, küçük etki değeriyle (η^2 = .004), kadınlar ve erkekler arasında istatistiksel olarak anlamlı bir farklılık ($t_{(2006)}$ = 2.861, p = .004) olduğunu göstermektedir. Sınıf düzeyi ele alındığında ise çalışmanın sonuçları farklı sınıf düzeylerine devam eden öğretmen adaylarının çevreye karşı tutumları arasında istatistiksel olarak anlamlı bir farklılık olmadığını (F (3, 2011) = 2.466, p = .061) göstermektedir.

Sonuç ve Öneriler

Türkiye, toplam nüfusunun üçte biri gençlerden oluşan ve hızla gelişmekte olan bir ülkedir. Gelişmekte olan ülkelerde artan nüfus ve buna paralel olarak artan tüketim çevre üzerindeki baskıyı da arttırmaktadır. Bu durum göz önüne alındığında genç nüfusu çevre konularında bilgili, çevre sorunlarına duyarlı ve yaşanan çevre problemlerini çözmek için istekli bireyler olarak yetiştirmek büyük önem taşımaktadır. Öğrencilere bu özellikler okullarda verilecek olan çevre eğitimi ile aşılanabilir. Ayrıca, öğretmenler öğrencilerinin çevreye karşı tutumlarını etkileme potansiyeline sahiptirler. Bu etkilemenin olumlu yönde gerçekleşmesi için öğretmenlerin de tutumlarının olumlu olması gerekmektedir.

Genel olarak değerlendirildiğinde çalışmanın sonuçları bugünün fen bilgisi öğretmen adaylarının çevreye karşı olumlu bir tutum sergilediklerini ortaya çıkarmaktadır. Bu çalışmadan ve alanyazından elde edilen diğer sonuçlara göre cinsiyetin öğretmen adaylarının tutumlarını etkileyen bir faktör olduğu göz önüne alındığında çevre eğitimi verilirken cinsiyet farkının göz önüne alınması önerilmektedir. Bunun yanı sıra, öğretmen adayları mesleki eğitimlerinde çevre eğitimini sadece ikinci yılın birinci döneminde almaktadır. Bu süre çevreye karşı tutumu geliştirmek için yeterli olmayabilir. Bu yüzden, öğretmen adaylarının üniversitelerde aldıkları eğitim süresince çevre eğitimi ile ilgili derslerin arttırılması önerilmektedir. Çevreye karşı tutumu yüksek öğretmenler yetiştirmek gelecek nesillerin de çevreye karşı olumlu tutum sergilemelerinin teminatı olacaktır. Çevre sorunlarının çözümünde çocuklarımızın çevreye karşı duyarlı birer birey olarak yetişmesi en vazgeçilmez yoldur.

Anahtar Kelimeler Çevre eğitimi, öğretmen adayları, çevreye karşı tutum, cinsiyet faktörü, sınıf düzeyi faktörü.