

Determination of Pre-Service Science Teachers' Level of Awareness of Environmental Ethics in Relation to Different Variables

Özgül Keleş^a, and Nilgün Özer^a

^aAksaray University, Aksaray, TURKEY

ABSTRACT

The purpose of the current study is to determine the pre-service science teachers' awareness levels of environmental ethics in relation to different variables. The sampling of the present study is comprised of 1023 third and fourth year pre-service science teachers selected from 12 different universities in the spring term of 2013-2014 academic year. As a data collection instrument in the study, "Environmental Ethics Awareness Scale" developed by the researcher was employed. In the analysis of the collected data, t-test and one-way analysis of variance (ANOVA) from SPSS program package were used. The results of the t-test analysis revealed a significant difference between the male students and the female students ($t_{(1021)}=4.292$; $p<.001$). No significant difference was found between the third year students and the fourth year students as a result of the t-test analysis ($t_{(1021)}=1.090$; $p>.05$). The results of the variance analysis also did not reveal any significant difference based on the grade level ($F_{(11-1011)}=51.215$; $p<.001$). In light of the findings of the study, it was suggested that future research should be conducted on different samplings and with different variables.

KEYWORDS

Awareness level, environmental ethics, pre-service science teachers, gender, grade level

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Introduction

It is known that there has been a struggle between the man and nature for ages as human have desired to exploit nature. There are many ways of stopping this struggle; one of the most effective ways of doing this is to adopt an ethical approach to environment.

Ethics is a normative study of the principles of human conduct in relation to justice and injustice, good and evil, right and wrong, and virtue and vice. It questions what ought to be done and the extent to which there is justification for

CORRESPONDENCE Özgül Keleş ✉ ozgulkeles@gmail.com

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a past action that had been done. By environment, we mean our surroundings, including the life support provided by the air, water, land, animals and the entire ecosystem of which man is but a part (Osuntokun, 2001). Ethics has something meaningful to do with the environment. It questions humanity's relationship to the environment, its understanding of and responsibility to nature, and its obligations to leave some of nature's resources to prosperity (Pojman, 1997; Oiomo, 2011).

Considering moral relationships of man and environment, environmental ethics embraces the broadest circle of problems. Environmental ethics is a teaching about moral relationships of man and nature based on the perception of nature as a moral partner, equivalence and equality of rights of all flesh, aimed at the solution of the environmental problem (Nasibulina, 2015; Mantatov, 2014).

Environmental ethics is a field in applied ethics that asks fundamental questions about humans and the environment; it examines the moral basis of environmental responsibility (Oiomo, 2011). As Rolston (2003) states, Aldo Leopold, a forester-ecologist and prophet of environmental ethics, claimed, famously: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." "That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics" (Leopold, 1969; Rolston, 2003).

Environmental ethics deals with the conceptual foundations of environmental values as well as issues related to actions and policies of the society to protect and sustain biodiversity and ecological systems (Zalta & Abramsky, 2003; Tufa, 2015). Environmental ethics is even more inclusive. Whales slaughtered, wolves extirpated, whooping cranes and their habitats disrupted, ancient forests cut, Earth threatened by global warming-these are ethical questions intrinsically, owing to values destroyed in nature, as well as also instrumentally, owing to human resources jeopardized. Humans need to include nature in their ethics; humans need to include themselves in nature (Rolston, 2003).

Adjusting the relationship between humans and nature is one of the most fundamental issues we face and must deal with today. Environmental ethics is a new sub-discipline of philosophy that deals with the ethical problems surrounding environmental protection. It aims to provide ethical justification and moral motivation for the cause of global environmental protection. There are several distinctive features of environmental ethics. First, environmental ethics is extended. Environmental ethics extends the scope of ethical concerns beyond one's community and nation to include not only all people everywhere, but also animals and the whole of nature – the biosphere – both now and beyond the imminent future to include future generations. Second, environmental ethics is interdisciplinary. There are many overlapping concerns and areas of consensus among environmental ethics, environmental politics, environmental economics, environmental sciences and environmental literature, for example. Third, environmental ethics is plural. From the moment it was born, environmental ethics has been an area in which different ideas and perspectives compete with each other. Anthropocentrism, animal liberation/rights theory, biocentrism and ecocentrism all provide unique and, in some sense, reasonable ethical justifications for environmental protection (Yang, 2006).

When the relevant literature is examined, it is seen that there are many ethics studies conducted in different disciplines such as nanotechnology (Preston, 2005), tourism (Holden, 2002; Psarikidou, 2008), housing (Gražulevičiūtė-Vilenišké & Narvydas, 2012), river water management (Mahmutoğlu, 2010) and environmental ethics history (Laal, 2009). There are also many meta-analysis studies conducted in the field (Taylor, 1981; Ertan, 1998; Alrge & Kristensen, 2003; Ertan, 2004; Yaylı, 2012; Karaca, 2008; Ergün & Çobanoğlu, 2012).

Besides these studies, there are some other studies conducted in the field of environmental ethics focusing on university students' ethical attitudes towards environment (Özdemir, 2012); the role of news in environmental ethics education (Kıraç, Yıldız & Çobanoğlu, 2012); pre-service teachers' attitudes towards environmental ethics (Saka, Sürmeli & Öztuna, 2009); examining the role of critical thinking in regards to environmental ethical issues (Quinn, 2012); pre-service science teachers' perception of environmental ethics (Bülbül, 2013); an empirical test of anchoring the NEP scale in environmental ethics (Noblet, Anderson & Teisl, 2013); an environmental ethical content analyses in environmental education and education for sustainable development (Kronlid & Öhman, 2013); investigation of environmental topics in the science and technology curriculum and textbooks in terms of environmental ethics and aesthetics (Laçın Şimşek, 2011); an overview of the field of environmental ethics (Buckeridge, 2014); perspectives on environmental ethics in sustainability of membrane based technologies for water and energy production (Tufa, 2015); philosophical underpinnings of environmental ethics: (Mantatov & Mantatova, 2015); exploring the ethical grounds of nonanthropocentric ethics and Japan's environmental education (Fukazawa, 2009); develop an instrument that will support more in-depth study of beliefs in environmental values and ethics (Meyers, 2002). However, no research aiming to determine individuals' awareness level of environmental ethics was encountered.

Environmental ethics does not only deal with humans, living entities or environment. Environmental ethics is a more comprehensive field determining its direction by considering the future of environment. Therefore, it is associated with the concept of sustainability. Support of sustainability of life at present and provision of its security in the future is the main objective of environmental ethics (Mantatov & Mantatova, 2015).

Inculcation of skills and techniques in individuals for them to be more responsible, conscious and prepared to deal with the problems to be encountered while protecting the quality of environment and life within the framework of sustainable development should be one of the primary objectives of education (Keleş, 2007). In this regard, the main responsibility should be assumed by teachers taken as role models to make ecological awareness more widespread among students and to help them to convert the principles of sustainable life into behaviors. Thus, pre-service teachers should be rendered more aware of their negative impacts on nature. For efficient environmental education to take place, first awareness levels of teachers who are expected to demonstrate sensitive role models and to make use of appropriate and valid teaching methods should be raised (Keleş, et al., 2010).

The field of environmental education includes a wide range of volunteers and professionals committed to improving the environment. Many dedicated educators have sought to engage students and the public in discussions on

environmental values, ethics and awareness, which has generated interest in obtaining additional tools addressing awareness and ethics. Given the importance of self-knowledge, educators have sought tools to increase awareness and understanding of their environmental values and ethics, and to increase insight into the values of others. With the conviction that awareness might bring about important changes on human beings, the current study seeks answer to the question “What is the pre-service teachers’ awareness level of environmental ethics?” For this purpose, the answers to the following sub-problems were also sought.

- Is there a significant difference between the pre-service science teachers’ mean scores taken from the environmental ethics awareness scale based on gender?
- Is there a significant difference between the pre-service science teachers’ mean scores taken from the environmental ethics awareness scale based on grade level?
- Do the pre-service science teachers’ environmental ethics awareness levels vary depending on the regions where their universities are located?
- Is there a significant difference among the environmental ethics awareness levels of the students depending on the he regions where their universities are located?

Method

Research model

As the current study aimed to determine the environmental ethics awareness levels of the third and fourth year pre-service science teachers in relation to different variables, it employed the relational survey method within the descriptive survey model.

Study group

The universe of the current study consists of third and fourth year students attending the departments of science teaching of the state universities in Turkey.

The sampling of the study was constructed on the basis of the classification performed by TSI (Turkish Statistical Institute). In this classification, TSI divided Turkey into 12 regions and this classification was called Level 1 (12 regional units). A university having the department of science teaching was selected from each region and thus, totally 12 universities were selected and a total of 1023 third and fourth year students were involved in the study in the spring term of 2013-2014 academic year. Of the 1023 participants of the study, 697 (68.1%) are female students and 326 (31.9%) are male students. When their grade levels are examined, it is seen that 540 (52.8%) are third year students and 483 (47.2%) are fourth year students.

For the selection of the study group, cluster sampling method was used. In this regard, the clusters were formed by selecting equal number of students from the clusters including different numbers of units. The names of the universities involved in the current study are not mentioned due to ethical concerns.

Data Collection Instrument

For the collection of the data in the present study, “Environmental Ethics Awareness Scale” developed by Özer & Keleş (2016) was employed. The scale is 5-

point Likert-type scale consisting of 4 dimensions (definition of environmental ethics, its purpose, the reason for its emergence and precautions to be taken) and 23 items.

In order to establish the content validity of the scale, opinions of five expert academicians (whom are experts in the field of science education, environmental education, education for sustainable development and environmental science and environmental ethics) were sought. The reliability Cronbach alpha coefficient of the scale was calculated to be 0.95.

As can be seen in Table 1, confirmatory factor analysis was run to establish the construct validity of the scale and goodness of fit indices exhibited excellent and good fit ($X^2/df=4,99$; $RMSEA=0.070$, $CFI=0.96$, $AGFI=0.86$ and $NFI=0.95$) and thus, the construct validity of the scale was established.

Table 1. The results of confirmatory factor analysis

X^2	df	P	X^2/df	NFI	AGFI	CFI	RMSEA
1118.58	224	0.00	4.99	0.95	0.86	0.96	0.070

$p < .01$

Data Analysis

The analysis of the data was conducted through SPSS 17 program package. T-test was run to determine whether the participants' mean scores taken from Environmental Ethics Awareness Scale vary significantly depending on gender and grade level; and one-way analysis of variance (ANOVA) was conducted to determine whether the participants' mean scores vary significantly depending on the region where their universities are located and to determine the source of the difference; if there is any.

FINDINGS

In this section, the findings related to the sub-problem of the study are discussed. The findings related to the first sub-problem "Is there a significant difference between the pre-service science teachers' mean scores taken from the environmental ethics awareness scale based on gender?" are presented in Table 2.

Table 2. T-test results related to environmental ethics awareness depending on gender

Dependent Variable	Sex	N	M	SD	df	t	p
Awareness of Environmental Ethics	Females	697	87.57	12.790	1021	4.292	.000
	Males	326	83.86	13.00			

$p < .001$

As can be seen in Table 2, a difference was found between the male and the female participants of the study in favor of the female students (3.71) and this difference is statistically significant ($t_{(1021)}=4.292$; $p < .001$).

The findings related to the second sub-question of the study "Is there a significant difference between the pre-service science teachers' mean scores taken

from the environmental ethics awareness scale based on grade level?" are presented in Table 3 below:

Table 3. T-test results related to environmental ethics awareness depending on grade level

Dependent Variable	Grade Level	N	M	SD	df	t	p
Awareness of Environmental Ethics	3	540	86.80	13.156	1021	1.09	.276
	4	483	85.91	12.786			

p>.05

As can be seen in Table 3, it is seen that while the mean score for the third year students' environmental ethics awareness level is $M=86.80$, the mean score for the fourth year students' environmental awareness level is $M=85.91$. The difference (0.89) found in favor of the third year students was found to be statistically insignificant as a result of t-test ($t_{(1021)}= 1.09$; $p>.05$).

The findings related to the third sub-problem of the study "Do the pre-service science teachers' environmental ethics awareness levels vary depending on the regions where their universities are located?" are presented in Table 4.

Table 4. The results of descriptive statistics related to the students' environmental ethics awareness levels

Dependent Variable	Name of Region	N	M	SD
Awareness of Environmental Ethics	Eastern Marmara	97	90.83	9.12
	South East Anatolia	21	91.38	9.06
	East Blacksea	102	91.41	8.53
	West Blacksea	93	86.25	11.20
	West Marmara	77	91.54	10.36
	Middle Eastern Anatolia	105	64.36	9.11
	İstanbul	26	94.11	10.57
	Aegean	91	87.83	10.87
	Middle Anatolia	83	85.41	10.26
	Western Anatolia	39	92.02	5.97
	Northeast Anatolia	170	87.60	11.49
	Mediterranean	119	88.07	12.89
	Total		1023	86.39

As can be seen in Table 4, the highest environmental ethics awareness level was found for the participants from Istanbul ($M=94.11$). On the other hand, the lowest environmental ethics awareness level was found for the students from the Central Eastern Anatolia ($M=64.36$).

The findings related to the fourth sub-problem of the study “Is there a significant difference among the environmental ethics awareness levels of the students depending on the he regions where their universities are located?” are presented in Table 5.

Table 5. One-way ANOVA results related to the students’ environmental ethics awareness levels in relation to the regions where their universities are located

The Source of Variance	Sum of Squares	df	Mean Square	F	p	η^2
Between Groups	61654,095	11	5604,908	51,215	,000	0,358
Within Groups	110642,160	1011	109,438			
Total	172296,254	1022				

$p < .01$

As can be seen in Table 5, the mean score differences found among the students’ environmental ethics awareness levels were calculated to be significant as a result of the variance analysis ($F_{(11-1011)}=51.215$; $p < .001$). Thus, it can be argued that the students’ environmental ethics awareness levels vary significantly depending on the locations of their universities. Moreover, the impact size value was found to be (η^2) 0.358 in the current study. Pallant (2001) interpreted the impact size values as follows: .01: small impact; .06: moderate impact; .14: large impact. As the variances found for the groups are not homogeneous (Table 6), multiple comparisons were performed through Dunnet C test (Table 6).

Table 6. Variance homogeneity test

F	df ₁	df ₂	p
3,513	11	1011	,000

$p > .05$

As shown in Table 7, the source of the difference found in the multiple comparisons test was attempted to be determined. Thus, it was determined that the environmental ethics awareness mean scores of the students from the Eastern Marmara Region, the Eastern Black Sea Region, the South Eastern Anatolian Region, the Western Black Sea Region, İstanbul, the Western Marmara Region, the Aegean Region, the Central Anatolian Region, the Western Anatolian Region, the Northeastern Anatolian Region and the Mediterranean Region are significantly higher than that of those coming from the Central Eastern Anatolian Region. No significant difference was found among the other groups.

Table 7. Findings of multiple comparisons related to the universities' environmental ethics levels (Dunnet-C) (*) the difference is significant at the level of .05

Dependent Variable	University	University	Mean Difference	Standard Error
Awareness of Environmental Ethics	East Marmara	Middle East Anatolia	26.47315*	1.284
		Middle Anatolia	5.42541*	1.458
		West Blacksea	5.16445*	1.436
	East Blacksea	Middle East Anatolia	27.04986*	1.226
		Middle Anatolia	6.00213*	1.408
	Southeastern Anatolia	Middle East Anatolia	27.01905*	2.168
		West Blacksea	Middle East Anatolia	21.88541*
	İstanbul	Middle East Anatolia	29.75348*	2.256
		Middle Anatolia	8.70575*	2.359
		West Marmara	Middle East Anatolia	27.18355*
	Aegean	Middle East Anatolia	6.13582*	1.632
		Middle Anatolia	23.47326*	1.446
	Middle Anatolia	Middle East Anatolia	21.04773*	1.435
		West Blacksea	5.77833*	1.505
		West Anatolian	Middle East Anatolia	27.66374*
	Northeast Anatolia	Middle East Anatolia	6.61600*	1.478
		Middle East Anatolia	23.23810*	1.252
	Mediterranean	Middle East Anatolia	23.70532*	1.479

Discussion and Conclusion

The purpose of the current study is to determine the pre-service science teachers' environmental ethics awareness levels and whether their awareness levels vary depending on gender, grade level and the regions where their universities are located.

In light of the findings of the study, following conclusions can be reached: the female students' environmental ethics awareness level is higher than that of the male students. This difference favoring the female students was found to be statistically significant. The finding of the current study thus concurs with these findings reported in the literature. In research focusing on gender in relation to environmental ethics, it has been reported that females' attitudes, approaches and awareness are higher in general. Thus, it can be maintained that females are more sensitive towards environment. Pherigo (1997) reported that females were significantly more likely to display environmental concern than males. Young females express slightly greater environmental concern than their male counterparts. Girls may be more responsive to information about environmental hazards (Stern et al. 1993). Gilligan (1982) theorized that an ethic of care was

characteristic of women and an ethic of justice was characteristic of men. Wongchantra et al. (2008) states that, environmental education teaching process using ethics infusion could develop females were environmental knowledge and environmental ethics more than male. Studies by Stern and colleagues (1993; 1994) have partially demonstrated that women care about the physical environment as an extension of their ethic of care. Their findings suggest that for women, environmental concern is born of an awareness of the consequences to their families, themselves and the natural environment (Stern et al. 1993). Stern, Dietz & Kalof (1993) developed a social-psychological model to examine the proposition that environmentalism represents a shift in worldview away from the dominant social paradigm toward what has been termed the New Environmental Paradigm (NEP). In this conceptual model, action in support of environmental quality may result from three different value orientations: egoistic, social-altruistic or biospheric. Based on a sample of 349 college students, gender was found to be strongly related to all three orientations. Women were significantly more concerned than men about the consequences of environmental quality on their personal well-being, social welfare and the health of the biosphere (Stern et al. 1993).

In contrast to this, Özdemir (2012) reported that the senior students' ethical attitudes towards environment do not significantly vary depending on gender. Turan (2009) also found no gender-based significant difference among the secondary school students' ecological ethics approaches. The finding of the current study thus does not concur with these findings reported in the literature. In research focusing on gender in relation to environmental ethics, it has been reported that females' attitudes, approaches and awareness are higher in general. Thus, it can be maintained that females are more sensitive towards environment.

When the participants' environmental ethics awareness levels were compared in terms of their grade levels, it was found that the third year students' environmental ethics awareness level is higher than that of the fourth year students. However, this difference was found to be statistically insignificant as a result of the t-test. Bülbül (2013) also reported that the environmental ethics awareness levels of the second year pre-service teachers and the fourth year pre-service teachers are parallel to each other. Within the current study, when the environmental ethics awareness scale was administered, the third year students were already taking the environmental ethics course; thus, their level might have been found to be higher than that of the fourth year students.

In the current study, the mean environmental ethics awareness level was found to be highest for the students coming from İstanbul. On the other hand, the lowest mean environmental ethics awareness level was found for the students from the Central Eastern Anatolian Region. The mean score differences found among the regions were found to be significant as a result of the variance analysis. Thus, it can be suggested that more effective environmental education should be given to students attending universities in the Central Eastern Anatolian Region. No research directed towards the investigation of environmental ethics awareness at university level was found. Mahmutoğlu (2010) conducted a study focusing on the opinions of local authorities about the issue of environmental ethics and found that training given about environment was found to be inadequate by the participants and there is no course specially focusing on environment within the curriculums of elementary and secondary schools. Thus, it might be taught that

education given at elementary and secondary schools about environment in some regions is not adequate and this may somehow find reflections in their university education.

In light of the results of the current study, it can be suggested that similar studies should be conducted at different universities with other populations that include a variety of age groups and other demographic variables so that more generalizable results could be obtained.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Özgül Keleş holds a PhD in science education and now is an associate professor at Aksaray University, Department of Science Education, Aksaray, Turkey.

Nilgün Özer is a PHD student at Aksaray University, Aksaray, Turkey.

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