

Effects of Gender and Grade Level on Environmental Moral Reasoning Patterns *

Küresel ve Yerel Çevre Sorunlarının Gerekçelendirilmesinde Etik: Cinsiyet ve Sınıf Seviyesinin Etkileri

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ABSTRACT: The purpose of this study was to examine environmental moral reasoning patterns of 120 pre-service science teachers together with the effects of gender and grade level on these reasoning. For data collection, participants were asked to write their concerns about four environmental problems (i.e., deforestation, electronic waste, oil spills, global warming) each of which were presented as local and global cases. Content analysis was performed on the participants' written statements and frequencies of the statements reflecting ecocentric, anthropocentric, and non-environmental moral reasoning were calculated to be used in descriptive and inferential analyses. While analyses did not reveal statistically significant difference between environmental moral reasoning patterns of males and females, grade level was found to have statistically significant effect. In addition to general patterns in pre-service science teachers' environmental moral reasoning, findings were also interpreted for local and global environmental problem dichotomy. Implications for environmental education were discussed.

Keywords: environmental moral reasoning, gender, grade level

ÖZ: Bu çalışmada 120 fen bilgisi öğretmen adayının çevresel sorunlar karşısında sergiledikleri çevresel ahlaki muhakeme örüntüleri ile cinsiyet ve sınıf seviyesinin bu örüntüler üzerindeki etkileri incelenmiştir. Veri toplama sürecinde, katılımcılardan kendilerine yerel ve küresel örnek olaylar şeklinde sunulmuş olan ormansızlaşma, elektronik atıklar, petrol sızıntıları ve küresel ısınma sorunlarıyla ilgili kaygılarını yazılı olarak ifade etmeleri istenmiştir. Katılımcıların ifadeleri içerik analizi ile incelenmiş ve çevre-merkezli, insan-merkezli ve çevresel kaygılar içermeyen ifadelerin frekansları hesaplanmıştır. Çıkarımsal analizler sonucunda çalışmaya katılan kadın ve erkek öğretmen adaylarının çevresel ahlaki muhakeme örüntüleri arasında anlamlı bir fark bulunmazken sınıf seviyesinin çevresel ahlaki muhakeme örüntüleri üzerinde anlamlı bir etkisinin olduğu sonucuna varılmıştır. Katılımcıların çevresel ahlaki muhakeme örüntüleri ve çevresel problemlerin yerel veya küresel olma durumunun bu örüntüler üzerindeki etkisi betimsel analizler yoluyla da incelenmiş ve elde edilen sonuçlar çevre eğitimi kapsamında tartışılmıştır.

Anahtar sözcükler: çevresel ahlaki muhakeme, cinsiyet, sınıf seviyesi

1. INTRODUCTION

It is accepted that that we should focus on humans and gain greater knowledge about human-environment relationships in order to find long-lasting solutions for the many environmental problems (Kellert & Wilson, 1993). Enhancing understanding of human-environment relationships through educational practices, it will be possible to promote more responsible environmental behaviors in learners thus in the society as a whole (Duan & Fortner, 2005). However, research shows that gaining greater knowledge and understanding about human-environment relationships is not enough by itself but development of a personal environmental ethic is also necessary to motivate individuals to behave in more pro-environmental ways (Tilbury, 1995). Stern, Dietz, Abel, Guagnano, and Kalof's (1999) value-belief-norm (VBN)

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theory provides a clear explanation for this argument. According to VBN theory, if people with particular personal values are aware of the adverse consequences of their behaviors to the environment and believe that they have contributed to the environmental problems or they could alleviate those consequences, they experience a moral obligation (personal norm) to act pro-environmentally. Likewise, values and moral norms as significant components of environmental ethics are frequently referred in research studying pro-environmental attitudes and behaviors. Moreover, research findings reveal that differences in people's motives, or reasons, for valuing nature are also very important and sometimes deterministic for people's approaches toward environmental issues (Bjerke & Kalternborn, 1999). Correspondingly, in the literature there are a number of categorizations proposed to explain differences in individuals' value orientations, motivational domains, and perceptions of environmental ethics, which are influential in approaches toward and concerns about environmental issues (e.g., Axelrod, 1994; De Groot & Steg, 2007; Merchant, 1992).

In line with previous research, in the present study the construct of environmental moral reasoning is examined. Moral reasoning is defined as a thinking process with the objective of determining whether an idea is right or wrong (Littleldyke, 2004). Therefore, we can define 'environmental moral reasoning' as a thinking process that is used to determine whether an idea or an action is right or wrong in terms of environmental improvement and protection. Since underlying reasons of people's decisions regarding the 'morality' of environmental ideas or actions are at least as important as the decisions themselves, in the present study the researchers focused on the differences in the participants' environmental moral reasoning patterns. In this sense, Kortenkamp and Moore's (2001) approach was utilized and environmental moral reasoning patterns were categorized into three as ecocentric, anthropocentric, and non-environmental moral reasoning. Ecocentric moral reasoning is mainly based on the idea of establishing equivalences between human and non-human life forms and valuing biological life and natural processes. For this moral reasoning category, valuing nature for its own sake (Gardner & Stern, 1996; Karpiak & Baril, 2008; Thompson & Barton, 1994), advocating equivalence and justice in the relationship between humans and the nature (Kahn, 1997), and concern for nonhuman objects (e.g., animals, ecosystems, biosphere) (Stern & Dietz, 1994) are frequently emphasized. On the other hand, anthropocentric moral reasoning has a utilitarian approach regarding human-environment relationships and favors the belief that nature is important because it is central to human wellbeing (Karpiak & Baril, 2008). Therefore, nature's material and physical benefits that it can provide for humans (Thompson & Barton, 1994) or threats to humans that may result from the degradation of the environment (Franson & Gärling, 1999) are the main matter of concerns for individuals who exhibit anthropocentric moral reasoning. Finally, the third environmental moral reasoning category of the study, non-environmental moral reasoning, indicates concentrating on non-environmental aspects of environmental problems such as laws rather than the effects of the environmental problems on humans or on the environment itself (Kortenkamp & Moore, 2001).

1.1. Locality and Environmental Moral Reasoning

In the study environmental moral reasoning patterns of pre-service science teachers toward local and global environmental problems were examined. Environmental problems that lead local problems (happened in participants' own country) were labeled as local and the ones that lead global impact (happened in any country in the world, other than participants' own country) were labeled as global. In addition to examining general patterns in environmental moral reasoning, effects of gender and grade level on these reasoning were investigated and results were interpreted for the environmental problems as a whole and for local/global environmental problems separately. Although examining this local/global dichotomy is very important to

understand people's perceptions and attitudes toward environmental issues as well as their environmental behaviors (Uzzell, 2000) and there are differences in people's perceptions, reasoning, and concerns about local and global environmental problems (Duan & Fortner, 2005; Garcia-Mira, Real, & Romay, 2005; Rickinson, 2001; Uzzel, 2000), number of research that include differential aspects of local/global dichotomy in their research methodology is relatively few. Therefore, by including local/global dichotomy in data analyses and interpretations, in this study the researchers aim to fill the gap in the literature and provide more holistic explanations regarding individuals' moral reasoning towards environmental problems.

1.2. Effect of Gender on Environmental Moral Reasoning

The similarity between the aims of women's movement and environmental movement (women's movement aimed to change the relationship between men and women, environmental movement aimed to rebuild human-environment relationships) lead researchers to link these two phenomena and hypothesize that there might be major differences in males' and females' approaches towards human-environment relationships (Arcury et al., 1987). Nevertheless, empirical research findings are inconclusive (Larson, Ibes, & White, 2011). While some research findings are in favor of females (e.g., Stern, Dietz, Kalof, and Guagnano, 1995) some others reveal opposite findings (e.g., Arcury et al., 1987). Moreover, findings of some other research (e.g., MacDonald & Hara, 1994) indicate that gender is just a weak predictor of environmental concern or it has no effect at all. Inconclusiveness in research findings is also valid for gender differences in environmental moral reasoning patterns. While in some of the studies (e.g., Arcury, Johnson, & Scollay, 1986) males are found to exhibit more ecocentric moral reasoning when compared to females in some other studies (e.g., Karpiak and Baril, 2008) their ecocentric moral considerations are found to be lower than that of females.

1.3. Effect of Grade Level on Environmental Moral Reasoning

Similar to gender, grade level is a common variable studied in relation to people's perceptions and reasoning about environmental issues. However, different from gender, there seems to be a consistency among research findings offering an explanatory effect of grade level on concerns and reasoning toward environmental issues. Findings generally suggest a developmental trend in which students in higher grades concern for wider issues regarding the environment since they are more able to perceive themselves in relation to the world at large (Littledyke, 2004). In addition, research findings reveal the tendency of students to exhibit less anthropocentric and more ecocentric moral reasoning as their grade levels increase (Kahn & Lourenço, 2002; Kellert, 1985). On the other hand, results of some research (e.g., Kahn, 1997) propose an increase in the use of both ecocentric and anthropocentric moral reasoning by the students as their grade level increase.

1.4. Purpose and Significance of the Study

In the present study it was aimed to examine environmental moral reasoning patterns (i.e., ecocentric, anthropocentric, non-environmental) of pre-service science teachers toward local and non-local environmental problems together with the effects of gender and grade level on these reasoning. The significance of the study is mainly twofold. Firstly, different from many of the previous studies which are conducted with undergraduate psychology students, the sample is constituted of pre-service science teachers. Keeping the vital roles of teachers in environmental education in mind, it is clear that there is need for empirical research conducted with teachers and teacher candidates. Secondly, instruments used for data collection adds to the significance of the

study. Four local and four global environmental cases (a total of eight environmental cases) related to four specific environmental problems were prepared specifically for the study. With this approach, more holistic information about the participant' environmental moral reasoning patterns was aimed to be obtained.

With all these, the researchers of the study looked for answers to the following research questions:

1- What patterns of environmental moral reasoning do pre-service science teachers have regarding local and global environmental problems?

2- To what extent does gender influence environmental moral reasoning patterns of pre-service science teachers toward local and global environmental problems?

3- To what extent does grade level influence environmental moral reasoning patterns of pre-service science teachers toward local and global environmental problems?

2. METHOD

2.1. Sample

Participants of the study were a convenience sample of 120 pre-service science teachers enrolled in a public university located in Ankara, Turkey. The sample constituted 60% of its accessible population and the mean age of the sample was calculated as 22 years (age range = 19-27 years). Participation to the study was voluntarily and no extra credit was given for participation. Detailed information about the participants is tabulated in Table 1.

Table 1: Demographic Information for Participants

Grade	Gender				Total	
	Male		Female			
	N	%	N	%	N	%
1	6	20.7	23	79.3	29	24.2
2	8	28.6	20	71.4	28	23.3
3	10	38.5	16	61.5	26	21.7
4	7	18.9	30	81.1	37	30.8
Total	31	25.8	89	74.2	120	100

2.2. Instrumentation

Short texts explaining four local (related to Turkey) and four global environmental cases regarding four real life environmental problems constituted data collection instruments of the study. Instrumentation period started with a detailed review of books, media sources, and web-pages of environmental activists. Based on the review, four environmental problems to be addressed in the prepared environmental cases were selected. Selection of the environmental problems was mainly based on two criteria: (i) the participants' familiarity with the environmental problem and (ii) environmental problem's potential to yield one local and one global case, which include similar information about the problem's (prospective) influence on humans, other living and non-living things, as well as economical, judicial, and social aspects. Environmental problems and corresponding local and global environmental cases are presented in Table 2.

Table 2: Environmental Problems and Corresponding Local and Global Cases

Environmental Problem	Local Case	Global Case
Deforestation	Deforestation in Turkey	Deforestation of Amazon Rain Forest
E-waste	E-waste in Turkey	E-waste in China
Oil spill	Independenta Tanker Accident	Exxon Valdez Oil Spill
Global warming	Water Scarcity in Turkey	Melting of Glaciers

Note. E-waste, electronic waste

Except for Exxon Valdez oil spill case, which was taken and adapted from Kahn's (1997) study, all of the texts explaining local and global cases were prepared by the researchers and examined by an expert committee comprised of two professors who have conducted many studies on environmental education and a professor specialized in measurement and assessment. Based on expert committee's suggestions, pairs of environmental cases corresponding to each of the pre-determined environmental problem were revised many times via an iterative process to obtain parallel local and global cases. Final versions of the environmental cases were presented to the participants and the participants were asked to list at least four concerns about each of the environmental cases.

2.3. Data Collection

In order to avoid potential carry-over of the participants' responses to local and global environmental cases data collection of the study was realized in two separate administration periods. In the first administration period the participants were asked to state their concerns regarding global environmental cases and after two weeks, in the second administration period, they were asked to state their concerns for the local cases. The time period between the two administration periods was assumed to be long enough for the participants to forget their earlier responses and too short to lead to a change in their moral reasoning, thus bring about maturation internal validity threat for the study. Each administration period took about 40-45 minutes (one course hour) and was completed in the participants' classrooms. First author of the study was present at each data collection site to explain the purpose of the study and answer any questions. Moreover, the participants were reminded to use an identification name, number or nickname that they will use in both of the administration periods so that their responses to local and global environmental cases could be compared.

2.4. Data Analysis

Data of the study was comprised of the participants' written statements reflecting their concerns about each of the local and global environmental cases. For analysis of the data, content analysis was conducted on the participants' statements and each statement was coded as ecocentric, anthropocentric or non-environmental according to their meanings. At the first stage of the coding process data gathered from 40 of the participants (10 participants from each of the four grade level) was coded separately by the two authors. Inter-rater agreement was calculated as 95%. Disagreements were resolved by discussion and the first author proceeded with the rest of the coding. After coding process, frequencies of statements reflecting each moral reasoning category were entered to Statistical Package for Social Sciences (SPSS). Then, participants' environmental moral reasoning patterns as well as effects of gender and grade level on these moral reasoning categories were analyzed via descriptive statistics, paired-samples t-tests, and MANOVAs by using frequencies of the statements reflecting each moral reasoning category.

3. FINDINGS

3.1. Environmental Moral Reasoning Patterns

Content analysis of the pre-service science teachers' responses revealed that their ecocentric moral reasoning was more dominant than the two other environmental moral reasoning categories for both local and non-local environmental problems. Although mean frequencies of ecocentric and anthropocentric moral considerations were comparative, participants' statements reflecting non-environmental moral reasoning were noticeably fewer when compared to ecocentric and anthropocentric ones. Relative standing of the participants' moral reasoning regarding local and global environmental problems as well as for the environmental problems as a whole are illustrated in Table 3.

Table 3: Mean Frequencies of Moral Reasoning for Local and Global Environmental Problems

	ecocentric	anthropocentric	non-environmental
Local	1.83	1.63	0.18
Global	2.00	1.48	0.18
TOTAL	1.92	1.56	0.18

In addition to descriptive analysis, paired samples t-tests were performed to test the significances of the differences among the three moral reasoning categories. As in the study of Kortenkamp and Moore (2001), frequencies of each moral reasoning category were used as the dependent variables of the analyses. Results showed that differences in the frequencies of ecocentric and anthropocentric considerations were statistically significant for local ($p=.006$) and global ($p=.000$) environmental problems as well as when the environmental problems were taken as a whole ($p=.000$). Likewise, differences between anthropocentric and non-environmental reasoning for local ($p=.000$) and global ($p=.000$) environmental problems and for the eight environmental problems in total ($p=.000$) were also statistically significant. In conclusion, results of the paired samples t-tests showed that the pre-service science teachers' ecocentric moral reasoning was significantly higher than their anthropocentric moral reasoning, and their anthropocentric moral reasoning was significantly higher than their non-environmental moral reasoning for both local and global environmental problems.

3.2. Effects of Gender and Grade Level on Environmental Moral Reasoning Patterns

3.2.1. Effect of gender on environmental moral reasoning patterns

In order to examine the effect of gender on pre-service science teachers' environmental moral reasoning patterns MANOVAs were performed with the frequencies of ecocentric, anthropocentric, non-environmental, and total moral considerations. Results showed that there was not a statistically significant difference between males and females on the combined dependent variables ($F(4, 115) = .40, p = .812$; Pillai's Trace = .01; partial eta squared = .01). Since no significant value was obtained on the multivariate test of significance, further values for significance of effect size were not examined.

On the other hand, when male and female participants' responses were analyzed descriptively some differences were observed. For instance, in the overall males were found to have more ecocentric and non-environmental but less anthropocentric moral considerations (see TOTAL column in Table 4). Moreover, for global environmental problems their considerations in each of the three moral reasoning categories were higher than females. On the other hand, female

participants of the study exhibited higher ecocentric and anthropocentric moral considerations for local environmental problems. Nevertheless, it should be noted that these differences are small and statistically insignificant. Comparison of the participants' environmental moral reasoning patterns with regard to their gender is illustrated in Table 4.

Table 4: Total Mean Frequencies of Moral Reasoning for Males and Females

	Local			Global			TOTAL		
	eco	anthro	NE	eco	anthro	NE	eco	anthro	NE
Male	6.98	6.31	1.04	8.39	6.06	0.82	15.45	12.39	1.63
Female	7.46	6.57	0.65	7.89	5.89	0.69	15.40	12.63	1.29

Note. Ecocentric (eco), anthropocentric (anthro), non-environmental (NE)

3.2.1. Effect of grade level on environmental moral reasoning patterns

Similar to gender, effect of grade level on pre-service science teachers' environmental moral reasoning patterns was examined through MANOVA analysis by using frequencies of ecocentric, anthropocentric, non-environmental, and total moral considerations. Effect of grade level on the combined dependent variables was found to be statistically significant ($F(12, 345) = 5.71$, $p = .000$; Pillai's Trace = .50; partial eta squared = .17). Further investigation of the follow-up tests showed that grade level mostly had a significant effect on all of the environmental moral reasoning categories. The only exception for this situation was for the effect of grade level on non-environmental moral reasoning when environmental problems were taken as a whole ($F(3, 116) = 1.29$, $p = .282$, partial eta squared = .03). Test of Between Subjects Effects values regarding moral considerations for local (L) and global (G) environmental problems, and for environmental problems as a whole are tabulated in Table 5.

Table 5: Tests of Between-Subjects Effects Values for the Effect of Grade Level

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared	Observed Power
Grade Level	L-eco	200.19	3	66.73	17.71	.00	.31	1.00
	L-anthro	136.13	3	45.38	11.97	.00	.24	1.00
	L-NE	14.89	3	4.96	4.14	.01	.09	.84
	L-total	750.93	3	250.31	27.52	.00	.42	1.00
	G-eco	113.09	3	37.69	7.07	.00	.15	.98
	G-anthro	92.25	3	30.75	8.35	.00	.18	.99
	G-NE	13.12	3	4.37	3.18	.03	.08	.72
	G-total	380.28	3	126.76	20.29	.00	.34	1.00
	Eco	462.56	3	154.19	15.99	.00	.29	1.00
	Anthro	313.91	3	104.64	11.03	.00	.22	.99
	NE	9.261	3	3.09	1.29	.28	.03	.34
	Total	1616.51	3	538.84	28.15	.00	.42	1.00

According to Partial Eta Squared values in Table 5, grade level had more than small effect for all of the environmental moral considerations (Pallant, 2007). Moreover, power values were sufficient for all of the moral reasoning categories except for non-environmental moral reasoning exhibited toward global environmental problems (G-NE) and for non-environmental moral reasoning exhibited for the total of environmental problems (NE). As also seen in Table 6, first grade pre-service science teachers exhibited noticeably lower levels of moral concerns for the environmental problems. On the other hand, fourth grade pre-service science teachers' environmental moral considerations were generally higher when compared to other grade levels. For a complete comparison see Table 6.

Table 6: Total Mean Frequencies of Moral Reasoning for the Four Grade Levels

Grade Level	Local			Global			TOTAL		
	eco	anthro	NE	eco	anthro	NE	eco	anthro	NE
First	5.13	4.62	.30	6.38	4.48	.85	12.13	9.76	1.09
Second	7.46	7.18	1.27	8.32	6.13	.32	15.67	13.25	1.44
Third	8.17	7.15	.54	8.19	6.96	.46	16.18	14.05	1.10
Fourth	8.38	7.02	.85	8.95	6.19	.13	17.31	13.22	1.74

4. DISCUSSION AND RESULTS

4.1. General Pattern in Environmental Moral Reasoning of the Participants

Descriptive findings revealed that pre-service science teachers who participated in the study exhibited more ecocentric moral reasoning than anthropocentric and non-environmental moral reasoning, respectively. This finding was also supported by the inferential analyses. Therefore, it can be concluded that participants of the study mostly had moral considerations for the environment itself including the ecosystems and biotic communities in it. On the other hand, while mean frequencies of anthropocentric moral considerations were close to those of ecocentric moral considerations, non-environmental moral reasoning exhibited by the participants were noticeably lower than the two moral reasoning categories (see Table 3). As have been explained in previously, non-environmental moral reasoning is a reflection of individuals' moral considerations regarding the judicial and social aspects of environmental problems. Therefore, this low level of non-environmental moral considerations among the pre-service science teachers may be attributed to their unawareness of these aspects of the environmental problems such as related environmental laws. Similarly, this situation may be a reflection of the deficiencies in the implementations of environmental laws or societal rules within their country and also around the world.

When results were examined for local and global environmental problems separately, a similar pattern was obtained with dominance of ecocentric and anthropocentric moral reasoning over non-environmental moral reasoning. Nevertheless, comparison of the mean frequencies of moral considerations for local and global environmental problems revealed that the pre-service science teachers' ecocentric and anthropocentric concern levels were slightly different for local and global environmental problems. Their anthropocentric moral considerations were higher and ecocentric moral considerations were lower for local environmental problems when compared to their responses for global environmental problems (see Table 3). This situation may be explained by the influence of personal experiences on people's moral reasoning (Zeidler & Schafer, 1984). Personal experiences of the participants may have made the participants to be more sensitive to the human-aspects of the local environmental problems resulting in suppression of ecocentric moral reasoning against anthropocentric moral reasoning.

4.2. Effects of Gender and Grade Level

In addition to the general pattern in environmental moral reasoning of the pre-service science teachers effects of gender and grade level on these moral reasoning were examined in scope of the study. In terms of gender, inferential analysis resulted in statistically insignificant findings but descriptive analysis revealed some slight differences (see Table 4). Males were found to exhibit more ecocentric, anthropocentric, and non-environmental moral considerations for the global environmental problems whereas female participants' ecocentric and anthropocentric moral considerations were higher for the local environmental problems. As have been explained

before, non-environmental moral reasoning is different from ecocentric and anthropocentric moral reasoning in that it does not reflect concerns about the effects of environmental problems but focuses on their judicial and social aspects. Therefore, female pre-service science teachers' higher frequencies of ecocentric and anthropocentric moral considerations for the local environmental problems, when compared to males, can be a reflection of their higher levels of environmental concerns. This finding is in line with previous research which proposed that females are more concerned about local environmental problems than males (Myers, Boyes, & Stanisstreet, 1999).

When environmental problems were taken as a whole, regardless of their locality, males' ecocentric and non-environmental moral considerations were higher but anthropocentric moral considerations were lower than those of females. A potential explanation for the relatively more anthropocentric moral considerations of female participants may be differences in sex role socializations of males and females. According to sex role socialization argument, one may expect females to be more anthropocentric toward the environment and concern for the human-well-being more because they have been socialized to develop 'care taker' and 'mother' roles throughout the history (Arcury et al., 1987). Therefore, females may be inclined to perceive a clean and safe environment as a necessity for the welfare and survival of their offspring (Tikka, Kuitunen, & Tynys, 2000). This situation may also explain why our female participants exhibited higher levels of anthropocentric moral considerations for local environmental problems when compared to global ones. They may have related local environmental problems with the well-being of their future offspring more and thus exhibited more anthropocentric moral reasoning toward the local environmental problems.

Nevertheless, differences found in the mean frequencies of ecocentric, anthropocentric, and non-environmental moral reasoning of the male and female participants were not statistically significant as in the case of Kahn and Lourenço's (2002) study. Kahn and Lourenço (2002) proposed their comparatively small sample size as a possible reason for statistically insignificant differences in their male and female participants' environmental moral reasoning. This explanation may also be valid for the present study since number of pre-service science teachers who constituted the study sample was 120, which is equal to Kahn and Lourenço's (2002) sample size. Nevertheless, the similarity in environmental moral reasoning patterns of males and females may derive from a general change in sex roles in the societies from men as the carriers of scientific-technological change and women as nurturers (MacDonald & Hara, 1994) to equality in social roles. Alternatively, for the present study, the findings regarding gender equivalence in environmental moral reasoning patterns may be just a reflection of the participants' characteristics. Pre-service teachers who participated in the study are undergraduate students in one of the most developed universities of the country. Moreover, they will undertake equal roles in the society as science teachers when they graduate and begin to perform their professionalism. Therefore, their characteristics are somewhat different from rest of the society they belong. Hence, replication of the study with a more representative sample, which is more reflective of the country's general characteristics and culture, is necessary to be able to generalize its findings to the society it belongs. Furthermore, although gender distribution of the study's sample was representative of its population it was not proportional (see Table 1). Therefore, exploring environmental moral reasoning patterns of pre-service science teachers in a sample that has a more proportional gender distribution may give more reliable results.

For the effect of grade level on environmental moral reasoning patterns MANOVA analysis was performed. Findings of the analysis revealed statistically significant results in all of the moral reasoning categories for both local and global environmental problems. In addition, when environmental problems were taken as a whole, regardless of their locality, ecocentric and anthropocentric moral reasoning of the pre-service science teachers were found to be significantly different for different grade levels. The differences mostly stemmed from the first graders who

expressed remarkably less moral considerations nearly for all of the environmental problems (see Table 6). For only global environmental problems their non-environmental moral reasoning was higher than the second and third grader participants. This low frequency of moral considerations expressed by the first graders may be attributed to their lack of interest in environmental issues, which can be named as environmental apathy (Thompson & Barton, 1994). However, this situation may also be an implication of the influence of education on environmental moral reasoning. In the university where the study is conducted pre-service science teachers generally begin to take environment related courses such as biology as well as other elective courses related to environmentalism and environmental education after they complete their first year courses. These courses and educational experiences may make pre-service science teachers be more interested in environmental issues and express higher levels of moral considerations about environmental problems.

4.3. Implications for Environmental Education and Further Research

Potential of environmental education for the solution of many environmental problems lies in the fact that humans have the capacity to modify the rate of undesirable changes they have imposed on the environment and/or reverse them (Goudie, 2013). In order to do this many environmental education programs give effort to enhance understanding of human-environment relationship and promote more responsible behaviors in the society. In this sense, findings of the present study have some important and practical implications for environmental education that should be taken into consideration by teachers, curriculum planners, and researchers. To begin with, as revealed by the descriptive and inferential analyses, there were some differences in our participants' environmental moral reasoning patterns, which reflect the importance they gave for different aspects of the environmental problems. While some of them concentrated on the effects of the environmental problems on humans some others were more concerned about their effects on the environment itself, while a few considered the problems' judicial and social aspects. Therefore, since importance given to different aspects of the same environmental issues is different for different individuals, diagnosing environmental moral reasoning patterns of learners in educational programs and adapting the content of the courses accordingly might increase the motivation of learners toward the courses and contribute to their effectiveness.

Secondly, presenting various aspects of environmental problems through real environmental cases is vital for an overall success in environmental education. In fact, helping learners discover real symptoms and causes of environmental problems and emphasizing the complexity of them have been listed among the guiding principles of environmental education for many years (UNESCO/UNEP, 1978). At this point, it is important to well educate our teachers because they are the active implementers of environmental education programs and main agents in shaping students' perceptions about environmental issues (Alim, 2006; Tuncer, Sungur, Tekkaya, & Ertepinar, 2007). Actually, the importance of teachers in delivering effective environmental education has been stated in many research studies (e.g., Powers, 2004) and reports such as the reports of UNESCO/UNEP International Environmental Education Programme in which teacher education was described as 'the priority of priorities' (UNESCO/UNEP, 1990, p.1). In addition to improving teacher education programs we should also provide our teachers with well-developed educational materials that they can utilize during their teaching. Research shows that lack of instructional materials is perceived as a barrier by some teachers for teaching environmental education (Kim & Fortner, 2006; Ko & Lee, 2003). Accordingly, the environmental cases which were specifically prepared for and used in this study may be useful for environmental education practices since they present various aspects of the four environmental problems from both local and global perspectives and since they are real-life cases as suggested. Likewise, environmental educators can also prepare their own environmental cases

by considering the issues that the researchers of the present study tried to achieve through detailed, iterative, and scrutinized procedures.

Furthermore, researchers of the study offer some recommendations for further research. Firstly, supplementary research with environmental problems and environmental cases other than the ones used in the present study will be helpful to clarify environmental moral reasoning patterns of pre-service science teachers and the possible factors that influence these reasoning. Secondly, future research can be expanded to different departments in education faculties, different faculties of universities as well as different levels of education including primary and secondary education. Comparison of these different groups in terms of their environmental moral reasoning patterns may be helpful to understand the factors underlying differences in environmental moral reasoning patterns. Moreover, there is need for further research to answer questions addressing whether people having different environmental moral reasoning patterns display different levels of pro-environmental behaviors as implied in Thompson and Barton's (1994) study. Finally, although some research findings propose differences in the effectiveness of using local and global issues in environmental education (e.g., Gokmen, 2008; Unal, 2008) they are very few in number. Therefore, further research is needed to clarify this issue and propose more robust suggestions regarding the use of local or global issues in environmental education programs.

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Geniřletilmiř zet

evre sorunlarına uzun lekli mler bulmak iin insan-evre iliřkileri hakkında daha fazla bilgi sahibi olmamız ve bu iliřkilerin iyileřtirilmesi adına evre eėitiminde insan-evre iliřkilerine yer vermemiz gerekliliėi birok arařtırmacı tarafından dile getirilmektedir (Duan & fortner, 2005; Keller & Wilson, 1993). Ancak, insan-evre iliřkisi hakkında bilgi sahibi olmanın evreci davranıřlar sergilemek iin tek bařına yeterli olmadığı, bireylerin evreci davranıřlar sergilemeleri iin bir takım evresel etik deėerlere de sahip olmaları gerektiėi yine arařtırmalar tarafından ortaya konulmuřtur (Stern, Dietz, Abel, Guagnano, & Kalof, 1999; Tilbury, 1995). Bu baėlamda, evre etiėinde nemli yer kaplayan deėerler ve ahlaki normlar zerinde yapılan alıřmalar bu kavramların kiřilerin evresel tutum ve davranıřlarında nemli rolleri olduėunu gstermiřtir. Bununla birlikte, bir bireyin evreye deėer vermesine neden olan motivasyon ve kaygılarındaki farklılıkların bu bireylerin farklı evresel durumlar karřısında sergileyecekleri tutumlar zerinde belirleyici olduėu bilinmektedir (Bjerke & Kalternborn, 1999). Bu durumdan yola ıkarak bireylerin sahip oldukları deėerler, motivasyonlar ve evresel etik algılarındaki farklılıkları ieren alıřmalar yapılmıř ve bu alıřmalar sonucunda farklı sınıflandırmalar elde edilmiřtir (Axelrod, 1994; De Groot & Steg, 2007; Merchant, 1992).

Alanyazındaki alıřmalara paralel olarak, bu alıřmada fen bilgisi ėretmen adaylarının evresel ahlaki muhakeme rntlerinin incelenmesi amalanmıřtır. evresel ahlaki muhakeme terimini, ahlaki muhakeme terimin anlamından yola ıkarak (Littledyke, 2004), bir fikrin veya eylemin evreye verdiėi/vereceėi zarar veya fayda bakımından deėerlendirilip doėru ya da yanlıř olma durumuna karar verilirken gerekleřtirilen dřnme sreci olarak tanımlayabiliriz. alıřma kapsamında, Kortenkamp ve Moore (2001) tarafından da kullanılmıř olan sınıflandırılma kullanılmıř ve katılımcıların evresel ahlaki muhakeme rntleri evre-merkezli, insan-merkezli ve evresel kaygılar iermeyen olmak zere  gurupta incelenmiřtir. Bu sınıflandırmaya gre, evre-merkezli ahlaki muhakeme sergileyen bireyler evrenin sahip olduėu isel deėere vurgu yapmakta ve insan-evre iliřkilerinde eřitlik kaygısını ne ıkarmaktadırlar (Gardner & Stern, 1996; Kahn, 1997; Karpiak & Baril, 2008; Thompson & Barton, 1994). te yandan, insan-merkezli evresel ahlaki muhakeme sergileyen bireyler daha faydacı bir yaklařımla evreyi insanlara saėladıėı fayda ve evresel sorunları insanlıėa verdiėi/vereceėi zararlar lsnde deėerlendirmektedirler (Franson & Grling, 1999; Thompson & Barton, 1994). Son olarak, ahlaki muhakeme rntlerinde evresel kaygılar iermeyen bireyler evresel sorunların sosyal ve hukuki normlara uygunluklarına odaklanmakta ve bu lekte deėerlendirmektedirler (Kortenkamp & Moore, 2001).

alıřmada veri toplama araları olarak yerel ve kresel evre sorunları kullanılmıř ve bulguların yorumları bu ayırım gzetilerek yapılmıřtır. Yerel/kresel ayırımın kiřilerin evresel kaygı ve evresel sorunlar karřısındaki muhakeme sreleri zerinde etkili olabileceėine ynelik bulgulara ve yerel/kresel ayırımının alıřılması gerekliliėine dair yorumlara raėmen (Duan & Fortner, 2005; Garcia-Mira, Real, & Romain, 2005; Rickinson, 2001; Uzzel, 2000) arařtırma yntemlerinde bu yaklařımı kullanmıř olan alıřma sayısı olduka azdır. Bu bakımdan, alıřmanın alanyazına nemli katkıda bulunacaėı dřnlmektedir.

ėretmen adaylarının evresel ahlaki muhakeme rntlerinin belirlenmesinin yanı sıra, alıřmada cinsiyet ve sınıf seviyesinin evresel ahlaki muhakeme rntleri zerindeki olası etkileri arařtırılmıřtır. alıřmada varsayımsal konular yerine gerek evresel sorunlarını yansıtan rnek olaylar kullanılarak katılımcıların gerekte sergileyecekleri dřnme srelerine en yakın cevaplar elde edilmeye alıřılmıřtır (Kortenkamp & Moore, 2001). ėretmenlerin evre eėitimindeki rolleri gz nnde bulundurulduğunda, alıřmanın katılımcılarının ėretmen adaylarından oluřmuř olması alıřmanın diėer bir nemli noktasıdır.

alıřmanın rneklemini 120 fen bilgisi ėretmen adayı (31 erkek, 89 kadın) oluřturmuřtur. ėretmen adaylarının sergiledikleri ahlaki muhakeme rntlerinin belirlenebilmesi iin arařtırmacılar tarafından ormansızlařma, elektronik atıklar, petrol sızıntıları ve kresel ısınma sorunlarıyla ilgili yerel ve kresel rnek olaylar hazırlanmıř ve katılımcılardan bu rnek olaylar ile ilgili kaygılarını yazılı olarak ifade etmeleri istenmiřtir. İerik analizi ile incelenen yazılı ifadeler anlamları doėrultusunda evre-merkezli, insan-merkezli ve evresel kaygılar iermeyen ifadeler olarak sınıflandırılmıř ve frekans hesaplamaları yapılmıřtır.

Yapılan analizler sonucunda alıřmaya katılan ėretmen adaylarının yerel ve kresel evre sorunları karřısındaki evre-merkezli kaygılar ieren ifadelerinin, sırasıyla, insan-merkezli ve evresel kaygılar iermeyen ifadelerinden daha fazla olduėu bulunmuřtur. Cinsiyetin ahlaki muhakeme rntleri zerinde

anlamalı bir etkisi bulunamamıştır. Ancak, betimsel analizler kadın fen bilgisi öğretmen adaylarının yerel çevresel sorunlar ile ilgili erkek fen bilgisi öğretmen adaylarından daha fazla çevresel kaygı taşıdıkları sonucunu ortaya çıkarmıştır. Diğer taraftan, sınıf seviyesinin katılımcıların çevresel sorunlar karşısında sergilemiş oldukları ahlaki muhakeme örüntülerini anlamalı bir şekilde etkilediği sonucuna varılmıştır. Çalışmaya katılan üniversite birinci sınıftaki öğretmen adayları her üç ahlaki muhakeme sınıflandırmasında (çevre-merkezli, insan-merkezli, çevresel kaygılar içermeyen) diğer sınıf seviyelerindeki öğretmen adaylarından daha düşük seviyede kaygı ifade etmişlerdir.

Çalışmanın sonuçları katılımcıların çevresel sorunlar ile ilgili kaygılarının çevrenin insan için önemi veya çevresel sorunların insanlar için oluşturabilecekleri tehditlerden daha ziyade çevrenin sahip olduğu içsel değere odaklandığını göstermiştir. Ek olarak, katılımcılar verilen örnek olayların “yasal olmama” gibi çevresel boyutunun dışındaki yönlerini çok az dikkate almışlardır. Bu bulgu katılımcıların çevre ile ilgili yasalar hakkındaki farkındalıklarının düşük olması veya Türkiye’de çevreyi koruma amaçlı yasaların yetersiz olması şeklinde yorumlanabilir. Bulguların diğer ülkelerdeki çalışma sonuçları ile kıyaslanmasıyla ortaya çıkan fark, kültürün çevresel ahlaki muhakeme örüntüleri üzerinde etkili olabileceği izlenimini de vermektedir.

Cinsiyetin katılımcıların ahlaki muhakeme örüntüleri üzerinde anlamalı bir etkisinin olmadığı bulgusu çalışma örneklemindeki cinsiyet dağılımının orantılı olmamasından kaynaklanmış olabilir. Bunun yanında, elde edilen sonuç, cinsiyet rollerinin ahlaki muhakeme örüntüleri üzerindeki etkileri doğrultusunda ele alındığında (Arcury, Scollay, & Johnson, 1987), katılımcıların toplumda eşit roller üstlenmeleri beklenen öğretmen adaylarından oluşmuş olmasına bağlanabilir. Diğer taraftan, çalışmaya katılan üniversite birinci sınıf öğretmen adaylarının diğer üst sınıf seviyelerindeki öğretmen adaylarına göre daha düşük seviyede ahlaki muhakeme sergilemiş olmaları eğitimin çevresel ahlaki muhakemenin gelişimine katkıda bulunabileceğine işaret etmektedir. Konu ile ilgili çalışmaların daha geniş ve farklı örneklemlemlerle tekrarlanması çevresel muhakeme örüntülerin ve bu örüntüler üzerinde etkili olabilecek faktörlerin açıklığa kavuşturulması ve bulgu ve yorumların güvenilirliği açısından önemlidir.

Kaynakça Bilgisi

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