MORAL REASONING OF PRE-SERVICE SCIENCE TEACHERS TOWARD LOCAL AND NON-LOCAL ENVIRONMENTAL PROBLEMS

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ABSTRACT

MORAL REASONING OF PRE-SERVICE SCIENCE TEACHERS
TOWARD LOCAL AND NON-LOCAL ENVIRONMENTAL PROBLEMS

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Based on the importance of environmental ethics in both causing and solving many of the environmental problems, the present study aimed to (1) Examine moral reasoning patterns (i.e. ecocentric, anthropocentric, non-environmental) of pre-service science teachers toward local and non-local environmental problems, (2) Investigate the effects of gender and grade level on moral reasoning patterns, and (3) Explain the factors that may have led to the observed differences in participants' moral reasoning patterns. Throughout 2008-2009 Fall and Spring semesters, environmental cases regarding local and non-local environmental problems were distributed to a convenience sample of 120 pre-service science teachers who were enrolled in Middle East Technical University and moral decision-making interviews (MDMIs) were carried out with a sub-sample of 16 pre-service science teachers. In accordance with the purpose of the

study, descriptive statistics, paired-samples t-tests, and multivariate analysis of variance (MANOVA) tests as well as qualitative analysis of the interviews were utilized. Analyses demonstrated that participants of the study mostly exhibited ecocentric moral reasoning for both local and non-local environmental problems, and their ecocentric and anthropocentric concerns showed statistically significant difference with regard to problems' locality. Moreover, while gender did not have a statistically significant effect on participants' moral reasoning patterns, grade level did have a statistically significant effect. Finally, analysis of the interviews revealed sixteen factors effective in participants' environmental concerns and their moral reasoning regarding environmental issues.

Keywords: Environmental Education, Moral Reasoning, Local Environmental Problems, Non-Local Environmental Problems, Teacher Education

ÖZ

FEN BİLGİSİ ÖĞRETMEN ADAYLARININ
YEREL VE GENEL ÇEVRE SORUNLARINA KARŞI SERGİLEDİKLERİ
ETİK USLAMLAMA ÖRÜNTÜLERİ

Tuncay, Büşra
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Çevre etiğinin birçok çevre sorunlarına sebep olma ve birçok çevre sorununu çözmedeki önemine dayanılarak, bu çalışmada; (1) Fen bilgisi öğretmen adaylarının yerel ve genel çevre sorunlarına karşı sergiledikleri etik uslamlama örüntülerini incelemek, (2) Cinsiyet ve sınıf seviyesinin etik uslamlama örüntüleri üzerindeki etkilerini araştırmak, (3) Katılımcıların etik uslamlama örüntülerinde gözlemlenen farklılıklara sebep olmuş olabilecek etmenleri açıklamak amaçlanmıştır. 2008-2009 Güz ve Bahar dönemleri süresince, Orta Doğu Teknik Üniversitesinde kayıtlı bulunan 120 fen bilgisi öğretmen adayına yerel ve genel çevre sorunları ile ilgili durum hikâyeleri dağıtılmış ve çalışmaya katılmış olan 16 fen bilgisi öğretmen adayı ile mülakatlar yapılmıştır. Çalışmanın amacına uygun olarak, betimleyici istatistik testleri, bağımlı örneklem t-test analizleri, çok yönlü

varyans analizleri ve mülakatlar için nitel analiz yöntemleri kullanılmıştır. Yapılan analizler katılımcıların yerel ve genel çevre sorunları karşısında çoğunlukla ekosentrik etik uslamlama örüntüsü sergilediklerini ve çevre sorunlarının yerel ve genel olmasına göre ekosentrik ve antroposentrik etik uslamlama örüntülerinin istatistiksel olarak anlamlı fark gösterdiklerini ortaya koymuştur. Ek olarak, cinsiyet katılımcıların etik uslamlama örüntüleri üzerinde istatistiksel olarak anlamlı bir etkiye sahip olmazken, sınıf seviyesinin etik uslamlama örüntüleri üzerinde anlamlı etkisinin olduğu saptanmıştır. Son olarak, mülakatların analizleri sonucunda katılımcıların çevresel kaygılarında ve çevre konuları hakkındaki etik uslamlama örüntülerinde etkili olan onaltı adet faktör ortaya çıkmıştır.

Anahtar Kelimeler: Çevre Eğitimi, Etik Uslamlama, Yerel Çevre Sorunları, Genel Çevre Sorunları, Öğretmen Eğitimi

To all my family…

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INTRODUCTION

1.1 Evolving Perspectives in Environmental Education

Human behavior is the major reason for many environmental problems such as global warming, water pollution, fast decline of forests and desertification (World Commission on Environment and Development [WCED], 1987) and their solutions (Gardner & Stern, 2002). Therefore, it is important to influence people's behavior to be less destructive but more pro-environmental (Fransson & Gärling, 1999). Correspondingly, creating changes in people's behavior is accepted as one of the key elements and triggering force for environmentalism (Stern, Dietz, Abel, Guagnano, & Kalof, 1999).

Many years ago, Maloney and Ward (1973) emphasized the vital role of education for the solution of the environmental problems by creating changes in people's behaviors. Moreover, today the ultimate goal of environmental education is stated as developing and promoting responsible environmental behavior in the society (Culen, 2001), where purchasing environmentally benign products and reductions in energy use (Stern et al., 1999) can be given as examples for these desired behaviors in the society.

However, Hungerford and Volk (1990) argued that an increasing trend in degradation of environment was an implication of the insufficiency of environmental education programs for resolving environmental problems. The reason for the failure of environmental education programs to promote responsible environmental behaviors in their learners may stem from various reasons. One of these reasons may be the focus of these educational programs.

When we look at the history of environmental education, it is noticed that cognitive domain has been given more place than affective domain (Gurevitz, 2000). Moreover, most of the curricula and educational materials used in environmental education programs were designed to address basic knowledge of ecological concepts rather than more higher-level educational goals such as investigation, evaluation, or citizenship participation so that lessons were able to develop and enhance environmentally responsible behaviors of students (Volk, 1983). Likewise, Pomerantz's (1991) analysis of elementary school natural resource lessons also showed that programs were mostly focusing on ecological principles and very few of the instructional materials were sufficient to develop critical thinking skills and behaviors, which are necessary for promoting responsible environmental behaviors. Therefore, the insufficiency of environmental education programs to promote responsible environmental behaviors in their learners made some researchers to conclude that environmental education programs whose focus is limited to environmental knowledge and awareness were not successful in achieving the ultimate goal of environmental education, which is to

educate environmentally responsible citizens, (Leeming, Dwyer, Porter, & Cobern, 1993).

Correspondingly, on one hand, researchers tried to understand how education might lead to responsible environmental behaviors (REBs) and on the other hand, they tried to understand the predictor variables that may have relationships with REBs. In parallel to efforts in developing effective environmental education programs, models that include the predictors of REBs have been constructed and revised. The first model was quite simple and indicated a linear relationship between knowledge, attitude, and REB. According to this model, which was named as knowledge-attitude-behavior (K-A-B) model by Marcinkowski (2001), Culen (2001), and Hungerford and Volk (1990), increased environmental knowledge has a direct relationship with environmental attitudes, which in turn leads to REBs. However, educational practices revealed that knowledge accumulation, by itself, did not result in having REB (Gurevitz, 2000). Thus, in light of new understandings researchers continued to develop other models.

Hines, Hungerford, and Tomera's (1987) model was based on the review of 128 studies from 1970 to 1987. In this model, Hines *et al.* (1987) point out intention to act and situational factors as the two main factors related to responsible environmental behavior. According to this model, personality factors (i.e. attitudes, locus of control, personal responsibility), knowledge (i.e. knowledge of action strategies, knowledge of issues), and action skills are the components having

relationships with intention to act, which in turn affect responsible environmental behavior together with situational factors.

Another model attempting to clarify the process by which environmental behavior is implemented is the model of Hungerford and Volk (1990). In the proposed model, researchers categorized variables that contribute to environmental behavior under three headings: entry-level variables (i.e. sensitivity as the major variable; knowledge of ecology, androgyny, and attitudes toward pollution, technology and economics as minor variables); ownership variables (i.e. in-depth knowledge about issues, personal investment in the issues and the environment as major variables; knowledge of the consequences of both behavior-both positive and negative, and personal commitment to issue resolution as minor variables); and empowerment variables (i.e. knowledge of and skill in using environmental action strategies, locus of control, and intention to act as major variables; in-depth knowledge about issues as minor variables).

When these two models are examined, it can be seen that although they are more well- rounded and include more variables to explain REB than K-A-B model, they still do not sufficiently emphasize the importance of affective variables such as values to motivate responsible environmental behaviors in individuals. However, besides these leading models in environmental education, in the literature there are also substantial number of studies and proposed models highlighting norms and values among the factors that have relationships with REB. For instance, Stern and Oskamp's (1987) model is a straight-forward application of Schwartz' (1977) norm activation theory and it takes values and norms as bases for behavior. Schwartz's

theory argues that awareness of the consequences of the action (AC), and responsibility for these consequences (AR) guides people's behavior and thus the personal norms (moral obligations) are implemented in actual behaviors of individuals.

Similarly, Dahlstrand and Biel's (1997) model emphasizes the importance of values for environmental behaviors. In their model, they tried to specify how an old behavior changes into a new behavior, possibly environmentally friendly behavior, and then becomes a new habit. According to their model, general attitudes, norms, and values are the primary determining factors for behaviors. Finally, Franson and Gärling (1999) pointed out that it is important to include values as well as knowledge and awareness in models that are aiming to explain environmentally responsible behaviors of people and proposed a process model that assumes values affect attitudes, which in turn accounts for differences in environmental concerns and differences in intentions to perform pro-environmental behaviors.

Although the importance of integrating values and other aspects of affective domain in the implementation of environmental education programs were not recognized in the earlier years of environmental education, their significance have been highlighted in important documents related to environment many decades ago. For example, in the declaration of the first Intergovernmental Conference on Environmental Education, Tbilisi declaration (1978), it was indicated that environmental education should educate individuals in a way that they can understand the problems of our world and protect environment with regard to

ethical values. Similarly, in the reports of United Nations Environment Programme (UNEP) goal of environmental education in the long run was stated as fostering and reinforcing attitudes and behaviors appropriate to the idea that people should embrace plants and animals as well as other people in order to live in harmony with the natural world (IUCN/UNEP/WWF, 1980, section 13). In conclusion, environmental ethics was seen as a tool to develop awareness and concern toward environment among people in those years (IUCN/UNEP/WWF, 1991). In course of time, more and more researchers agreed on the argumentation that in order to promote REB in their learners, focus of environmental education programs should not be limited to environmental knowledge and awareness. For instance, Tilbury (1995) proposed that decisions of people to participate in environmental improvement are not simulated by the cognitive realm, but these decisions depend on personal motivation resulting from the development of a personal environmental ethic. Similarly, in recent years it is believed that affective forms of environmental education encourage individuals to develop more positive attitudes toward environment and engage in more environmentally sustainable behaviors than scientific knowledge based approaches (Gurevitz, 2000). Finally, Yeung (2002) pointed out that throughout environmental education, teachers should give more attention to the elements of concern and empathy in the classroom because they cannot be very effective in promoting behavioral changes just by concentrating on the understanding of environmental issues. To achieve this purpose, first we need to identify moral and ethical values hold by learners. Thus, in this study, it was

aimed to determine pre-service science teachers' moral values regarding different environmental issues.

1.2 Moral Reasoning in Environmentalism

Review of the studies including proposed models as well as other types of research reveals that various terminologies are used while explaining the variables related to affective domain of environmentalism and environmental education. Concern (e.g., Stern, Dietz, & Kalof, 1993), attitude (e.g., Thompson & Barton, 1994), value orientation (e.g., Stern & Dietz, 1994), value (e.g., Bjerke & Kalternborn, 1998) and motive (e.g., Bjerke & Kalternborn, 1999) are some of these terms, which have tiny differences/nuances in their usage and evoke the same meaning in general.

Aside from these, we can also find some research in which the term "morality" is explicitly used. For instance, Kellert's (1991) scale developed to measure attitudes toward carnivores consists of 35 items and items of the scale are classified into six subscales, one of which is 'moralistic' subscale. This subscale represents opposition to cruelty and giving harm to species and indicates the importance of morality in attitudes toward environmental issues. Findings of Bjerke and Kalternborn's (1999) study, in which the same scale was used, also support this argument. They found significant correlations between attitudes of all the three groups of their study (i.e. sheep farmers, wildlife managers, research biologists) and morality subscale.

Finally, Kortenkamp and Moore (2001) used the term "moral reasoning" for differentiating their participants' considerations about ecological dilemmas.

Likewise, the researchers of the present study also used the same term. The term "moral reasoning" is defined as a thinking process with the objective of determining whether an idea is right or wrong (Littledyke, 2004). Therefore, 'environmental moral reasoning' can be described as the thinking process of determining whether an idea/action is right or wrong with regard to environmental improvement and protection. In the study, similar to Kortenkamp and Moore (2001), three moral reasoning categories were used to differentiate participants' environmental moral reasoning patterns: ecocentric, anthropocentric, and non-environmental moral reasoning. Although more detailed information about each of the three environmental moral reasoning category is given in the following chapters, basic ideas underlying them and how they were operationalized in this study are explained as in the following:

People who have ecocentric moral reasoning value environment/nature due to its intrinsic value, which is value aside from its usefulness to humans. On the other hand, people who have anthropocentric moral reasoning believe that environmental quality is important because a degraded environment possesses a threat to the well-being of people. Finally, when someone concentrates on non-environmental aspects of the given environmental problems such laws rather than effects of the environmental problems on humans or on environment itself, he/she is said to exhibit a non-environmental moral reasoning toward the given environmental problems.

The reason for investigating environmental moral reasoning patterns of our participants is based on the idea that studying underlying reasoning of people

toward environmental issues would be helpful to understand the process in which environmental concerns are converted to pro-environmental behaviors. This idea has been supported by many research studies investigating the relationships between human and environment. For example, Thompson and Barton (1994) proposed that studying motives underlying support for the environment merits consideration since making ecocentrism-anthropocentrism distinction helps improve prediction of environmental apathy as well as conserving behaviors than general environmental attitude scales. Correspondingly, Karpiak and Baril (2008) argue that different views about the importance of conservation and sustainability, and the reasons of their importance are important because these views are influential in the development of moral reasoning. Therefore, with their study, Karpiak and Baril (2008) imply the necessity of studying different moral reasoning patterns people have toward environmental issues, as have been realized in the present study.

Environmental issues being controversial in their nature and involving various considerations from a variety of perspectives are given as examples to socio-scientific-issues (Sadler, 2004). In addition, as in other socio-scientific-issues, people's concerns toward environmental issues are correlated with the risks they attach to them (Bamberg, 2003). In the literature, research show that there are some differences in individual's perceptions about the risks of local and non-local environmental issues, where the cases that belong to the country where a particular study took place are considered as local, and the others as non-local. For instance, Duan and Fortner (2005) found that Chinese college students' perceptions about

global and local environmental issues were different in terms of perceived risks such as significance and danger as well as certainty, complexity, and tangibility. The participants perceived local environmental issues as more significant and tangible than global ones. Moreover, they were found to be more knowledgeable on local environmental issues than global environmental issues.

Together with situational factors such as being local and non-local, gender and grade level are the two other variables that are thought to be related to concerns and moral reasoning patterns of people toward environmental issues.

For the effect of gender, there are studies, which revealed significant difference in males and females' environmental concerns as well as the ones that resulted in weak difference (Bord & O'Connor, 1997). Moreover, there are also differences in the found direction of the correlation between gender and concerns of people regarding environmental issues. Some studies revealed the effect of gender in favor of males (e.g., Arcury, Scollay, & Johnson, 1987), whereas some others resulted in the opposite direction in which women were found to be more concerned about environment than men did (e.g., Stern, Dietz, & Kalof, 1993). Furthermore, some researchers such as Zelezny, Chua, and Aldrich (2000), and Karpiak and Baril (2008) found that gender was correlated with people's environmental reasoning patterns. For instance, Karpiak and Baril (2008) explained 5% of the variability in ecocentric and apathetic attitudes by gender and interpreted this in terms of the varying levels of concern for others in women and men.

Effect of grade level is also a common subject that is studied in the field of environmental moral reasoning. For instance, Littledyke's (2004) study carried out

with children from third and fourth grade primary school students showed that moral reasoning features of the children moved from personal, concrete, and egocentric phrase toward concerns that include relationships with environment and wider issues by considering the world at large, which is parallel with ecocentric moral reasoning, as their grade level increase. In another study, Kahn, Jr., and Lourenço (2002) interviewed students from 5th, 8th, and 11th grades of public and private schools and colleges within the age range of 10 to 19 and concluded that students' moral reasoning about living in harmony with nature showed a developmental level. Kellert's (1985) study is also consistent with the argument that there is a decrease in the use of anthropocentric moral reasoning and increase in ecocentric moral reasoning as the grade level increases.

1.3 Purpose and Scope of the Study

In light of the previously conducted research on environmental moral reasoning, the present study aimed to examine moral reasoning patterns of pre-service science teachers toward local and non-local environmental problems, and effects of the two most commonly investigated factors -gender and grade level- on these moral reasoning patterns. Moreover, supplementary analyses were conducted in order to explain the reasons of the differences in these reasoning patterns in more detail.

Different from research that relied on single-item questions or questionnaires designed to measure environmental concerns or environmental attitudes of people by one specific environmental issue such as acid rain (Arcury, Scollay & Johnson, 1987), in this study, four local and four non-local

environmental cases were prepared for four specific environmental issues (i.e. deforestation, e-waste, oil spill, and global warming). The cases that exist in the country where the study took place were defined as local environmental problems, and the other ones were defined as non-local. Each case was based on real environmental problems rather than hypothetical environmental issues. With this approach, the limitation of the possible difference between people's reasoning toward real-life and hypothetical issues (Kortenkamp & Moore, 2001) was aimed to be eliminated. Moreover, since the many aspects of the environmental problems were exhibited in the prepared cases, the participants required to perceive the complexity of the presented environmental problems and utilize their critical thinking skills in order to respond to the related questions, which are listed among the role, objectives, and characteristics of environmental education in Tbilisi Declaration (1978).

To conclude, keeping the importance of environmental ethics in both causing and solving many of the environmental problems in mind, this study aimed to examine moral reasoning patterns (i.e. ecocentric, anthropocentric, non-environmental) of pre-service science teachers. More specifically, it evolves around three main purposes: (1) Examining moral reasoning patterns (i.e. ecocentric, anthropocentric, non-environmental) of pre-service science teachers toward local and non-local environmental problems, (2) Investigating effects of gender and grade level on the moral reasoning patterns, (2) Explaining the factors that may lead to the observed differences in these patterns through in depth analyses.

1.4 Significance of the Study

Based on the above-mentioned importance of moral reasoning in environmental education, this study is believed to have important contributions to the literature with its findings to clarify the process of environmental moral reasoning and thus develop pro-environmental behaviors in the society.

Firstly, using both local and non-local environmental problems to examine moral reasoning patterns of participants is important because examining environmental issues from local, national, regional and international points of view has potential in letting students to gain holistic insights about environmental issues from a variety of views is emphasized in many environmental reports such as Tbilisi Declaration (1978).

Furthermore, the study has an additional importance owing to its sample being pre-service science teachers. As many researchers indicated, education faculties where teachers of future are educated have substantial importance in environmental education. Since pre-service teachers will have active role in environmental education in the future and be role models for their students during their professionalism, by giving effective environmental education to them we can achieve the ultimate goal of environmental education, which is educating environmentally responsible citizens (Culen, 2001).

Aside from these, this study is believed to contribute to the environmental education in Turkey and thus possesses an additional significance for the country. Research show that in Turkey there is not yet a well-established environmental education policy (Tuncer, Ertepınar, Tekkaya, & Sungur, 2005) and environmental

education is in its early stages (Unal, 2008). Therefore, research is needed to develop a well-established environmental education policy and improve environmental education practices in the country.

Furthermore, the revealed importance of affective domain including moral reasoning in environmental education is an implication for the need of further research in this field with various samples in different contexts such as different cultures. When the related literature is reviewed, it is seen that culture is addressed as one of the important variables that have relationships with reasoning patterns of people. However, number of research that will contribute to the knowledge regarding the relationships between culture and environmental moral reasoning is not satisfactory, especially in non-western countries. Therefore, this study has significance in contributing to the literature with its implications for the possible factors that may associate with culture and moral reasoning of people toward environmental issues.

CHAPTER II

LITERATURE REVIEW

In this chapter, a review of the literature on environmental ethics and related theories, relationship between humans and environment, affective approaches in environmental education, moral reasoning, and factors affecting moral reasoning patterns, namely locality of the environmental problems, gender, and grade level, and the state of related research conducted with pre-service teachers is presented respectively.

2.1 Environmental Ethics and Related Theories

Environmental ethics, on which the present study is based, has its roots on very early writings such as the writings of Aldo Leopold (1949) who is sometimes called as the father of environmental ethics (Kortenkamp & Moore, 2001). In course of time, especially with the growing movement of environmentalism, this construct has gained support. Accordingly, in the literature a number of theories were proposed, which give emphasis on the importance of values and moral norms for environmental attitudes and responsible environmental behaviors. For instance, in his norm-activation theory of altruism Schwartz (1977) stated that a person feels a sense of moral obligation to act if he/she is aware of the consequences of environmental damages and believes that his or her actions can ameliorate those consequences. Moreover, Ajzen (1985) included moral values regarding

environment as an element of his theory of planned behavior. Finally, Stern, Dietz, Abel, Guagnano, and Kalof (1999) proposed value-belief-norm (VBN) theory to explain social movements including environmental movement. In their theory, they generalized the awareness of adverse consequences (AC) of events, an element of Schwartz's (1977) norm- activation theory, from other people to nun-human species and the biosphere. Similarly, their theory extended ascription of responsibility (AR) element of norm-activation theory to beliefs about responsibility for causing damages or ability to lessen threats to any valued objects.

All these theories as well as other research can be accepted as evidences of the importance of morality and thus imply the importance of the construct moral reasoning, which will be explained in detail in the following sections of the chapter.

2.2 Relationship between Humans and Environment

For thousands of years philosophical, moral, and religious aspects of the relationship between humans and the rest of the environment have been considered (Nash, 1989) and there has long been a debate on the conception of the human nature (Kahn, 1997) and human's relationship with rest of nature.

Some philosophers argue that since humans are biological beings with an evolutionary history, all of the human activities may be perceived as 'natural'. On the other hand, some others believe that these activities have become so extensive and complex that the relationship of humans with nature is becoming complicated and conception of human is drawing apart from nature which it belongs (Rolston, 1989). The second argument in this debate supports the results of Kahn's (1997)

study, which concludes that some effects of human activity are not natural. Children who participated in his study distinguished harm given to the nature by humans and by other aspects of nature when they were asked whether it was different for fish to die by being eaten by other fish and to die due to an oil spill.

Although the debate on the relationship between humans and the rest of the environment started a long time ago, the history of scientific research in this field is short. Nevertheless, research in this area is quite widespread and extensive (Karpiak & Baril, 2008). For instance, as also explained in the study of Karpiak and Baril (2008), Vining and Ebreo (2002) examined the status of literature in terms of the range of theories that had been applied to the conservation behavior, and their meta-analysis resulted in at least 26 distinct theories related to theoretical and methodological approaches to conservation behavior.

Whether changes made by humans are natural or not, it is clear that not all of them are good for nature, indeed most of the recent changes have been bad (Callicott & da Rocha, 1996). Along with increasing environmental problems, scientists as well as developmental psychologists argue that greater knowledge about the human relationship with nature is needed (Kellert & Wilson, 1993). Similarly, research conducted in this area indicate that in order to be successful in achieving aims of environmental education such as developing responsible environmental behaviors in learners we should enhance students' understanding of the relationships between humans and rest of the environment (Duan & Fortner, 2005). Beside the importance of understanding the relationships between humans and environment, there is a debate in the literature that decisions of people to

participate in environmental improvement are not simulated merely by the cognitive realm, but these decisions depend mostly on personal motivation resulting from the development of a personal environmental ethic (Tilbury, 1995). Therefore, it is argued that more affective forms of environmental education encourage individuals to engage in more sustainable behaviors than scientific knowledge based approaches (Gurevitz, 2000). Accordingly, in the following paragraphs, detailed information about the importance of affective domain for environmental education will be presented.

2.3 Affective Approaches in Environmental Education

There are various terms found in the literature related to affective realm of environmental education such as environmental ethics, environmental attitude, environmental concern, value orientations toward environment, environmental motives, environmental worldviews, and environmental moral reasoning. Although there is not a strict distinction between the definitions of these terms, some nuances exist in their meanings. For instance, it can be said that attitudes are jointly determined by strengths of beliefs about consequences of the behavior and evaluations of these consequences in which value priorities play an important role (Franson & Gärling, 1999). Furthermore, values are defined as standards or criteria that guide action and other psychological constructs such as attitudes, judgments, and attributions (Rokeach, 1979) or "certain beliefs, attitudes, or convictions that are consistently reflected in one's behavior" (Tilbury, 1995, p.6).

Furthermore, based on the idea that different people may have different motives, or reasons, for valuing nature (Bjerke & Kalternborn, 1999), there is a

great deal of research examining human-environment relation and trying to find the underlying factors resulting in differences in people's reasoning regarding their perceptions of this relationship. For instance, according to Schwartz (1994), ten types of values, which are acquired through socialization, motivate actions of people. These values are built in mainly two dimensions: openness to change (stimulation, self-direction) vs. conservation (conformity, tradition, security), and self-enhancement (power, achievement) vs. self-transcendence (welfare for others, universalism, benevolence). Furthermore, Bjerke and Kaltenborn (1999) concluded their survey study, in which they evaluated general values and attitudes of Norwegian sheep farmers, wildlife managers, and research biologists, with recommendations to political authorities to reduce intensity of the conflict between people's own needs such as economic interests and environmental preservation practices. Moreover, they explained that this conflict might be the underlying reason for some people's reluctance to take part in these practices or demonstrate pro-environmental behaviors in their daily life. Actually, the variety and comprehensiveness of the studies examining human-environment relation was demonstrated excellently in Vining and Ebreo's (2002) meta-analysis. In their meta-analysis, the researchers presented variety of theories including theories of learning; motivational, moral, and value theories; theories of attitude, belief, or intention; and theories of emotion and affect, all of which are applied to explain reasoning processes of people about environmental issues as well as pro-environmental behaviors in the society. All these theories and further research conducted in this field

are important to reveal the comprehensiveness of the related literature and contributed to the theoretical background of the present study.

In the literature on environmental ethics, some researchers such as Merchant (1992) distinguish three ethics involved in land and natural resource dilemmas, namely egocentric, homocentric, and ecocentric ethic. Egocentric ethic implies that individuals have right to extract and use natural resources to enhance their own lives. On the other hand, homocentric, or anthropocentric, ethic is grounded in society and argues that social good should be maximized and human evil should be minimized. Finally, ecocentric ethic has an implication that all the things in the ecosystem have intrinsic value, thus deserve moral consideration (de Groot & Steg, 2007a).

A distinction similar to the one in environmental ethics is proposed in value orientations of people as egoistic, social-altruistic, and biospheric value orientation. People having egoistic, social-altruistic, and biospheric value orientations base their decisions to behave pro-environmentally or not on perceived costs and benefits for them personally, for other people, and for the ecosystem and biosphere as a whole respectively (de Groot &Steg, 2007a).

Moreover, according to Stern (1992), four value orientations are effective in environmental concerns. In the first value orientation, environmental concern represents a new way of thinking called the New Environmental Paradigm (NEP), which was later identified as ecocentric value orientation by Gardner and Stern (1996). In this value orientation, general worldviews such as the necessity of the control of economic growth to ensure that the environment is protected and humans

should live in harmony with nature are endorsed (Vining & Ebreo, 2002). The second value orientation is anthropocentric altruism in which well-being of people is of central concern. The third value orientation is the expression of self-interest, namely perceived personal threats caused by deterioration of environment. Finally, the fourth value orientation is identified by Stern (1992) is religious beliefs or post-materialistic values, which is claimed to be effective in environmental concerns of people.

Regarding ecocentric and anthropocentric concerns, Suzuki (2002) stated that strong philosophical, even religious, aspect of the environmental movement reveals the importance of an affectively based realization of the uniqueness of everything in nature. Yet, when thought over more deeply, it is seen that anthropocentrism not only includes a concern for human kind in general but also consists of an egocentric concern. However, Karpiak and Baril's (2008) study revealed that ecocentric and anthropocentric concerns are not negatively related with each other.

In addition to descriptive studies conducted in the affective realm of environmentalism and environmental education, there is also various research aiming to find correlations between the related variables. For instance, in their study, Thompson and Barton (1994) found a positive correlation between ecocentric moral reasoning and conserving behaviors and membership in environmental organizations, whereas the correlation between anthropocentrism and these variables were negative. On the other hand, in the same study

membership in environmental organizations was found to be positively related to ecocentrism and negatively related to anthropocentrism.

Similarly, Schultz and Zelezny (1999) studied the relationship between values of people from 14 different countries and their environmental attitudes. Their research resulted in a positive correlation between New Ecological Paradigm (NEP) scale, which is one of the psychometrically and conceptually sophisticated instrument tool used to measure positivity toward the environment (Karpiak & Baril, 2008) and ecocentrism.

Furthermore, in de Groot and Steg's (2007a) article, in which three studies were examined, it was restated that when people valued environment and biosphere more, which means they had more biospheric value orientation, they had stronger concern toward environment. Moreover, authors of the article concluded that egoistic, altruistic, and biospheric value orientations contributed to the explanation of the variance in environmental concern, environmental attitudes, and environmental intentions of people.

In addition, Axelrod (1994) aimed to determine environmental values (motivations) of 144 university students and identified three value orientations (i.e. economic, social, universal). His study showed that although people are influenced by all the three values to some extent while making decisions, they develop hierarchies in their values that guide their environmental concerns. Moreover, his hypothesis that people who embrace a "universal" value orientation were more prone to endorse environmentally protective actions since they consider the whole ecological system while making their decisions was supported by his research.

Stern et al. (1995) also found a similar result by showing that awareness of consequences to self and the biosphere were significantly related to willingness to take pro-environmental action whereas awareness of consequences for other people was not.

Finally, Karpiak and Baril's (2008) research resulted in important implications for the importance of different motivations in environmental attitudes of people. They found that ecocentrism was strongly negatively correlated with environmental apathy; whereas people who were anthropocentric were more likely to be apathetic toward environment.

Based on the above-summarized research, which demonstrated the importance of understanding the relationship between humans and the environment, the researchers of the present study aimed to examine perceptions of pre-service science teachers regarding this human-environment relationship. Moreover, previous research played a vital role to highlight the importance of affective domain, more specifically morality, in environmental education, and clarify the related terms that composed the base of the present study.

2.4 Moral Reasoning

As explained in the previous section, various terminologies such as value, value orientation, concern, motive, and moral reasoning are used in affective realm of environmentalism and environmental education with similar meanings. However, similar to Kortenkamp and Moore (2001)'s study, which was carried out with 91 undergraduate university students, in the present study the term 'moral reasoning' is used and three categories (i.e. ecocentrism, anthropocentrism, and

non-environmental) are labeled for participants' responses regarding their concerns about the given environmental problems.

The term, moral reasoning, is defined as a thinking process with the objective of determining whether an idea is right or wrong, and its development were first described by Jean Piaget (Littledyke, 2004). Therefore, 'environmental moral reasoning' can be described as the reasoning of people used to determine whether an idea or an action is right or wrong regarding environmental improvement and protection. In this sense, Karpiak and Baril (2008) argued that views about whether and why conservation and sustainability are important should be studied because they have effect on development of moral reasoning of people. In the following, reasoning underlying each of the moral reasoning categories is presented with their definitions made by researchers.

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 (Thompson & Barton, 1994; Gardner & Stern, 1996; Karpiak & Baril, 2008), and 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. In their study Kalternborn and Bjerke (1998) named ecocentrism as 'nature'. According to their analyses, this 'nature' factor consisted of five items, which were biological diversity, protection of the environment, unity with nature, a world of beauty, and closeness to nature. On the other hand, anthropocentric moral reasoning is the

belief that nature is important because it is central to human wellbeing and utility to humans (Karpiak & Baril, 2008). Moreover, Thompson and Barton (1994) defined anthropocentric moral reasoning as valuing nature due to its material and physical benefits it can provide for humans. Furthermore, it was defined as the idea that people should care about environmental quality because a degraded environment poses a threat to people's health (Franson & Gärling, 1999). Finally, as in the study of Kortenkamp and Moore (2001), non-environmental moral reasoning is labeled for people who concentrate on non-environmental aspects of environmental problems such as laws rather than effects of the environmentally damaging actions on humans or on environment itself.

2.5 Factors Affecting Moral Reasoning Patterns

As have been explained previously, in the present study, moral reasoning patterns (i.e. ecocentric, anthropocentric, non-environmental) of pre-service science teachers toward local and non-local environmental problems is examined together with effects of gender and grade level on these moral reasoning patterns. Moreover, it is expected that follow up interviews will reveal the effect of some personal factors such as personal experiences of participants, their moral emotions, or importance given by them to moral principles such as justice. In this respect, Sadler's (2004), and Sadler and Zeidler's (2004) studies, in which they interviewed with college students and examined how and to what extent they perceived moral aspects of socio-scientific issues contributed to the present study with the codes emerged from the analyses of the interviews. In their research, interviewees discussed their ideas, reactions, and feelings regarding genetic engineering issues

and based on the analyses of the interviews the researchers produced a taxonomy of moral concerns such as concern and empathy for the well-being of others, and aversion to altering the natural order. Moreover, a series of other factors such as personal experiences, family biases, background knowledge, and impact of popular culture emerged as important dimensions of socio scientific decision making. Therefore, the research findings showed that people integrate moral concerns while they make decisions about socioscientific issues, and affective features such as emotion and intuition are influential in people's decision-making, which is an implication of the importance of the present study since environmental issues are also accepted as socio-scientific issues.

Furthermore, owing to its qualitative inquiry feature, the present study has potential to reveal additional factors, which were not foreseen at the beginning of the study. Underlying reasons for the selection of locality, gender, and grade level as factors that are thought to be related to the moral reasoning of participants together with the related research are given respectively in the following sections of the chapter.

2.5.1 Effect of Locality of Environmental Problems on Moral Reasoning

Researchers' preference for using local and non-local environmental problems is based on the previous research that found differences in people's perceptions about local and non-local environmental issues. For instance, in his study, Axelrod (1994) stated that individuals' concrete and immediate personal benefits are in conflict with a minimal and distant harm to the environment. Thinking that people perceive non-local environmental problems more distant than

local environmental problems, there are hypotheses stating that local environmental problems may receive more concern than non-local environmental problems. Moreover, it is known that people's concerns toward environmental problems are correlated with the risks they attach to them (Bamberg, 2003).

Correspondingly, Duan and Fortner (2005) used eight local and nine global environmental issues to examine perceptions of 108 Chinese college students regarding internal (i.e. certainty, tangibility, complexity, significance, and danger) and external (i.e. personal knowledge, human responsibility, impact on personal life, and predicted trend) characteristics of the environmental issues. Differences were found in their participants' perceptions about the risks of local and global environmental problems. They perceived local issues more significant and tangible than global issues, which support the argument that people pay more attention to the issues they can directly sense (Duan & Fortner, 2005).

2.5.2 Effect of Gender on Moral Reasoning

Women's movement and environmental movement are the two major social movements that continue to have influences on the society (Arcury, Scollay & Johnson, 1987). Both of these movements are alike in their aims of restructuring relationships: women's movement aimed to change the relationship between men and women whereas environmental movement focused on the relationship between human beings and rest of the species in our planet. This similarity lead researchers including the researchers of the present study to link these two phenomena and hypothesize that there might be major differences in people's environmental attitudes and concerns regarding their genders due to sex role socialization (Arcury,

Scollay & Johnson, 1987). One of the arguments that has been presented to explain sex role differences claims that in the history men have commanded the techno scientific components of society and have acquired and socialized to un-ecological attitudes toward the environment, whereas women as in the roles of mothers and nurturers have been socialized to more environmental attitudes.

However, as MacDonald and Hara (1994) stated, there is an ambiguity in the literature regarding gender differences in environmental concern. Moreover, the results of the research are generally weak and thus inconclusive (Arcury, Scollay & Johnson, 1987). There are studies revealing effect of gender on environmental concern in favor of females, whereas some resulted in the opposite in which men were found to be more concerned about environment than women did.

For instance, Stern et al. (1995) concluded from their study that women were more concerned for environmental deterioration and its consequences to self, to others, to other species, and the biosphere, which was largely due to the differences in values of men and women. In contrast, in their study Arcury, Scollay and Johnson (1987) collected data about concern and knowledge about acid rain of 516 adults (persons aged 18 and older) via a statewide telephone survey. Analyses of their data resulted that men had more concern and knowledge about acid rain problem than women did.

Moreover, some research indicated that gender is a weak predictor of environmental concern or it has no effect at all. For example, MacDonald and Hara (1994) interviewed with 365 college students studying at a medium-sized Midwestern university on the phone. They conducted factor analyses on the data

gathered from their survey and grouped six items into an environmental concern scale. Ordinary least squares regression of environmental concern revealed a significant effect of gender; however, it explained little of the variance in environmental concern

Similar to Zelezny et al. (2000), Karpiak and Baril (2008) found that gender was correlated with their participants' environmental reasoning patterns, since 5% of the variability in ecocentric and apathetic attitudes was explained by gender. This may be due to varying levels of concern for others in women and men and is consistent with the environmental literature. Nonetheless, there is not a consistency in the results of the relationship regarding individuals' environmental moral reasoning patterns and their gender. As an example, Arcury, Johnson and Scollay (1986) found in their study that males had a stronger adherence to the view that "humans are equal members of the natural world, rather than being distinct from nature and exempt from natural laws" (p. 36), but in Karpiak and Baril's (2008) study women revealed more ecocentric moral reasoning than men.

2.5.3 Effect of Grade Level on Moral Reasoning

Similar to gender, grade level is a common subject studied in the field of environmental moral reasoning and environmental education. Therefore, based on previous research, effect of this factor on moral reasoning of pre-service science teachers is examined in the present study.

To begin with, in their review study, Van Liere and Dunlap (1980) proposed five hypotheses about the relation between socio-demographic factors (i.e. age,social-class, residence, political-ideology, and gender) and perceptions of

people about environment. Their hypothesis about the effect of age, which states that there is a difference in people's environmental concerns in favor of young, was supported by their later study (Van Liere & Dunlap, 1981).

Furthermore, literature shows that there may be differences in terms of environmental concerns and moral reasoning patters of people due to age and thus grade level. For instance, Littledyke's (2004) study carried out with third and fourth grade primary school students showed that as their grade level increased moral reasoning of the children moved from personal, concrete, and egocentric phrase toward concerns considering wider issues such as human-environment relationships and non-humans, which is parallel with ecocentric moral reasoning. Likewise, Kahn, Jr., and Lourenço's (2002) analysis of interviews conducted with students from 5^{th}, 8^{th}, 11^{th} grades of public and private schools and colleges within the age range of 10 to 19 supported that people's moral reasoning about living in harmony with nature showed a developmental level.

Moreover, in his study Kellert (1985) found a decrease in the use of anthropocentric moral reasoning and increase in ecocentric moral reasoning as the grade level of his participants increased. Finally, in his study, Kahn (1997) argued that throughout late childhood human oriented reasoning about environmental issues (i.e. anthropocentric moral reasoning) arises through the hierarchical integration of nature-oriented reasoning (i.e. ecocentric moral reasoning) and explained that as children develop their anthropocentric reasoning increases with age as well as their ecocentric reasoning.

2.6 Pre-Service Teachers and Environmental Education

As mentioned previously, teachers have key roles for effective environmental education. In line of this, the vitality of teacher education has been highlighted in many research reports and studies. For instance, the UNESCO-UNEP International Environmental Education Programme has described the preparation of teachers as "the priority of priorities" for action to improve the effectiveness of environmental education (UNESCO-UNEP 1990, p. 1). At this point, the need for environmental education given to pre-service teachers arises because they will have active role in environmental education in the future and be role models for their students during their professionalism. However, when the related literature on environmental education is reviewed, it is seen that despite the wide range of participants that constitute the sample of research, number of studies carried out with pre-service teachers are relatively low.

Similarly, in Turkey there are a few but increasing number of related studies conducted with pre-service teachers, which mostly aim to examine environmental awareness and attitudes of pre-service teachers via implemented questionnaires revealing quantitative findings. For instance, Tuncer, Sungur, Tekkaya, and Ertepınar (2007) examined environmental attitudes and awareness of 1235 pre-service teachers as well as 334 elementary school students. Similarly, in a more recent study Ozden (2008) investigated a total of 830 elementary education pre-service teachers and secondary education mathematics and social sciences teachers' environmental awareness and attitudes. In this respect, the present study' design

differs from many of the research conducted in Turkey since its quantitative results were supported by qualitative analysis of the related interviews.

Moreover, as explained previously, its nature of being conducted with pre-service teachers regarding their moral reasoning patterns toward local and non-local environmental problems increases its significance because theoretically based research related to environmental perceptions, attitudes, behaviors, or moral reasoning patterns -the main subject of the present study- employs theories drawn from other sub-disciplines of psychology (Vining & Ebreo, 2002). Therefore, quite a large number of the studies on the subject of moral reasoning were carried out by psychologists with undergraduate psychology student participants as in the study of Kortenkamp and Moore (2001).

2.7 Summary

In the previous sections of the chapter, review of the literature on environmental ethics and related theories, relationship between humans and environment, affective approaches in environmental education, moral reasoning, and factors affecting moral reasoning patterns, namely locality of the environmental problems, gender, and grade level, and the state of related research conducted with pre-service teachers was presented to the readers. In this summary section, these research will be summarized briefly before moving to the methodological details of the present study. Environmental ethics, which constitutes the base of the construct moral reasoning and thus most of the theoretical background of the present study, dates back to many years and includes studies conducted on the relationship between humans and the environment.

Accordingly, there are a number of related theories emphasizing the importance of values and moral norms for environmental attitudes and responsible environmental behaviors, which shape human-environment relationship. Moreover, many researchers argue that affective forms of environmental education encourage individuals more to engage in responsible environmental behaviors (Gurevitz, 2000). At this point, the necessity of studying moral reasoning of people toward environmental problems arises, because different people may have different motives, or reasons, for valuing nature (Bjerke & Kalternborn, 1999), which in turn creates changes in their perceptions of the relationship between humans and rest of the environment.

Among the reasons underlying the possible differences in people's environmental moral reasoning patterns, locality of the environmental problems, gender, and grade level of the participants are the remarkable ones and thus are aimed to be examined in the scope of the present study. Detailed review of the related research is presented in the previous sections, where the effect of the locality of environmental problems on moral reasoning was associated with the differences in the people's perceived risks attached to local and non-local environmental problems. In addition, review of the literature revealed that although there was not a consistency in the research findings regarding effect of gender, previous studies gave some clues for the possible effect of grade level on moral reasoning patterns. Finally, as also mentioned in the review, research conducted in this field reveals the insufficiency of research conducted with pre-service teachers

despite their vital role for the efficiency of environmental education, and thus implies the uniqueness and importance of the present study.

CHAPTER III

METHOD

The present chapter is devoted to information about the research design, sample, data collection instruments and procedure, data analyses, and assumptions and limitations of the study.

3.1 Research Design

In this survey study, examining pre-service science teachers' moral reasoning patterns (i.e. ecocentric, anthropocentric, non-environmental) toward local and non-local environmental problems was primarily aimed. Being a mixed-method study, an explanatory design was used in which the researcher first collected and analyzed quantitative data and then obtained qualitative data to follow up and refine the quantitative findings (Fraenkel & Wallen, 2006). For exploring the moral reasoning patterns of the participants, content analysis was carried out on the essay type written responses of the participants to the distributed cases related to four environmental problems (i.e. deforestation, e-waste, oil spill, and global warming). Based on the calculated frequencies of each moral reasoning category, statistical analyses were performed. In addition, in order to support the quantitative data results and explore the moral reasoning processes of the

participants including the factors that might lead to the observed differences in their moral reasoning patterns in more detail, qualitative analysis was utilized on the conducted moral decision-making interviews (MDMI) s.

3.2 Sample

For quantitative part of the study with an accessible population of all pre-service science teachers enrolled in Education Faculty of Middle East Technical University (METU), a convenience sample of 120 pre-service science teachers from all of the four grade levels of the faculty participated in the study. The students enrolling in the university take all of their courses in English after one year of prep school. Similarly, all of the instructors are compulsory to teach their courses in English in the university.

The sample of the study constitutes 60% of the accessible population, which is 200 pre-service science teachers (N_{male}= 62, N_{female}= 138). The mean age of the sample was calculated as 22.08 years. The number (N) and percentage (%) of male and female participants in each grade level is presented in Table 3.1. As also seen in the table, number of female participants was more than the number of male participants similar to the gender distribution of the accessible population. By selecting participants from each grade level, the researcher reached a heterogeneous participant group and thus was able to identify the factors that might lead to the observed differences in moral reasoning patterns of pre-service science teachers adequately.

Table 3.1 Demographic information for participants

	gender					
	male		female		total	
Grade	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

For qualitative part of the study, Moral-decision making interviews (MDMI)s were conducted with 16 pre-service science teachers in equal numbers from all grade levels (N_{male}= 8, N_{female}= 8). Based on some psychological research (Ford & Lovery, 1986; Gilligan, 1982) that resulted in different moral reasoning patterns in males and females, equal number of males and females were invited to participate in the interviews. During the two administration periods in which participants answered the questions regarding four specific environmental problems, they were asked to write their names and e-mails if they were willing to participate the follow up interviews. Then, among the given list of names, four participants (2 males, 2 females) who participated in both of the administrations about non-local and local environmental cases were selected from each grade level.

3.3 Instrumentation

3.3.1 Local and Non-local Environmental Cases

In the study, four local and four non-local environmental cases were prepared about four specific environmental issues (i.e. deforestation, e-waste, oil spill, and global warming). The reason for the preference of using real

environmental cases rather than hypothetical dilemmas is based on the findings of research demonstrating the importance of using real life problems in environmental education as well as in studies examining reasoning, perceptions, concerns, and attitudes of people about environmental issues. For instance, in their study, Tuncer and Erdoğan (2006) stated that environmental education courses contribute to pre-service teachers' environmental awareness and feelings of responsibility toward environmental problems more when they are supported by real life environmental issues. Similarly, Kortenkamp and Moore (2001) emphasized that using real-life ecological dilemmas might elicit different environmental moral reasoning than hypothetical dilemmas do.

Instrument development began with a long period of investigation including detailed review of the research conducted in the field from many online resources such as Educational Resources Information Center (ERIC), Ebscohost, Science Direct, Social Science Citation Index (SSCI) and other databases as well as MS and PhD theses done worldwide were reached through the university library's electronic and printed recourses, and important publications such as the report of "State of the Earth" published by Worldwatch Institute and declarations of Ministry of Environment and Forestry of Turkey (MoEF,2004). Moreover, since the influence of mass media in people's obtaining information is known (Chan, 1999), for the selection of the cases, in addition to the resources accessed from the above mentioned resources newspapers, web-pages of non-governmental organizations such as Greenpeace, TEMA (The Turkish Foundation of Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats), Doğa Derneği were

reviewed. The reason for selecting the environmental problems based on their familiarity to the participants and their need of urgent solution is to be able to attract participants' attention and make them to respond to the cases more enthusiastically. Another criterion that affected issue selection for the prepared cases was being able to find parallel local and non-local environmental problems. It was believed that the prepared cases needed to show parallelism in terms of their influences on human and other living and non-living things and significances regarding economical, judicial, and social aspects.

All of the cases except from Exxon Valdez oil spill were prepared by the researcher. "Exxon Valdez Oil Spill" case was taken from the study of Kahn (1997) and was used with some adaptations. During this heavy case writing process two experts on environmental education at faculty of education provided their expertise. While developing the content of the environmental cases, all aspects (e.g., environmental, social, economical, etc) of the problems were tried to be included equally across each case. It was also accepted that providing all the relevant information to the decision maker is impossible (Gore, 1992) in cases. Thus, very selective process was used to decide type of knowledge for cases. Based on these experts' suggestions the researcher revised the cases with iterative process. In this iterative process, the same procedure was repeated several times to obtain parallel cases for each environmental problem. After an agreement was established between these two experts and the researcher, the final structures of the cases were examined by an expert committee and their suggestions were taken in order to assure the validity of the instrument. Aside from these two experts on

environmental education, the expert committee included two professors conducted their studies on environmental education and an expert about measurement and assessment. Expert committee was asked to evaluate the prepared texts in terms of the relevance to the aim of the study, appropriateness of the language, and sufficiency of the given information about each environmental problem. Moreover, they were asked whether environmental, social and economical aspects of each problem were given equal weight in each case. Finally, they were solicited to examine the cases so that the amount and type of the enhanced information in local and non-local environmental cases were identical. The evaluation form given to the expert committee is present in Appendix A. In light of expert committee's suggestions, the researcher revised the cases again with the help of the two experts on environmental education.

The cases were prepared in English because the participants possess the necessary language capacity and ability to comprehend the distributed environmental cases and answer the related questions appropriately. Moreover, since they learned all their courses in English they were more familiar with the scientific use of the terms in English. However, to eliminate any misunderstanding, Turkish meanings of some terms, which may not be known by some of the participants, were given in parenthesis in the texts. Furthermore, the researcher was present during all of the data collection periods and answered any possible questions related to the meaning of additional words found in the texts. The distributed local and non-local environmental cases are given in Appendix B and Appendix C respectively.

3.3.2 Moral Decision-Making Interview (MDMI)

As a second instrument, Moral Decision-Making Interview (MDMI) protocol developed by Sadler and Zeidler (2005) was used basically to reveal the factors that shape participants' moral reasoning toward local and non-local environmental problems. In the original protocol, two scenarios about gene therapy for Huntington's disease and reproductive cloning were used to investigate moral decision-making factors of the study's participants. In the present study, in accordance with its main purpose-examining moral reasoning of participants toward local and non-local environmental problems- five questions related to participants' perceptions of local and local problems, and their thoughts and feelings in general regarding the previously presented environmental cases were added. Moreover, these questions served as warm up questions before the main moral reasoning interview. The questions asked during the interviews are given in Appendix D.

Although the questions found in the interview protocol was in English, and participants' English were assumed to be adequate, the language of the interviews were in participants' native language, Turkish. Original interview questions, which were in English, were given to the participants to look at during the interview, so that they were more able to understand the main question that was being asked during the interview. With this approach, it is believed that possible ambiguity between the English and Turkish versions of the questions was diminished, so that participants understood the questions asked during the interviews and were able to express their ideas and feelings in an optimum way.

3.4 Data Collection

Data was collected in order to examine moral reasoning patterns of pre-service science teachers toward local and non-local environmental problems and effects of demographic variables, namely gender and grade level, on these patterns, and the factors that may lead to the observed differences in the moral reasoning patterns via demographic information sheet, open-ended questions, and interviews respectively. Data collection was carried out over two semesters (2008-2009 Fall, 2008-2009 Spring) of the university and was completed after two administration periods apart from interviews. In the first administration period, the participants' responses to non-local environmental cases (i.e. deforestation of Amazon rain forest, e-waste in China, Exxon Valdez oil spill, melting of glaciers) were collected. After two months, local environmental cases (i.e. deforestation in Turkey, e-waste in Turkey, Independenta tanker accident, water scarcity in Turkey) were administered to the participants. With the two month of time interval between the two administrations, the possible interaction among participants' responses to local and non-local environmental cases was tried to be eliminated. With the permission of Ethical Committee of Middle East Technical University, necessary permissions were taken from the instructors of the courses in order to administer the surveys. Thus, in each data collection site the participants participated the study in their classrooms. In addition, according to the rules of the ethical committee every participant signed a consent form in each administration period as well as before conducting the interviews, confirming that they voluntarily participated the

study and had an option of excluding themselves from the study whenever they want. Informed consent forms can be seen in Appendix F and Appendix G.

At each data collection site, the aim of the study was explained briefly to the pre-service science teachers. For each administration, the participants were asked to list and explain at least four of their considerations that concerned them most about each environmental problem. They were solicited not to leave any case unanswered and were reminded that their responses were very vital and would influence the results of the study. Moreover, they were asked to write their names, student numbers, or nicknames (only if they would use the same nickname for the two administrations) since their responses to local and non-local environmental problems would be analyzed together. The participants were guaranteed that their names and responses would be kept concealed. It took about 40-45 minutes (one course hour) for the participants to answer the questions related to the environmental problems in each administration period. The researcher was present in each of the data collection period and answered the questions of the participants when they had difficulty to comprehend the given cases related to local and non-local environmental problems.

During each data collection site e-mails of those who were willing to participate in the follow-up interviews were collected. With the help of the collected contact information, the researcher arranged meeting time to conduct interviews with volunteer participants. Each interview session was audio-taped after getting permission from the participants. In order to prevent the researcher's fatigue, maximum three interviews were conducted in one day. Moreover, since the

interviews were carried out in a seminar room unexpected interruptions did not generate a history threat. The interview location was organized in advance and a quiet and relaxed atmosphere was created in order to provide a comfortable environment for the participants. There was no time limitation in the interviews but the interviews lasted approximately 30-45 minutes for each participant. The researcher tried to maintain an open, non-confrontational environment during the interviews, in which the participants were given chance to reflect freely on their opinions and know that all opinions were valued equally by the researcher. Moreover, the interviewers were encouraged to offer honest opinions and reactions regarding the issues being discussed.

At the beginning of each interview, in order to help interviewers remember the main issues described in the cases they were given time to look at the environmental cases that they had responded before. In addition, during the interviews, the cases were available for the participants so that they could look at the cases whenever they wanted.

In order keep the interviews 30-45 minutes so that the interviewers would not be distracted, the open-ended questions asked during the interviews focused on two of the eight environmental cases: one non-local case (i.e. melting of glaciers), which received the highest number of concerns in previous administrations, and its corresponding local case (i.e. water scarcity in Turkey).

3.5 Data Analyses

Both quantitative and qualitative data analysis methods were utilized in order to analyze the study's data on moral reasoning patterns of pre-service science teachers toward local and non-local environmental problems.

For quantitative analyses, initially content analysis was carried on the participants' responses to the distributed environmental cases regarding their concerns about the environmental problems and each statement was coded as ecocentric, anthropocentric or non-environmental according to their meanings. Based on the content analyses, frequencies of each reasoning category (i.e. ecocentric, anthropocentric, non-environmental) were computed. The categorization of the moral reasoning patterns was the same with Kortenkamp and Moore's (2001) study.

With the frequencies of ecocentric, anthropocentric, and non-environmental reasoning responses as dependent variables, descriptive statistics, paired-samples t-tests, and MANOVAs were performed to analyze the moral reasoning patterns of the participants by using the Statistical Package for Social Sciences (SPSS) version 15.0 for Windows. More specifically, descriptive statistics, including mean, standard deviation, skewness and kurtosis values, was used to describe the characteristics of the sample and check the variables for any violation of the assumptions underlying t-tests and MANOVAs; paired-samples t-tests were used to test the significance of the found differences in moral reasoning patterns (i.e. ecocentric, anthropocentric, non-environmental) of participants, and look for any differences in their moral reasoning patterns toward local and non-local

environmental problems; and MANOVAs were used to see the effect of gender and grade level on these moral reasoning patterns.

Moreover, Miles and Huberman's (1994) approach of qualitative data analysis was used for the analyses of the interviews. As proposed by the researchers, three components of data analysis (i.e. data reduction, data display, conclusion drawing and verification) were utilized respectively. More specifically, in order to keep the data manageable, coding was done and collected data was reduced via document sheets prepared for each participant's interview transcripts. Then, matrix was used for displaying the emerged information in a more organized and meaningful way. Finally, reliability and validity of the obtained findings were tested to infer plausible explanations. In accordance with Miles and Huberman's (1994) suggestions, 'factoring' was used to discover the factors underlying the process of participants' environmental moral reasoning.

For both content analysis of the written responses of participants toward the administered environmental cases and qualitative analysis of the interview transcripts, a second researcher who participated in the development of the research involved in the processes to test the reliability. For the content analysis, she coded data gathered from 40 of the participants (10 participants from each of the four grade level) and an inter-rater agreement at 95% was found.

Since most of the codes used during the analyses of the interview transcripts were taken from Sadler's (2004), and Sadler and Zeidler's (2004) studies, at the beginning of the analysis appropriateness of the definitions of the codes to the present study were discussed by the researchers. Depending on the discussions,

some of the definitions given by Sadler (2004), and Sadler and Zeidler (2004) were revised so that the codes became more appropriate to the subject of the study. For instance, 'diversity' code emerged from Sadler and Zeidler's (2004) study corresponds to participants' concerns, which were based on the idea that erosion of diversity would restrict individuality and overall diversity in the society. This code was revised by the researches of the present study and renamed as 'endangered species', which stood for concerns regarding the erosion of diversity and extinction of species.

In the following steps of the analysis, first researcher proceeded with the already formed and described codes in an easygoing way. Throughout the process, she noted the statements that she had difficulty to label into a specific code and then the two researchers reviewed the statements together. The final agreement reached after the discussions was found to be 87%.

3.6 Trustworthiness of the Qualitative Analysis

Trustworthiness, as described by Lincoln and Guba (1985) refers to "How can an inquirer persuade his or her audiences (including self) that the findings of inquiry is worth paying attention to, worth taking account of? (p.290)," and is very important for supporting a qualitative study's value (Kirk, & Miller, 1986, as cited in Sadler, 2003). Credibility, applicability, dependability, and confirmability are the constructs that define trustworthiness of a qualitative research, and are generally analogous to the terms internal validity, external validity, reliability, and objectivity used in quantitative research respectively (Sadler, 2003).

In the following sections, information about the verification of these concepts in the context of the current study will be presented.

3.6.1 Credibility

This term, as also referred as 'truth value' (Sadler, 2003), is used to define the degree to which obtained data and their interpretations accurately reflect the thoughts, behaviors, and decisions of participants of a qualitative study (Lincoln & Guba, 1985). As proposed by Denzin (1970), multiple investigators and multiple sources of data are the two methods utilized to provide credibility in a qualitative study. Similarly, in the present study, data collection triangulation, and data analysis triangulation were used to achieve credibility, where triangulation is crosschecking of the collected data by using multiple data sources or multiple data-collection procedures (Fraenkel & Wallen, 2006). For data collection triangulation, data collected from the written concerns of the participants regarding the effects of the distributed environmental cases on humans or on the environment were compared with participants' answers to the asked questions during the moral reasoning interviews. Moreover, in order to ensure data analysis triangulation, a second researcher participated in the analysis of the interview transcripts and the final agreement between the two researchers were found to be 87%.

3.6.2 Applicability

Contrary to quantitative research, in qualitative studies the extent that a study's findings can be transferred to another context cannot be pre-determined by the researcher in advance; instead, it is the audience that will pre-determine the research findings or implications (Sadler, 2003). Therefore, in order to guide the

readers of the present study, descriptions of the participants such as their academic majors, gender and grade level distributions, name and the main characteristics of the university which they were enrolled in, and participants' nationality as an indicator of their culture were given. Furthermore, details of data collection procedure as well as the qualitative approach utilized during the data analysis were explained in detail.

3.6.3 Dependability

Despite the fact that participants and their interpretations of research instruments (in this study interview questions) used in qualitative studies are dynamic and thus exact replication of the results of a qualitative study is not possible (Sadler, 2003), there are still ways researchers use to achieve consistency in the findings of their qualitative studies, namely dependability. This term is generally analogous to reliability term used in quantitative research and the methods to achieve dependability and reliability are similar. Correspondingly, in order to verify dependability of the present study, agreement between the two inter-raters was considered.

3.6.4 Confirmability

As being the final construct regarding trustworthiness of a qualitative study, confirmability can be defined as "the degree which qualitative data and their interpretations can be authenticated" (Sadler, 2003, p.105), and measures the degree of how well the inquiry's findings are supported by the data collected (Lincoln & Guba, 1985). Since the techniques used to verify credibility are also applicable to confirmability (Sadler, 2003), triangulation, which was used to verify

credibility of the study, was also utilized for verification of the study's confirmability. Moreover, two experts, one of which was the second coder of the interviews, contributed to the study in all steps including instrument development, data collection, and data analysis with their expertise in research methodologies and environmental education.

3.7 Assumptions and Limitations of the Study

The assumptions and limitations of the present study, which might affect the effective usefulness of the results, and are believed to enrich the drawn conclusions by identifying both positive and negative aspects of the study, are presented below.

3.7.1 Assumptions

The following assumptions are made by the researchers for this study:

1. All participants' responses to the data collection tools including questions regarding participants' concerns toward local and non-local environmental cases and questions asked during MDMIs were sincere.
2. The administration of the instruments was under standard conditions.
3. There was no interaction between the participants while responding the data collection instruments.
4. Since reducing the fear of personal exposure is very important in obtaining the most reliable self-report measures, participants were made certain that their identification information would be kept concealed.

5. The participants of the study have the necessary language capacity and ability to comprehend the distributed environmental cases and answer the related questions appropriately.

3.7.2 Limitations

The study was subjected to the following limitations:

1. The subjects of the study were limited to 120 pre-service science teachers enrolled in one university. Therefore, more research with broader and more diverse samples is needed.
2. The study was limited by its reliance on self-reported data on participants' responses so that the data might not represent the complete objectivity.
3. Data collection instruments utilized during the study were in English. Although this situation was not a limitation for the present study since education language of the university where the study was conducted is English, it limits the generalizability of the findings.
4. The found moral reasoning patterns are valid within the framework of the environmental cases used in the study; different patterns may be found in the use of different environmental cases.

CHAPTER IV

RESULTS

This chapter is divided into two sections in which results of quantitative and qualitative analyses are presented respectively. The first section deals with descriptive and inferential data analyses conducted to examine moral reasoning patterns of pre-service science teachers toward local and non-local environmental problems, and effects of gender and grade level on these moral reasoning patterns. The second section presents the factors that might lead to differences in the moral reasoning patterns of the participants via qualitative analysis of participants' responses to MDMIs.

4.1 Results of the Quantitative Analyses

In this section, results of the collected data regarding moral reasoning patterns (i.e. ecocentric, anthropocentric, non-environmental) of pre-service science teachers toward local and non-local environmental problems, and effects of gender and grade level on these patterns are presented.

4.1.1 Moral Reasoning Patterns toward Local and Non-Local Environmental Problems

Based on the content analysis of the participants' written responses to the distributed cases regarding local and non-local environmental problems related to

deforestation, e-waste, oil spill, and global warming environmental problems, frequencies of ecocentric, anthropocentric, and non-environmental responses were calculated. According to the descriptive analysis of the given responses, it was found that the participants of the study mostly exhibited ecocentric concerns toward the environmental problems. Moreover, participants' anthropocentric concerns were found to be higher than their non-environmental concerns. Comparison of the ecocentric (eco), anthropocentric (anthro), and non-environmental (NE) moral concerns of participants as well as their total number of moral concerns (total) regarding the four local, four non-local, and for the total of eight environmental cases are summarized in Figure 4.1.

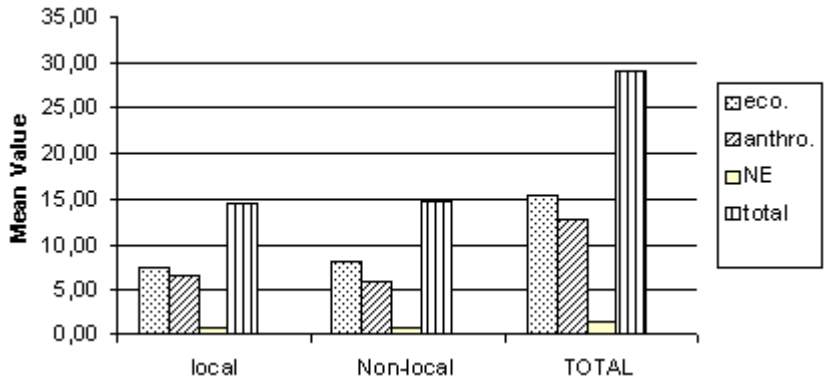

Figure 4.1. Mean values of ecocentric (eco), anthropocentric (anthro), and non-environmental (NE) moral considerations.

Although descriptive analysis results reveal the relative standing of participants' moral considerations, paired samples t-tests were performed in order to test the significance of the found differences between ecocentric,

anthropocentric, and non-environmental moral reasoning categories. According to the t-tests results, differences between ecocentric and anthropocentric concerns for local (p=.006) and non-local (p=.000) environmental problems, as well as when responses to the problems were taken as a whole (p=.000) were statistically significant. In the same way, the difference between participants' anthropocentric and non-environmental concerns for local (p=.000) and non-local (p=.000) environmental problems, and when the responses to environmental problems were taken as a whole (p=.000) were found to be statistically significant. In conclusion, paired samples t-tests revealed that participants of the study exhibited significantly more ecocentric moral considerations for both local and non-local environmental problems. Moreover, their anthropocentric concerns were significantly higher than their non-environmental moral concerns.

In addition to the mean values of the frequencies of participants' stated moral considerations, other descriptive information including standard deviation (S.D.), skewness (skew.), kurtosis (kurts), minimum (min.), and maximum (max.) number of responses falling into each category are tabulated in Table 4.1 to illustrate characteristics of the sample. As seen in the table, missing values corresponding to each of the moral consideration category equal to zero because missing values were replaced by the mean values for each of the dependent variable.

Table 4.1 Descriptive statistics on moral reasoning patterns of participants

	Non-local				Local				TOTAL			
	eco	anthro	NE	total	eco	anthro	NE	total	eco	anthro	NE	total
N												
Valid	120	120	120	120	120	120	120	120	120	120	120	120
Miss.	0	0	0	0	0	0	0	0	0	0	0	0
Mean	8,02	5,93	,73	14,50	7,33	6,51	,75	14,35	15,43	12,57	1,37	28,99
S.D.	2,48	2,09	1,20	3,05	2,31	2,20	1,14	3,90	3,64	3,45	1,55	1,21
Skew	-,63	-,01	2,42	-1,77	-,97	-1,08	1,87	-2,19	-,61	-,79	2,03	2,42
Kurts.	1,17	,28	6,56	3,79	1,72	1,99	2,98	4,79	1,07	1,58	5,28	6,56
Min.	,0	,0	,0	3,0	,0	,0	,0	,0	4,0	2,0	,0	,0
Max.	14,0	11,0	6,0	21,0	12,0	11,0	5,0	20,0	24,0	21,0	8,0	6,0

As have been explained in the previous chapters, one of the purposes of the present study was to investigate the possible difference in moral reasoning patterns of pre-service science teachers toward local and non-local environmental problems. Although mean values of the calculated frequencies of each moral consideration category give an idea about the moral reasoning patterns of the participants toward local and non-local environmental problems, in order to investigate the significance of the revealed differences, paired samples t-tests were conducted on participants' responses based on their concerns for local and non-local environmental problems.

Before conducting the analyses, assumptions of the paired samples t-test were checked. The results of the assumption tests are summarized below before the interpretation of the results. Paired-samples t-test (also referred as repeated measures) has assumptions of 1) level of measurement, 2) random sampling, 3) independence of observations, 4) normality.

1. Level of measurement: As in all of the parametric approaches, paired-samples t-test assumes that the dependent variables are measured at interval or ratio level, using a continuous scale (Tabachnick & Fidell, 2001). In the present study, all of the dependent variables (i.e. frequency of ecocentric, anthropocentric, non-environmental, as well as total moral considerations) were measured at the ratio level, and thus this assumption is met.

2. Random sampling: As in many research, this assumption of using a random sample from the population for obtaining data is violated, since convenient sampling was used in the study.

3. Independence of observations: The researcher of the study was present in all of the data collection sites and tried to keep the participants' interaction in a minimum level so that the measurements of the study were not influenced by each other, they were independent.

4. Normality: For normality assumption, skewness and kurtosis values given in descriptive statistics section were used (see Table 4.1). In addition, paired samples t-test has an additional assumption that the difference between two scores obtained for each subject should be normally distributed (Pallant, 2007). Owing to study's large sample size of 120 participants, which is more than 30, the violation of these assumptions is believed not to cause any major problem and paired-samples t-tests yield reasonably accurate p values (Green & Salkind, 2005).

After checking the assumptions, paired samples t-test analyses were performed on ecocentric, anthropocentric, and non-environmental moral reasoning of participants as well as their total concerns by taking frequencies of each reasoning

category as dependent variables so that the differences in moral reasoning of participants toward local and non-local environmental problems were tested. t and p values obtained from the analyses for each of the four environmental problems (deforestation, e-waste, oil spill, global warming) when they were taken separately , and for the total of these four environmental problems (TOTAL) are tabulated in Table 4.2. Each column labeled by one of the four environmental problems and total of the environmental problems (TOTAL) shows the comparison of participants' moral concerns regarding the local and non-local difference.

Table 4.2 Paired-samples t-test values for moral reasoning patterns toward environmental cases

	deforestation		e-waste		oil spill		global warming		TOTAL	
	t	p	t	p	t	p	t	p	t	P
eco	-1.99	0.049	1.24	0.217	-0.22	0.825	7.69	0.000	2.59	0.011
anthro	-2.17	0.245	1.66	0.098	0.01	0.993	-6.59	0.000	-2.67	0.009
NE	3.74	0.000	-3.20	0.002	0.28	0.779	0.70	0.483	-0.12	0.906
TOTAL	-0.84	0.402	0.40	0.689	0.41	0.683	1.40	0.165	0.43	0.666

As tabulated in the above table, there were statistically significant differences in the participants' ecocentric concerns for deforestation (p= .049) and global warming (p= .000) environmental problems, and for the total of four environmental problems (p= .011). In addition, participants' anthropocentric moral considerations showed statistically significant differences for global warming problem (p= .000) as well as for the total of four environmental problems (p= .009). Moreover, their non-environmental moral concerns were significantly

different for deforestation (p= .000) and e-waste (p= .002) environmental problems. On the contrary, there was not any statistically significant difference in participants' total moral concerns toward neither of the environmental problems separately nor the total of these four environmental problems showing that participants' degree of concerns about local and non-local environmental problems were similar.

Furthermore, calculated effect sizes are given in Table 4.3. When powers corresponding to these effect sizes were examined, it was seen that power values were smaller than .50 for small effect sizes, and larger than .80 for large effect sizes. Therefore, while interpreting the results, the reader should keep in mind that small effect sizes thus small powers indicate the likelihood of Type 2 error.

Table 4.3 Effect sizes of paired samples t-tests

	deforestation	e-waste	oil spill	global warming	TOTAL
eco	-1.99	1.24	-0.22	7.69	2.59
anthro	-2.17	1.66	0.01	-6.59	-2.67
NE	3.74	-3.20	0.28	0.70	-0.12
TOTAL	-0.84	0.40	0.41	1.40	0.43

Finally, when environmental cases were examined separately, it is seen that most number of total environmental concerns were stated for "Melting of Glaciers" case among the four non-local cases, and "Deforestation in Turkey" case among the four local cases. Mean numbers of concerns stated for these two cases were equal. In addition, participants of the study exhibited highest number of ecocentric concerns for all of the cases except from "Exxon Valdez oil spill" and "water

scarcity in Turkey" case. For these two cases, mean numbers of anthropocentric concerns were higher than mean number of ecocentric concerns. Although the difference in the stated ecocentric and anthropocentric concerns was small in the "Exxon Valdez oil spill" case, it was conspicuous in the "water scarcity in Turkey" case. As will be explained in the qualitative results part of this chapter in detail, this conspicuous difference most probably stems from participants' personal experiences in which they had to experience for many days in the capital city of the country, Ankara, two years ago. Mean numbers of ecocentric (eco), anthropocentric (anthro), non-environmental (NE) moral considerations as well as total concerns (total) stated for each non-local and local case are presented in Table 4.4.

Table 4.4 Mean number of moral considerations stated for each environmental case

		Mean Number of Moral Considerations			
		eco	anthro	NE	total
Non-local	Deforestation of Amazon	1.92	1.38	0.32	3.58
	E-waste in China	2.10	1.33	0.21	3.56
	Exxon Valdez Oil Spill	1.73	1.77	0.17	3.65
	Melting of Glaciers	2.25	1.43	0.03	3.68
Local cases	Deforestation in Turkey	2.16	1.51	0.07	3.68
	E-waste in Turkey	1.94	1.19	0.50	3.50
	Independenta Tanker Accident	1.75	1.73	0.15	3.61
	Water Scarcity in Turkey	1.45	2.07	0.01	3.54

4.1.2 Effects of Gender and Grade Level on Moral Reasoning Patterns

In this section, results of MANOVA analyses conducted to examine effects of gender and grade level on moral reasoning patterns of the participants toward local and non-local environmental problems are presented respectively. Before

presenting the MANOVA results, assumptions of the analyses were checked and their results were discussed as in the following. The analysis has assumptions of 1) sample size, 2) normality, 3) outliers, 4) linearity, 5) multicollinearity and singularity, and 6) homogeneity of variance-covariance matrices (Tabachnick & Fidell, 2001).

1. Sample size: In order to confirm this assumption, number of cases in each cell should be more than the number of dependent variables of the study. The minimum required number of cases in each cell in this study is four (ecocentric, anthropocentric, non-environmental, and total moral considerations) and total number of cells is eight for the effect of gender (two levels of independent variable: male/female), and 16 for the effect of grade level (four levels of independent variable: first, second, third, and fourth grades). For both of the MANOVA analyses on the effect of gender and grade level, number of cases per cell are more than the required numbers.

2. Normality: As discussed in the previous section, scores of the participants on the dependent variables of ecocentric and anthropocentric moral considerations were in the acceptable range of normal distribution but the distribution of non-environmental moral reasoning for both local and non-local environmental problems were not (see skewness and kurtosis values in Table 4.1). However, minimum number of cases in each cell being larger than 20 (31 for the effect of gender, 26 for the effect of the grade level) so that conducted MANOVAs are robust to the violation of this assumption (Tabachnick & Fidell, 2001).

3. Outliers: The data of the study was checked for both univariate outliers and multivariate outliers. In order to check univariate outliers, histograms of the distributions, Boxplots, and 5% trimmed means were checked and no extreme values were found. Moreover, potential multivariate outliers were checked out based on Mahalanobis distances and it was seen that only two cases had slightly larger values than the critical value. Therefore, no cases were deleted from the data file.

4. Linearity: In order to test the presence of straight-line relationships between each pair of dependent variables of the study a matrix of scatterplots were generated for males and females, and for each of the four grade levels. The plots did not show any obvious evidence of non-linearity and thus the assumption of linearity was satisfied for both the effect of gender and effect of grade level on moral reasoning patterns of participants.

5. Multicollinearity and singularity: Correlation analysis was run to check the strength of correlations among the dependent variables of the study. The correlation between ecocentric, anthropocentric, non-environmental, and total moral reasoning considerations for local and non-local cases as well when cases were taken as a whole were moderate as suggested (Tabachnick & Fidell, 2001).

6. Homogeneity of variance-covariance matrices: The test of this assumption is generated as a part of MANOVA output with the test of Box's M Test of Equality of Covariance Matrices. For the effect of gender, the significance values in the Box's test were larger than .001, while significance values in the Box's test for effect of grade level did not satisfy the assumption. Furthermore,

Levene's Test of Equality of Error Variances obtained from the output of the analyses revealed that the assumption of equal variances was satisfied for most of the dependent variables both for the effect of gender and grade level (Table 4.5). Effect of the violation of homogeneity of variance-covariance matrices assumption is minimized by using Pillai's criterion instead of Wilk's Lambda for interpretation of the SPSS outputs.

Table 4.5 Levene's test of equality of error variances

	Effect of gender				Effect of grade level			
	F	df1	df2	Sig.	F	df1	df2	Sig.
NL-eco	,013	1	118	,908	,790	3	116	,502
NL-anthro	1,041	1	118	,310	,427	3	116	,734
NL-NE	,997	1	118	,320	4,827	3	116	,003
NL-total	2,137	1	118	,146	11,468	3	116	,000
L-eco	,463	1	118	,497	7,877	3	116	,000
L-anthro	,003	1	118	,957	9,466	3	116	,000
L-NE	7,710	1	118	,006	7,045	3	116	,000
L-total	,648	1	118	,423	34,437	3	116	,000
eco	,067	1	118	,796	6,165	3	116	,001
anthro	,807	1	118	,371	5,445	3	116	,002
NE	1,867	1	118	,174	1,814	3	116	,149
total	2,078	1	118	,152	31,367	3	116	,000

Note. In the table, 'NL' prefix represents non-local environmental cases, 'L' prefix represents local environmental cases, whereas labeling of 'eco', 'anthro', 'NE', and 'total' -with no prefixes- are the Levene's test of equality of error variances results for the total of eight environmental cases, regardless of their locality.

4.1.2.1 Effect of Gender on Moral Reasoning Patterns

In order to examine the effect of gender on participants' moral reasoning patterns for local and non-local environmental problems as well as for the environmental problems when they were taken as a whole MANOVA analysis was conducted with ecocentric, anthropocentric, non-environmental, and total moral considerations as dependent variables. To test the significance of the differences among moral reasoning of males and females, Pilai's criterion was used. According

to the analysis, 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 mean values for male and female participants were examined it was seen that males exhibited slightly more moral concerns in each of the categories for non-local environmental problems, while female participants' ecocentric and anthropocentric moral concerns were slightly higher for local environmental problems. Moreover, when the environmental problems were taken as a whole male participants' ecocentric and non-environmental moral concerns were higher, while their anthropocentric concerns were lower than female participants. Table 4.6 illustrates the comparison of participants' moral reasoning categories with regard to their gender. However, it should be noted that these differences were small and not statistically significant.

Table 4.6 Mean values for moral reasoning categories of male and female participants

	Non-local			Local			TOTAL		
	eco	anthro	NE	eco	anthro	NE	eco	anthro	NE
Male	8,39	6,06	0,82	6,98	6,31	1,04	15,45	12,39	1,63
Female	7,89	5,89	0,69	7,46	6,57	0,65	15,40	12,63	1,29

4.1.2.2 Effect of Grade Level on Moral Reasoning Patterns

As was conducted for examining the effect of gender on participants' moral reasoning patterns for local and non-local environmental problems as well as for

the environmental problems when they were taken as a whole, MANOVA analysis was conducted to investigate the effect of grade level on moral reasoning patterns of participants. As in the previous analyses, participants' ecocentric, anthropocentric, non-environmental, and total moral considerations were taken as dependent variables.

To test the significance of the differences among moral reasoning of first, second, third, and fourth grade pre-service science teachers, value obtained for Pilai's criterion was examined. Analysis revealed that there was a statistically significant effect of grade level on moral reasoning patterns of participants: $F(12, 345) = 5.71$, $p = .000$; Pillai's Trace= .50; partial eta squared= .17.

Having obtained a significant result on multivariate test of significance, further investigation was performed about the effect of grade level for each of the moral considerations regarding local and non-local environmental problems, as well as for the environmental problems when they were taken as a whole. Results of Test of Between Subjects Effects for each dependent variable are tabulated in Table 4.7. The labeling used for dependent variables in the table is the same with Table 4.5.

Table 4.7 Tests of between-subjects effects 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	NL-eco	113,09	3	37,69	7,07	,00	,15	,98
	NL-anthro	92,25	3	30,75	8,35	,00	,18	,99
	NL-NE	13,12	3	4,37	3,18	,03	,08	,72
	NL-total	380,28	3	126,76	20,29	,00	,34	1,00
	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
	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 the analyses, there was statistically significant effect of grade level on moral reasoning patterns of the participants, except from non-environmental moral reasoning for environmental problems when they were taken as a whole ($F(3, 116) = 1.29$, $p = .282$, partial eta squared= .03).

In the table, the values in the column of Partial Eta Squared represent the proportion of the variances in the dependent variables that can be explained by grade level, which are their effect sizes. According to these values, effect sizes were in the range between .032 and .416, which means grade level had more than small effect for all of the categories. Moreover, power values were sufficient for all of the moral reasoning categories except from non-environmental moral reasoning toward non-local environmental problems (NL-NE), and for environmental problems when they were taken as a whole (NE) as predicted.

More specifically, when mean values for each grade level were examined it was seen that first graders exhibited lowest moral concerns regarding the environmental problems and generally highest number of moral concerns were exhibited by fourth grade participants. Detailed information on the comparison of moral reasoning categories of participants is given in Table 4.8.

Table 4.8 Mean values for moral reasoning categories of first, second, third, and fourth graders

	Non-local			Local			TOTAL		
	eco	anthro	NE	eco	anthro	NE	eco	anthro	NE
First	6,38	4,48	,85	5,13	4,62	,30	12,13	9,76	1,09
Second	8,32	6,13	,32	7,46	7,18	1,27	15,67	13,25	1,44
Third	8,19	6,96	,46	8,17	7,15	,54	16,18	14,05	1,10
Fourth	8,95	6,19	1,13	8,38	7,02	,85	17,31	13,22	1,74

4.2 Results of the Qualitative Analyses

In this section, the findings of the quantitative data analyses were examined in more detail with in depth analyses of the MDMIs. With this approach, factors that might lead to the observed differences in moral reasoning patterns of participants were aimed to be explained.

Similar to the findings of the quantitative analyses, review of the interview transcripts revealed no observable differences in moral reasoning of male and female interviewees. They demonstrated similar reasoning and concern for the environmental problems, and their statements regarding the factors that affected

their moral reasoning were alike. In the same way, quantitative findings regarding the effect of grade level on moral reasoning were supported by the conducted interviews. Although there was not an evident tendency of increasing environmental concerns as the grade level of the participants increased, statements given by higher graders were observed to be more comprehensive and explanatory, especially when compared to first grader participants.

As have been explained in the method chapter, Miles and Huberman's (1994) approach of qualitative data analysis was utilized for the analyses of the interviews, and factors that are thought to have affected interviewers' concerns and reasoning regarding environmental issues were examined according to this approach. Most of the factors were already determined before the content analysis and were based on the previous works of Sadler (2003; 2004), and Sadler and Zeidler (2004; 2005), whereas two additional factors (i.e. aesthetics, locality) emerged during the analysis of the interviews. Although the meanings of the factors were based on Sadler's codes, some changes were made due to the characteristics of the interviews. Below, Table 4.9 demonstrating the summary of the descriptions of each factor as well as corresponding frequencies (freq) and percentages (%) of each factor in a descending order is presented. Following the table, detailed information about the meanings of factors and exemplars fitting each factor is given. (see Appendix G for Turkish versions of the quotations)

Table 4.9 Explanations and frequencies of factors that affected participants' environmental moral reasoning

Factor	Descriptions	freq	%
Effect on human life	Concerns regarding effects of environmental problems on human life such as effects on health of individuals	94	12,63
Formal principles	Labeled for participants' justifications, which are based on formal principles such as justice and duty. For instance, statements including criticisms about people who are not performing their responsibilities are included in this factor.	63	8,47
Notion of rights	Statements emphasizing the importance of nation of rights and societal rights	62	8,33
Moral emotions	Any kind of emotions such as sympathy, empathy, respect, and conscience that guided participants' responses	58	7,80
Potential harm to others	Labeled for participants' responses regarding potential harms to animals and plants or concerns for lives, health, and well-being of others in general	55	7,39
Popular culture	Movies, documentaries, advertisements, and other types of media that influenced participants reasoning regarding their concerns about environmental problems	54	7,26
Economical and social problems	Economical and social problems of people including adaptation problems or other problems that would emerge due to chaos in the society	53	7,12
Experiences	Events or situations that participants themselves or their relatives or friends experienced. Experiences with nature such as farming, which influenced participants' reasoning, are also included in this factor.	47	6,32
Knowledge	Statements that imply the importance of knowledge for the way of approaching environmental problems	47	6,32
Disrupting natural order	Statements, which take nature as a whole and highlight the importance of maintaining natural order as well as the balance in nature, are labeled for this factor.	45	6,05
Locality	Labeled for participants' statements, which showed that the way of reasoning or amount of concern of the participants were somewhat dependent on environmental problems' features of being local or non-local.	38	5,11
Slippery slope	Labeled for participants who thought that events in the cases could be tolerated up to some point or environmental problems would be solved by nature itself without much effort.	36	4,84
Next generations	Problems that next generations would have to face with in the future	34	4,57
Endangered species	Concerns regarding the erosion of diversity and extinction of species	29	3,90
Aesthetics	Labeled for participants' responses highlighting the importance of aesthetics for making them feel good and showing their desire to maintain the beauty of nature	19	2,55
Intuitionism	Labeled for participants' statements showing that they could not articulate a specific reason for their reasoning	10	1,34

Effect on Human Life

As also seen in Table 4.9, this factor is the most frequently stated factor affecting participants' reasoning and concerns regarding environmental problems (12.63 % of the total statements), and includes concerns about the effects of the problems on human life such as effects on health of individuals.

Although this high percentage may seem contradictory to the study's quantitative results, which demonstrated that pre-service science teachers who participated in the study mostly have ecocentric concerns regarding environmental problems and believe in the intrinsic value of nature, this situation is just a result of the difference in the characteristics of the factors. If examined carefully, it will be seen that this factor is the broadest factor in which very general statements about effects on humans such as "people are affected negatively" are also included. On the contrary, other factors especially the ones related to nature have narrower features in their meanings. For instance, the factor 'endangered species' is merely composed of statements that explicitly utter participants' concerns about erosion of diversity and extinction of species.

Having clarified any possible confusion regarding the quantitative and qualitative results of the study, some statements labeled for 'effect on human life' factor are given in the following.

> P2: For example, when there is a tanker accident, air that people breath is polluted and people are affected negatively by this.

P5: It was said [in the given texts] that e-wastes harm neurological system, this harm is very difficult to be cured and should be taken seriously especially for children.

P7: Since global warming affect agriculture, humans' diets thus their life styles will be affected.

As demonstrated in the above excerpts, regarding the concerns of the participants about the effects of environmental problems on human life, the interviewees of the study mostly concentrated on the damages on health of people due to pollution or other environmental problems such as global warming, which in tern had/will have effects on the life styles of people.

Formal Principles

Some of the participants justified their positions toward environmental problems in terms of formal principles. For instance, some of them argued that causing harm to people or other living things are against justice. Moreover, some others stated that many of the environmental problems are due to acting against laws and criticized people who are not performing their responsibilities properly or obeying rules as in the following exemplars.

P2: I think governors are also responsible for this [environmental problems]. They should inform us about the problems and encourage us to make the situation better. However, these are not done, so the situation is bad.

P6: Poor people already do not consume water sources as much as rich people. Therefore, rich ones cause water scarcity. However, poor people had to deal with this problem, rich will pay the money, and nothing will change in their lives. It is very unjust!

P7: There are people who do not use filters in their factories and are not punished since they bribe to the people who control them.

The above statements clearly demonstrate the importance of formal principles for the participants. For instance, participant 2 (P2) and participant 7 (P7) pointed out the responsibilities of governors and owners of the factories for solving and preventing environmental problems. Moreover, P7 complained about the malfunction in the implementation of the existing laws. Finally, statements of P6 exemplify the importance of the construct justice in reasoning of the participants toward environmental problems.

Notion of Rights

Following the formal principles, a significant frequency of the coded statements (8.33 % of the total statements) given by participants are statements, which are emphasizing the importance of notion of rights and societal rights that should be considered regarding environmental problems. Some participants stated that people do not have right to cause environmental problems because people do not have right to consume resources that others also have right to use, and it is

against human rights as well as rights of other living things who share the world with humans.

> P2: We do not have right to cause environmental problems because our freedom end when others' begin.
>
> P8: Let's think about two people, although there is water scarcity one spends too much water but the other uses it thrifty. The one who spends too much also grabs others; this is not ethical.
>
> P10: People absolutely do not have right to damage nature. We are also a part of nature and we have the same rights as other living things.

In congruence with the factor 'notion of rights', P2 emphasized the equality of right for freedom for all living things, and P10 supported this argument in a more general way. Moreover, P8 specified this situation to human-human relationship.

Moral Emotions

This factor is important to reveal the importance of emotions for approaches of participants toward environmental problems. It has a higher percentage (7.80 %) than knowledge factor (6.32 %), which may be an implication of the priority of affective domain over cognitive domain as have been explained in the introduction and literature chapters of the present study. Any kind of emotions such as sympathy, empathy, respect, and conscience that guided participants' responses asked during the interviews are included in this factor. For instance, P6 explicitly

stated that he/she put himself/herself in place of a polar bear while thinking about the melting of glaciers, and his/her reasoning was influenced by his/her emotions. Furthermore, P12 also exhibited the same approach for another issue (i.e. hunting), while P3 offered the argument of the necessity for respect as another moral emotion included in this factor. The following are some sample statements exhibited by the participants.

> P3: As we do not want our living areas to be intervened by others, we should respect them [animals] in the same way.
>
> P6: I can at least put myself in place of a polar bear, which is alone on a piece of ice and cannot do anything. I was very influenced by it; it could be us in that situation.
>
> P12: It is unethical to kill an animal in a forest just because his/her pleasure. You will not feel good, if somebody having a gun runs behind you.

Potential Harm to Others

This factor is labeled for participants' statements, which are about potential harms to animals and plants or concerns of the participants regarding health and well-being of others in general. The following quotations taken from the interview transcripts of P1, P7, and P15 provide examples for this factor.

P1: The thing that mostly concerns me about melting of glaciers is the threat of penguins being homeless. I am not sure whether they could adapt to the changes or not.

P7: Deforestation for agriculture for example, we harm all of the living things such as birds, foxes, bacteria on trees, algae... just to get more food for ourselves.

P15: Spill of oil into the sea for example, dead fish on the surface of water, sinking of oil to the bottom of sea and destroying the living things there... that kind of things come in to my mind.

Popular Culture

Interviews showed that movies, documentaries, advertisements, and other types of media, which are labeled as popular culture in this study, similar to Sadler and Zeidler's (2004) research, influenced participants' reasoning patterns as well as degree of concerns regarding environmental problems. For instance, in the following exemplars, it is seen that the advertisement made P11 more knowledgeable about the extent of pollution caused by lead and increased his/her awareness about the problem similar to the influence made by the cartoon movie on P3. In addition, as have been stated before, media seems to influence moral reasoning pattern of P10 toward local and non-local environmental problems and shape his/her reasoning so that he/she becomes more concerned about the effects of

non-local environmental problems on environment itself including animals but concentrates more on problems' effects on humans when they are in Turkey.

The following exemplars demonstrate the effect of popular culture on reasoning of the participants.

> P3: There was a cartoon movie, wall-e, showing that every part of the world was covered by electronic wastes. Maybe after a few years it will be a reality.

> P10: For global problems, always animals are shown in media. Newspapers, television programs, documentaries are always related to them. I mean, they do not show the people effected from the problems such as fishermen but they say that diversity of environment was destroyed and show visuals related to it. I think it causes me to perceive the problems in that way. However, when the problems are in Turkey, effects on humans are shown.

> P11: For example, nowadays there is an advertisement showing how much water is polluted by 10 grams of lead. In such a case, the most important problem is water pollution.

Economical and Social Problems

This factor demonstrates concerns of participants about economical and social problems of people that they faced or will face due to environmental problems. As in the following quotations, these problems were generally related to adaptation

problems of people or other problems that would emerge as a result of the chaos in the society. During the interviews, participants such as P7 and P8 generally talked about the social problems that might occur due to migration of people from their own hometowns to other places. Moreover, they frequently stated the importance of economic well-being for the social peace including the relationships in the families, as also stated by P12.

> P7: People who have to migrate may have problems to get used to the cultures of the places they migrate and thus have psychological, cultural, and economical problems.
>
> P12: These problems affect people economically too, and these economical problems cause other problems in relationships of people with each other, problems in their families...It is like a chain.
>
> P8: If we think about the cases in which fishermen could not fish anymore. If they go other places, they will have problems since they will not be able to do their craft in the places they go. If we think them, they most probably will have economical problems, as well as adaptation problems. This may cause discomfort and chaos in the society.

Experiences

As also seen in Table 4.9, this factor composes 6.32 % of the participants' explanations made during the interviews. It corresponds to experiences of participants themselves or their relatives/friends' experiences that were influential in their moral reasoning patterns toward environmental problems. As an example, throughout the interview, P1 noticed the effect of experiencing an environmental problem on his/her reasoning toward environmental problems, which surprised him/her. Moreover, directly experiencing effects of an environmental problem (e.g., pollution of river, in excerpts of P5's interview transcripts) or observing a pro-environmental behavior around him/her (e.g., recycling, as stated by P16) also had influenced participants reasoning toward environmental problems. In addition, although not given in the below exemplars, effects of the participants' experiences with nature such as farming on their reasoning were also included in this factor.

> P1: Although I claim that humans are least important for me... I was here in the water scarcity problem, and nothing came into my mind related to nature. The only thing I thought was not being able to bath.

> P5: I, myself, experience the pollution of livers by factories in the city I live. Now, Ergene river's color is black, it smells very bad, and there is no living thing in it.

P16: In my hometown, we have a huge solid waste collection center. My aunt in the village also gives her jerry cans, tins, and solid wastes to there. It is very fascinating.

Knowledge

As discussed previously, participants of the study based their justifications about their reasoning regarding environmental problems more on their emotions than their knowledge. The 'knowledge' factor, which is consisted of statements implying the importance of knowledge for concerning about environmental problems or the way people approach them has a smaller percentage (6.32 %) than the percentage of moral emotions factor (7.80 %). The following excerpts provide examples for this factor.

P1: Graphs also show the situation, the world has warmed up in the history but the amount was never as big as this

P6: I was not aware that there is a kind of chain relation, and everything is connected to each other. Becoming aware of this made me to understand the importance of other living things

P14: When we were in the elementary school, nobody taught us that we might run out of water one day. The things that were thought us was that: ¾ of world is composed of water

As also seen in the above statements, some of the participants like P6 saw being knowledgeable about the interrelatedness of elements of the environment as a

key factor to be aware of the importance of other living things, in other words made them to develop more ecocentric reasoning. Moreover, as also have seen in the excerpt that was taken from the interview transcript of P14, in many of the interviews, participants emphasized the importance of education, especially education given in primary school, for increasing environmental awareness. The importance given to the role of elementary level education in increasing environmental awareness and knowledge of students may be interpreted as a result of the sample's characteristics of being comprised of pre-service science teachers, which will be discussed in more detail in the subsequent chapter of the study.

Disrupting Natural Order

As also tabulated in Table 4.9, 6.05 % of the participants' statements were concentrated on the wholeness of nature and highlighted the importance of natural order as well as the balance in nature. As also exemplified in the following exemplars, some of the participants such as P6 and P7 mentioned nature as a 'chain' to demonstrate the interdependence of its elements on each other.

> P6: Disrupting natural ecosystems will create a chain and everything will be affected due to this disruption.

> P11: We have to think everything because everything is dependent on each other like a chain. When something is affected, it affects others.

P12: In ecosystems, many living things kill each other but it has an order, there is a maintained ratio in their number. When humans intervene to the nature, this order is destroyed by affecting many species.

Locality

Although this factor did not emerge in Sadler's (2004), and Sadler and Zeidler's (2004) previous studies in which the same interview protocol (MDMI) was used, it was stated with a percentage of 5.11% in accordance with the aim of the present study. The corresponding statements revealed that the way of reasoning as in the statements of P4 and P5 or degree of concerns of some of the participants as P16 was dependent on locality of environmental problems. The below statements of P4 and P5 show that these participants exhibited more ecocentric concerns when they considered environmental problems from a non-local perspective, whereas their reasoning patterns became to be more anthropocentric when the problems were thought in the context of their own country, as a result of the influence of their emotions. Moreover, some of the participants such as P16 expressed the effect of locality on the degree of concern possessed about environmental problems and the perceived importance of these problems as demonstrated in the excerpts below.

P4: When I generalize the events to the world, plants and animals seem to be a bit more important than humans but when I think them in the context of Turkey I consider humans in the first place.

P5: When events are local, our emotions affect us more and we behave according to our emotions instead of our logic. However, when the events are global we can think more logically, and we can consider nature as a whole and we can regard animals as equal to humans.

P16: For example, I can see pollution of Bosporus directly so I am concerned about it, worried about it emotionally more than a global problem. When problems are global, I may not be aware of its importance as much as a local problem.

Slippery Slope

In their study, Sadler and Zeidler (2004) found that some people permit some applications such as technology in some contexts but express much concern for the application of it in some other contexts. Similarly, in the present study some of the participants stated that events in the given cases could be tolerated up to some point (e.g., P12) or environmental problems would be solved by nature itself without much effort (e.g., P4). Moreover some of the participants like P14 believe in the endlessness of the natural resources as long as they are used in a sustainable way. The following are exemplars corresponding to this situation.

P4: I do not think that we are in an irreversible way because the world has already experienced these kinds of problems previously.

> It could have coped with them without us, and I believe that it can achieve it with us too.
>
> P12: We have right to cut a tree because we use it in many ways. However, we should not exaggerate it; there should be a limit to it.
>
> P14: I believe that the world will always meet our needs; oxygen will never finish for example. The world provides us these kinds of things but we should also favor it, I mean we should try to sustain it.

Next Generations

In response to the question "What made you most concerned about these cases when you think about the future?", some of the participants demonstrated their concerns about the problems that next generations would have to face as in the following quotations. At this point, it should be noted that some of the interviewees such as P10 were concerned about their own children or grandchildren when they thought about future, whereas some others (e.g., P2, P6) did not perceive any distinction between his/her children and children of others, and considered next generations as a whole.

> P2: Next generations will really have to live in hard conditions. Aside from economical problems, the will not be enough space for them to live, to breath for example.

P6: I am mostly concerned about future children; there will not be enough fresh air, water, or clean places to do walking.

P10: I am very concerned about my children in the future. What will they eat, drink, or do?

Endangered Species

Some of the statements expressed during the interviews were related to participants' concerns regarding erosion of diversity and extinction of species due to environmental problems. These statements compose 3.90 % of the total statements and show the effect of this factor on emotions and reasoning of participants explicitly as demonstrated in the following exemplars.

P5: One of the cases was talking about diversity of bird species in Konya basin. It affected me very much.

P6: Since their habitats will be destroyed, many species will become extinct. This is an end point, nobody will be able to reverse it. It is very upsetting.

P12: From now on there will be much less species because many species have already come to the brink of extinction.

Aesthetics

This factor is one of the two factors added to the categories that emerged from the moral decision making interview (MDMI) protocol and is believed to be

impressive to show the importance of aesthetics for participants' concerns regarding environmental problems. It is labeled for participants' statements, which highlighted the importance of aesthetics for making them feel good and demonstrated their desire to maintain the beauty of nature. For instance, P4 overtly states the importance of plants and animals, blowing of a wind for making him/her feel happy. Similarly, excerpts of the P11 and P13's statements clearly show that they give importance to the aesthetical value of nature. The following excerpts taken from the transcripts are important to illustrate this point.

> P4: I enjoy from the being of plants and animals very much. When I see a flower, or when the wind blows I like it very much, I become happy.
>
> P11: Think about walking in forest and walking on a pavement. They will never give the same taste.
>
> P13: When we look old days... there are forests everywhere, everywhere and everything is clean...How nice! Isn't it?

Intuitionism

Finally, with least percentage (1.34 %) some of the statements of participants revealed that they could not articulate a specific reason for their way of reasoning or explain their ideas explicitly. Some participants did/could not justify their reasoning based on any principles, emotions, or any other discernible factors as in the following exemplars. For instance, when P1 was asked to explain the reason for

the change in his/her reasoning pattern from valuing humans more to valuing nature and animals more, he/she tried to make explanation based on the change in his/her inner world. The following excerpts provide examples for the effect of intuitionism on participants reasoning regarding their moral reasoning patterns toward environmental issues.

> P1: In fact, I think there was a change in my inner world.
>
> P5: I cannot see animals as being equal to humans, maybe I should see but I cannot see. I do not know why, maybe due to my emotions.
>
> P13: At first humans. Why? I do not know... maybe it is instinctive but it is like this.

CHAPTER V

DISCUSSION

In this chapter, summary of the study, conclusions and discussions of its findings as well as its implications and recommendations for further research are presented.

5.1 Summary of the Study

In order to investigate the previously explained purposes of this survey study, a convenience sample of 120 pre-service science teachers who enrolled in Middle East Technical University participated in the study. In addition, appropriate to the characteristics of explanatory design, follow up interviews were carried out with a sub-sample of 16 pre-service science teachers. Data collection was realized over 2008-2009 Fall and Spring semesters and was completed after two administration periods apart from the interviews. Content analysis was utilized on the written responses of participants regarding their concerns about the presented local and non-local environmental cases on deforestation, e-waste, oil spill, and global warming environmental problems. Following the content analysis, descriptive and statistical analyses were performed on the frequencies of each moral reasoning category (i.e. ecocentric, anthropocentric, non-environmental).

Similarly, interviews were transcribed and analyzed qualitatively to bring out the possible factors that affected participants' moral reasoning toward environmental issues.

5.2 Discussions

5.2.1 General Pattern in Moral Reasoning of the Participants

Descriptive findings of the study revealed that pre-service science teachers who participated in the study mostly exhibited ecocentric moral reasoning toward both local and non-local environmental cases. Then, they revealed anthropocentric concerns and finally non-environmental concerns with least frequency. This finding was also supported by the conducted inferential statistics since the found differences among the frequencies of ecocentric, anthropocentric, and non-environmental concerns listed by the participants were shown to be statistically significant. Therefore, it can be concluded that participants gave significantly more importance to the effects of environmental damages on environment itself rather than their effects on humans or problems' other non-environmental aspects such as being illegal. One of the reasons for the participants' not giving much importance to the non-environmental aspects of the presented environmental problems may be their unawareness about the presence of the environmental laws or the deficiencies in the implementations of these laws in the country as some of the participants highlighted during the interviews.

In addition, the findings of the study regarding the general pattern in moral reasoning of the participants is a great contrast to some of previous research conducted in western countries such as the study of Kortenkamp and Moore

(2001), implying possible effect of culture on moral reasoning regarding environmental issues. In their study, concerning the presented ecological dilemmas, undergraduate students who participated in the study exhibited non-environmental moral reasoning with the highest frequency, and the mean number of their anthropocentric reasoning were found to be higher than the mean number of their ecocentric reasoning. The reason of the researchers of the present study for interpreting this contrast between the findings of the two studies as an effect of culture is based on the similarity in their samples-undergraduate university students- and data collection as well as data analysis methods utilized throughout the studies.

In fact, some other researchers such as Schwartz (1994) who stated that values are acquired through socialization have also implied effect of culture on values thus moral reasoning of people. Correspondingly, de Groot and Steg (2007b) found differences in value orientations and environmental beliefs of 490 respondents from five different countries (i.e. Australia, Czech Republic, Italy, Netherlands, and Sweden). Depending on their findings, they suggested that culture should be investigated as an underlying reason for valuing nonhuman aspects of the environment less in some countries including U.S. Moreover, Kahn and Lourenço (2002) proposed that one of the explanations regarding the relationship between biocentric reasoning (corresponds to ecocentric moral reasoning in the present study) and culture may be daily, intimate contact with the land. This seems to be a plausible explanation for the high frequency of ecocentric moral reasoning exhibited by the participants of the present study because many of the participants

talked about their experiences with nature such as farming during the interviews. However, in order to be able to point out effect of culture in a more sound way, there is an urgent need to conduct further research in this field in non-western countries like Turkey in addition to the studies conducted in western countries.

5.2.2 Effect of Locality of Environmental Problems on Moral Reasoning

Results of the analyses conducted to examine whether there were any statistically significant differences in moral reasoning patterns of participants toward local versus non-local environmental problems demonstrated that their ecocentric concerns were statistically higher, and anthropocentric concerns were lower for non-local environmental problems than local environmental problems.

Conversely, participants' non-environmental concerns as well as their moral concerns in total did not show a statistically significant difference in terms of environmental problems' characteristics of being local or non-local. Similarly, when the transcripts of the interviews were examined there was not an apparent tendency of participants to be more concerned about local or non-local environmental problems. Some participants stated that environmental problems' locality did not affect their total environmental concerns because they did not perceive local and non-local environmental problems as different environmental concepts. Participant 2 (P2)' statements exemplifies this situation since he/she replied as "In fact, I do not distinguish between local and non-local environmental problems. I could live in another place in the world but now I live in Turkey. There is certainly no difference." when asked whether there was any difference in his/her perception of local and non-local environmental problems.

However, despite insignificant values obtained from the inferential analysis of the collected data and lack of an apparent tendency of participants to concern more for local or non-local environmental problems in the conducted interviews, descriptive analysis revealed some difference in total concerns of the study's participants regarding local and non-local environmental problems in favor of non-local environmental problems. This finding is confirmatory to some previous research conducted in Turkey. For instance, in her research Unal (2008) concluded that Turkish pre-service teachers were more concerned about global environmental problems than local ones because they viewed global environmental problems as more complex, tangible, significant, and dangerous. Moreover, her participants were more certain about the presence of global environmental problems and perceived them as more threatening to humans and/or nature.

Moreover, when descriptive findings of the study were examined separately for each environmental case, it was seen that 'Exxon Valdez Oil Spill' case among the non-local cases and 'Water Scarcity in Turkey' case among the local cases received more anthropocentric concerns than ecocentric concerns by the participants. While the mean number of ecocentric (1.73) and anthropocentric (1.77) moral concerns stated by the participants were near to each other for 'Exxon Valdez Oil Spill' case, the mean difference in ecocentric (1.45) and anthropocentric (2.07) moral reasoning for 'Water Scarcity in Turkey' case was striking. Actually, review of the related literature brings about important explanations for this situation. For instance, in their study Duan and Fortner (2005) concluded that their participants perceived the environmental issues that they could directly sense as

more important than the other ones. Furthermore, as in Axelrod's (1994) study, people develop and reveal hierarchies in their value orientations while they are reasoning and deciding about ecological dilemmas. For instance, a person who exhibits a universal value orientation toward an ecological dilemma and defends preventing the destruction of the natural environment strongly, may exhibit socially oriented approach for another ecological dilemma where a specific environmental protection action involves certain social and economic costs to him/her or to other people in the society. In fact, this explanation seems to be valid for the present study's participants because they most probably experienced the two-week water scarcity in Ankara, which occurred in August of 2007. In that year, the precipitation was not enough in the country, and water in the dams of the city could not meet the need, so there was water cut in most of the regions of the city.

Accordingly, the effect of personal experiences and superiority of people's own needs were clearly shown up in the interviews with the participants. For instance, one of the participants used the following statement in response to a question regarding water scarcity in Turkey: "Although I claim that humans are least important for me... I was here [Ankara] in the water scarcity problem, and nothing came into my mind related to nature. The only thing I thought was not being able to bath". This finding is also supported by Cullingford's (1996) finding that young people's views of environment change according to their personal experiences with environmental problems. For instance, if they experience pollution around them, they generally think about the environment in terms of pollution and its effects.

Furthermore, as have been explained and exemplified in the results chapter, during the interviews some participants explicitly stated the effect of 'locality' of environmental problems on their moral reasoning patterns, as participant 5 (P5) did: "When events are local, our emotions affect us more and we behave according to our emotions [in a more anthropocentric way] instead of our logic. However, when the events are global we can think more logically, and we can consider nature as a whole and we can regard animals as equal to humans."

5.2.3 Effect of Gender and Grade Level on Moral Reasoning

In addition to examining moral reasoning patterns of pre-service science teachers toward local and non-local environmental problems, researchers of the present study aimed to examine the effects of gender and grade level, as the two mostly examined variables in relation to environmental concerns and moral reasoning patterns of people. Descriptive analyses revealed that male participants exhibited slightly more concerns in each of ecocentric, anthropocentric, and non-environmental categories for non-local environmental problems, while female participants' anthropocentric and total concerns were higher than males for local environmental problems. In addition, males' ecocentric and non-environmental moral concerns were higher, but anthropocentric and total concerns were lower when environmental problems were taken as a whole, regardless of their being local or non-local.

These findings of the study is confirmatory to a number of research found in the literature, which indicate that females are more sensitive to the environmental problems, which are nearer to them and exhibit anthropocentric

concerns due to their ‘care taker’ and ‘mother’ roles, thus have some implications for the role of gender in moral reasoning of people. For instance, Tikka, Kuitunen, and Tynys (2000) interpreted the tendency of their female participants to take a more emotional attitude toward nature as a way of taking care of their offspring because they perceived a clean and safe environment as a necessity for welfare and survival.

However, in the present study, the difference emerged from the descriptive analysis of the collected data was not supported neither by the conducted MANOVA analysis nor the carried out interviews. During the interviews, the participants demonstrated similar reasoning and concern for the environmental problems, and their statements regarding the factors that affected their moral reasoning were alike demonstrating no gender tendency. The findings of Kahn and Lourenço’s (2002) study is parallel to these findings in that the researchers also did not find any quantitative or qualitative evidence for gender difference in terms of their participants environmental moral reasoning. Moreover, as in the present study, their participants’ reasoning was similar in terms of content and structure.

One explanation for the equivalence of environmental moral reasoning of male and female participants may derive from a general change in sex roles in the societies (Arcury, Scollay, & Johnson, 1987) from men as the carriers of scientific-technological change and women as nurturers (MacDonald & Hara, 1994) to equality in social roles. This explanation seems to be valid for the participants of the present study because they are in the same conditions as being students in one of the largest 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. However, it should be noted that the sample of the study differs from the rest of the country so performing the same study with a larger and different sample which reflects the country' characteristics and culture more is necessary to be able to generalize the findings to the country.

Similar to the effect of gender, MANOVA analysis were conducted in order to examine the effect of grade level on moral reasoning patterns of participants and statistically significant differences were found in each of these moral reasoning patterns for both local and non-local environmental problems in terms of grade levels of the participants. Similarly, except from non-environmental moral reasoning, grade level had significant effect on moral reasoning of participants when environmental problems were taken as a whole, regardless of their being local or non-local. When the results of the analyses were examined, it was noticed that the found difference mostly seemed to have stemmed from first graders. They expressed remarkably less concerns for all of the environmental problems than the rest of the sample. This situation may be interpreted as a result of the effect of educational experiences of the participants, which might have affected their environmental willingness. During the data collection peiod of the study, first grader particants seemed to be less willing to participate in the study than other participants were. Moreover, it was observed that some of the first graders did not answer all of the questions asked related to the environmental cases. Although this may be just due to their low level of willingness to participate in any research, it may also be interpreted as their low level of awareness about the importance of

environmental problems or environmental behavior intentions as Dietz, Stern, and Guagnano (1998) concluded in their study that aimed to explain environmental concern as a function of social structure.

5.2.4 Other Factors Found to be Effective in Moral Reasoning

Besides all of the quantitative findings, maybe the most evident result that can be concluded from the carried out interviews is that all of the participants perceived moral aspects of environmental problems and many of them were aware of the significance of human-environment relationship for resolving many of the environmental problems. This finding is confirmatory to the findings of many other research, which showed that morality was an important factor for people's decision making in various topics including environmental issues (Sadler, 2003).

In addition, analyses of the interviews revealed sixteen factors that affected interviewees' moral reasoning regarding environmental problems. Many of the participants stated that people did not have right to cause environmental problems due to various reasons including moral principles, and problems' effects on humans and animals. Moreover, as the related literature review also showed, it was seen that participants' emotions such as sympathy, empathy, and conscience guided them more than their knowledge about the environmental problems while answering the questions during the interviews. This finding can be accepted as an implication for the importance of affective domain in environmental education. In parallel to this, aesthetical concerns emerged as another factor that participants of the study considered throughout the interviews. They generally stated that they missed the old days when they were children or they missed their villages where

they can find many of the 'beauties' they are devoid of now. For instance, participant two (P2) stated that "When I was a child, there was a garden, I and my friends used to go there and enjoy very much. But now, it does not exist anymore", and participant eleven (P11) described his/her emotions by his/her saying "My village is a very beautiful place. Its air, water, natural foods... Every summer I go there to have a breathe". Moreover, some of the participants expressed their feelings of happiness when they are in nature as exemplified in the saying of participant four (P4): "I enjoy from the being of plants and animals very much. When I see a flower, or when the wind blows I like it very much, I become happy".

All these findings clearly reveal the need for a change in function of environmental education from just transmitting ecological knowledge to bringing out the emotions of learners regarding the value of nature and its elements. In fact, many researchers have stated the importance of affective approaches for a more effective environmental education numerous times. For instance, Yeung (2002) stated that while giving environmental education, teachers should give more attention to the elements of concern and empathy in the classroom in order to enhance the effectiveness of environmental education. Similarly, Littledyke (2004) suggested teachers to consider development of empathy and care for living things in environmental education implying the importance of emotions as motivators for responsible environmental behaviors.

Apart from these, importance of popular culture including mass media emerged as another important factor effective in participants' degree of concerns and moral reasoning patterns toward local and non-local environmental issues. This

finding is consistent with previous research displaying the important role of popular culture. As an example, Eagles and Demare's (1999) study with 6th grade students showed that attitudes of the students toward environment were related with watching nature films as well as conversations about environment at home and reading about environment. Similarly, fifty-five percent of pre-service teachers who participated in Efe, Gönen, and Baran's (2006) study stated that they gained their environmental knowledge from visual and printed media. Moreover, in her study, Alp (2005) pointed the effect of the way environmental issues are presented on television news and newspapers as a possible explanation for her participants being more knowledgeable about some of the environmental issues such as animals and energy than the other ones.

5.3 Implications of the Study

By its findings, the present study has revealed some implications that should be taken into consideration by teachers, curriculum planners, and the researchers who deal with environmental education programs. At this point, it is noted that these suggestions ought to be taken into consideration in a holistic way since in order to be successful in environmental education collaboration among different stakeholders is very vital (Yılmaz, Boone, & Anderson, 2004).

Importance of moral values as a part of affective domain in environmentalism and environmental education has been emphasized once more. Therefore, environmental education programs or courses related to environment should not only supply environmental knowledge but also should foster emotions that will lead learners to internalize environmental problems and thus exhibit

responsible environmental behaviors in their daily lives more. This implication is also supported by some research such as Vaske and Kobrin's (2001) study in which the researchers stated that people develop an environmental responsibility towards environment and behave more environmentally when they develop an emotional connection to environment.

Interviews with the participants of the present study showed that environmental concerns and moral reasoning of people are affected by the use of mass media. Therefore, coverage of environmental issues in mass media such as television and newspapers should be enhanced and presented in a well-rounded way.

While giving environmental education diagnosing moral reasoning patters of learners in advance and designing the content of the courses accordingly might improve the effectiveness of the courses. Similarly, presenting environmental issues via highlighting effects of environmental problems' effects on humans and on environment itself, and presenting various aspects of the problems may be useful to increase students' motivation to the environmental courses. Moreover, this approach may be helpful to increase students' concerns toward environmental problems and encourage them to exhibit responsible environmental problems more in their daily life. In fact, the necessity of presenting various aspects of the environmental problems was also stated in Tbilisi Declaration (1978). In the declaration, helping learners discover the symptoms and real causes of environmental problems and emphasizing the complexity of them were listed among the guiding principles of environmental education.

Since teachers are accepted as one of the key factors in shaping and affecting students' interest in environmental issues (Tuncer, Sungur, Tekkaya & Ertepınar, 2007), giving an effective environmental education in education faculties possesses additional importance. Furthermore, effectiveness of environmental education programs given to pre-service teachers will in turn increase their students' awareness about environmental issues and develop them as environmentally responsible citizens in the society (Alım, 2006).

Moreover, the suggested revisions in the content of environmental education programs, from just transmission of ecological concepts to a more affective approach, which draws attention to the human-environment relationship and emotional connections with the environment, should be applied to all levels of education in all grade levels.

5.4 Recommendations for Further Research

Based on the findings of the present study and previous research, following recommendations can be offered for further research:

Replication of the same study with a larger sample including pre-service science teachers from education faculties of different universities from different regions of the country will be beneficial for the sake of generalizing results.

Moreover, future research can be expanded to different departments in the education faculties, different faculties of the universities as well as different levels of education including primary and secondary education. Furthermore, comparison of these different groups in terms of their moral reasoning patterns may be helpful

to understand the factors underlying the differences in moral reasoning patterns of people more.

There is a need for further research to answer the questions addressing whether people having different environmental moral reasoning patterns display differences in terms of responsible environmental behaviors. According to the observed results, contents of environmental courses may be organized in an appropriate way by emphasizing effects of the problems on environment or humans more because research such as the study of Kortenkamp and Moore (2001) showed that information enhancement about the effects of environmental problems on environment and humans are affective in moral reasoning patterns of people.

Analyses of the current study's data resulted in no statistically significant difference in terms of total concerns of pre-service science teachers regarding local and non-local environmental problems. However, further research is needed because there exist a very limited number of research in this area which examine possible differences people's perceptions about local and non-local environmental problems.

As mentioned previously, the reason for not finding any significant difference in moral reasoning of female and male participants may be owing to the characteristics of the sample, which is somewhat different from rest of the society they belong. Therefore, replicating the study with a larger and more diverse sample, which reflects the country' characteristics and culture more is needed to be able to generalize the findings of the study to the country with regard to the effect of gender on environmental moral reasoning.

In the literature there are some research conducted on the differences in the effectiveness of environmental education by using local versus non-local environmental issues. For instance, Unal (2008) proposed that if educators focus on local environmental issues during their instruction, they can give real-life examples to their students more and motivate the students to take action to solve those problems easier. Likewise, according to Gokmen (2008) students can link theoretical knowledge with their real life more when local environmental problems are used during the lessons in which problem based learning is utilized. Nevertheless, number of research, including experimental research, needs to be increased in order to clarify the effect of using local and non-local environmental problems in environmental education programs.

Environmental problems or environmental cases other than the ones used in the present study may elicit different patterns of moral reasoning; therefore, supplementary research with different environmental problems and/or environmental cases may be helpful to clarify the moral reasoning patterns and factors effective in the formation of these moral reasoning patterns. Suggested work together with the findings of the current study may reveal a more holistic view on environmental moral reasoning of people.

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APPENDIX A

EVALUATION FORM GIVEN TO THE EXPERT COMMITTEE

Dear Expert Committee,

In this study, we aim to analyze the responses of pre-service science teachers given to the non-local and local cases. There are four non-local cases and four local cases corresponding to the non-local ones. The cases are listed as in the following:

Non-Local Cases	Local Cases
1. Deforestation of Amazon Rain Forest	1. Deforestation in Turkey
2. E-waste in China	2. E-waste in Turkey
3. Exxon Valdez Oil Spill	3. Independenta Tanker Accident
4. Melting of Glaciers	4. Water Scarcity in Turkey

We ask our experts to give us feedback related to

- Appropriateness of the language,
- Appropriateness of the cases,
- Correspondence of the non-local and local cases with each other,
- Whether the cases can adequately explain the intended event/situation in terms of both human and environment aspects or not,
- Whether the cases can adequately explain the intended event/situation in terms of the causes, consequences and processes of the events/situations or not.

Thank you very much for your time and considerations.

APPENDIX B

LOCAL ENVIRONMENTAL CASES

1. Deforestation in Turkey

Today, 21.2 million hectares of Turkey is forested, which constitutes (oluşturmak) 27.2 % of the total area of the country. However, 50 years ago, forested areas in Turkey were 44.3 million hectares. Likewise, more than half of the forests in Turkey have been losing their property rapidly in the last 50 years. Although sustainable forestry is vital to protect the remaining forests, only 2% of the forests in Turkey are under protection. Among the many reasons for deforestation such as clear-cutting patches for agriculture and settlement, excessive grazing, and air pollution resulting from industrialization, forest fires are seen as the most important threat to forests in Turkey. Indeed, there are 2 thousand forest fires in Turkey every year on average and the majority of these forest fires (96%) are caused by people. Forest fires, like other threats, both affect humans and other living organisms in direct and indirect ways. For instance, loss of forests will cause problems to many people who depend on forests to earn their life. Similarly, due to forest fires functional merits (değer) of forests such as preventing erosion, protecting soil, regulation of water regime are being lost resulting in economical and environmental damage to our country in the long run (uzun vadede). Moreover, loss of forests will lead health problems in people because forests clean air by holding some of the harmful particles in the air and provide oxygen. In addition to harming humans as well as many organisms living in the forests, degrading habitats and causing loss of biodiversity, forest fires also damage soil's biological property. Thus, no matter new trees are planted after a forest fire; it takes many years for that soil to come to life (canlanmak) and that region to be regarded as forest again.

2. E-Waste in Turkey

Rapidly increasing electronic wastes (e.g., TVs, computers, printers, telephones, fax machines, screens, medical devices, etc) have become a growing problem in the world with huge amounts of spaces they occupy and poisonous matters they contain. As many countries, Turkey has also become an electronic junk yard (hurdalık) because of rapidly renewing technology. For instance, it is estimated that there are about 40 million television tubes in Turkey and there exists 2 kilograms of lead in a 10-15 kg television tube. This means that just these televisions will release 80 million kilograms of lead to the environment when they become waste. In accordance with (uyarınca) Basel Convention ratified (imzalanmak) in 1989, Turkey has to obey the strict rules about movements and disposal of WEEE (Waste Electrical & Electronic Equipment) wastes. However, since there are only five e-waste recycling companies in Turkey, only 10 thousand of 1 million tons of the country's e-waste

generated each year is exported to EU countries, USA and Canada for recycling. The remaining 990 thousand tons of the waste is dumped into the junk yards (hurdalık) or municipality landfills (belediye çöplükleri). Although, matters such as PVC, lead, mercury, cadmium, phosphorus, plastics, and chlorine solvents used in the production of electronic devices are not harmful when these devices are in use, they comprise threats for both human health and environment when they are improperly disposed (imha edilmek). Improper disposing processes are generally burning into ashes, dismantling (parçalarına ayrılmak) or dumping in landfills. Toxic chemicals in electronic products can leach into the land over time or are released to the atmosphere when they are disposed by these methods. As a result, people living by these areas as well as workers are exposed to the highly hazardous toxic chemical. These chemicals are known to be potentially harmful to human health, especially for children. Moreover, toxic materials in e-wastes cause air, water and soil pollution and in time they are transferred to living organisms through bioaccumulation in the food chains.

3. Independenta Tanker Accident

In 1979, the tragic and devastating (yok edici) Independenta/Shipbroker tanker accident occurred in the Marmara Sea at the entrance to the Istanbul Strait. Almost all of the Romanian tanker crew (mürettebat) lost their lives (only 3 out of 46 survived). The collision caused a fire and the tanker's wreck (enkaz) remained grounded for many years. This accident was the tenth of the most serious oil spill in the world as 30,000 tons of crude oil was burned and 64,000 tons was spilled into the sea. Burning of oil resulted in air pollution in the Istanbul area that maximum accumulation of particles in the air during the fire reached four times greater than the permissible limit set for human health. Likewise, heavy oil contamination formed on the surface of the sea and the shores of the Marmara and Istanbul Strait caused sea pollution. The ecological hazard generated by the oil spill has resulted in the decrease or extinction of surface and subsurface fish species and crustaceans (kabuklular). Besides, the anglers (balıkçılar) could not work for many days and the fish caught were tinted (boyanmak) with oil. What's more, mass mortality of commercial fish after the accident such as bluefish (lüfer), grey mullet (kefal), and sea bream (karagöz balığı) caused economical damage to the country.

4. Water Scarcity in Turkey

Turkey is one of the countries that will be affected negatively by global warming. According to the information given by the authorities, global warming will be effective in decreasing Turkey's water resources. In the 5th technical report of Intergovernmental Panel on Climate Change (IPCL), which was published in 2002, it was stated that there is a 0,20 C$^{\circ}$ increase in temperature and 10% decrease in the annual precipitation averages in Turkey. Water scarcity leads to difficulties in agriculture in that heavy dry seasons increased the water

demand of the farmers. However, most of the farmers could not find enough water to irrigate (sulamak) their farms. Due to increasing temperature and shortage of water, these farms turn into desert. As a result of this, farmers started to feel economical problems and migrate to big cities, and biological diversities in these agricultural fields are being lost very day. Difficulties were also seen in finding drinking water high in quality especially for people living in the big cities of Turkey such as Istanbul, Ankara and Izmir. Official information about the current status of dams in Turkey clearly show the effect of global warming on our water resources. Some of the dams are completely emptied. The occupancy rate (doluluk oranı) of the dams in Istanbul deteriorated to 20 % and the ones in Ankara to less than 5 %. According to the report of ASKİ, due to the increase in population and social development, amount of water used per person will double in 20 years of time in Turkey. In such a case, our country will be categorized as 'arid country'. Although, effects of global warming have been felt for many years in Turkey, this problem was only realized after water scarcity problems faced in Istanbul and other big cities of our country). For instance, in the past 50 years more than 30 lakes have been totally vanished (yok olmak). Total area of these lakes is larger than the area of Marmara Sea. Likewise, the ground water of Konya Basin (Havza), which possesses one third of the ground water of Turkey, goes down many meters every year. With its biological richness, this basin is among the most important basins in Turkey. It provides reproduction area for eight of 13 endangered (nesli tehlike altında olan) bird species that reproduce in Europe and hosts (ev sahipliği yapmak) many endemic plant species.

APPENDIX C

NON-LOCAL ENVIRONMENTAL CASES

1. Deforestation of Amazon Rain Forest

Over half of the world's remaining tropical rain forests, the most biologically diverse region of the world, lies within the Amazon basin (havza), where more forest is being lost than anywhere else on Earth. According to UN reports, tropical countries lose more than 15 million hectares of forests a year to agriculture, logging, and other threats. Deforestation is primarily done by conversion of forest into farms and ranches (hayvan çiftliği). Ranchers and farmers illegally clear-cut patches of forest for grazing and agricultural purposes. At the same time, people living in the forest also earn money by cutting trees and selling them illegally. When forest soil is used for farming, this soil loses its fertility rapidly, so there is a constant demand for fresh soil. Thus, the forested areas are vanishing rapidly without any control. When people cut forest, they do not only lose trees and quality of soils but they also lose the genetic information in tropical biodiversity. It is estimated that as much as 40% of medicines worldwide contain chemicals derived from tropical wild plants and animals, suggesting that the tropics may harbor many additional plants and animals with medical uses that are presently unknown. Based on estimates, the Amazon may be losing as many as 11 to 16 species per day and the resulting ecosystems, which are home to many rare species that cannot survive in other habitats are often highly degraded.

2. E-waste in China

Although Basel Convention bans the export of hazardous electronic waste (e-waste) from rich countries to poorer countries, the fate of large quantities of e-waste is unknown. Most of the electronic devices such as old computer monitors, keyboards, screens, printers, and TVs are thrown away in Europe, US or Japan are dumped in China because it is cheaper to dump this hazardous waste, containing dangerous lead, mercury, and cadmium, in China than dispose of (imha etmek) it properly. In China, and elsewhere, electronic wastes are commonly treated by two ways: burning into ashes in the open air or dumping in landfills, which are often close to farms or sources of drinking water. By these methods, toxic chemicals in electronic products can leach into the land over time or are released into the atmosphere, which in turn pollute water, soil, and air. Eventually, these pollutants bioaccumulate in the food chain, particularly in fish (the major route of exposure for the human). Heavy pollution in water, soil, and air also influence the biodiversity. Many animals and plants lose their environment due to these dumping areas and can hardly live in polluted areas. Health of people, especially children, living by these polluted areas and cheap workers working in these e-waste treatment areas are influenced most from the

open air burning of computer waste, which is done to recover useful metals and releases large amounts of highly poisonous gases. They inhale these toxic gases from the air. For instance, e-waste contain mercury, cadmium, and other toxins that when released carelessly can cause neurological damage in children, among other harmful effects, as in children in rural Guiyu, China. It was found that their blood contained lead at twice the acceptable level set by the U.S. Centers for Disease Control & Prevention.

3. Exxon Valdez Oil Spill

On March 24, 1989, the Exxon Valdez supertanker ran aground (karaya oturmak) in Prince William Sound, Alaska and nearly 40.9 million liters of crude oil (ham petrol) spilled into the Sound (boğaz). This oil spill has been the largest one to occur in North America and the most destructive single event of oil pollution in North American history. There were debates (tartışmalar) about the reason of the accident. Exxon Shipping Company, which owned the oil tanker, was widely criticized for acting recklessly (düşüncesizce) in permitting a known drinking alcoholic captain to run its largest ship. Main damages caused by the oil spill can be summarized under two headings. First, oiling of fur or feathers caused many sea animals and birds as well as invertebrates on oiled shores die in the days immediately after the oil spill. Overall reductions in population have also been seen in various ocean animals, including pink salmon (somon balığı), sea otters (su samuru), and ducks. On the whole, it is estimated that this oil spill killed thousands of marine mammals and more than a quarter of a million birds and harmed the ecosystem of the Sound for at least decades. Second, the oil spill caused extreme human health hazards due to its "persistent, bioaccumulative, and toxic" content. Moreover, it harmed the livelihoods of subsistence (kıt kanaat geçinen) Native Americans, led to potentially long-term psychological disorders of residents within local communities, and resulted in many billions of dollars of economic damage including the loss of recreational sports fisheries, and reduced tourism.

4. Melting of Glaciers

Glaciers present today have taken centuries to form. They keep on melting, forming rivers and lakes; essential for human survival in many places across the world. However, due to global warming they are melting very rapidly. Melting of glaciers increase the temperature of seawater since ice glaciers are able to deflect (yönünü değiştirmek) almost 80% heat of the sun, absorbing approximately 20% heat. This figure is reversed when glaciers melt because when sunlight falls on earth, 80% is absorbed and only 20% is deflected back. Most obviously, melting of glaciers will damage many ecosystems. We have already lost one entire ecosystem from the Arctic. An estimated 15 % of the Arctic tundra has already been lost since the 1970s - (an area roughly one and a half times the size of Turkey). Thus, many animals died due to the disappearance of their habitat. Similarly, polar bears, unable to cross thin or nonexistent ice to hunt seals (fok) will soon face a severely reduced food

source. Scientists fear that with continued melting, the bears may become extinct by the end of the century. Many non-glacial living animals such as seals (fok), walruses (deniz aygırı), and seabirds will also lose their key feeding and breeding grounds (alan) along the ice edge because they rely on food found only in areas where melt water from glaciers meets up with the ocean. Moreover, because of melting of glaciers sea level will increase, which will be felt first in most coastal areas of America and most of Asia. Likewise, people living by coastal regions across the globe will have to relocate due to flooding, soil erosion, and contamination of underground fresh water with salt water. In fact, millions of people living in Asia and South America rely on glacial runoff for drinking water and irrigation. If the glaciers disappear, severe water shortages are sure to follow. Losing lands and water sources will greatly influence the wealth of human not only who lived by sees and oceans but also human who live far away from these water sources.

APPENDIX D

ENVIRONMENTAL MORAL REASONING INTERVIEW QUESTIONS

Warm-Up Questions

1. Did you have a perception of local environmental problems and non-local environmental problems as different environmental concepts before you read the given cases?
2. How do you define local and non-local environmental problems?
3. Among the given eight environmental cases, which one affected you most?
4. Among the given four local environmental cases and four non-local environmental cases which two (one local, one non-local) affected you most?
5. Do you exhibit different reasoning toward local and non-local environmental problems? Do you have differences in your priorities when environmental problems are local or non-local?

Moral Reasoning Interview Questions

1. What factors were influential in determining your concerns toward the given environmental cases?
2. Did you immediately feel that something was wrong in these cases? If yes, which types of issues were wrong in the cases?
3. Did you know your position on the issues before you consciously reflected on them?
4. In arriving at you decision, did you consider the perspective or feelings of anyone or anything involved in the cases? If so, how did this affect your decision-making?

5. Did you try to put yourself in the place of either a person or an animal living there? If so, how did this affect your decision-making?
6. Do you think that environmental problems described in this study are subject to any kind of moral rules or principles? If so, how did this affect your decision-making?
7. Did you consider the responsibility of decision-makers in the given cases? If so, what are the responsibilities of decision-makers in these cases?
8. Did you consider whether people have right to cause the environmental problems described in the cases or not? If so, how did this affect your decision-making?
9. What made you most concerned about these cases when you think about future? Did you consider the rights of the future children, animals, or plants? If so, how did this affect your decision-making?
10. Were you concerned with any scientific issues associated with the given cases? If so, what issues did you think about?
11. Were you concerned with any technological issues associated with the given cases? If so, what issues did you think about?
12. Were you concerned with any social issues associated with the given cases? If so, what issues did you think about?
13. Were you concerned with any environmental issues associated with the given cases? If so, what issues did you think about?
14. Is there anything else that I might know about your thinking process or reasoning as you considered these environmental cases?

APPENDIX E

CONSENT FORM-1

Merhaba,

Ben Büşra TUNCAY. Orta Doğu Teknik Üniversitesi Eğitim Fakültesi, İlköğretim Bölümü'nde araştırma görevlisi olarak çalışıyorum. Aynı zamanda İlköğretim Fen ve Matematik Eğitimi Anabilim Dalı'nda devam ettiğim yüksek lisans eğitimimde tez aşamasına gelmiş bulunuyorum.

Bu çalışmada, tez danışmanlarım Doç.Dr. Özgül YILMAZ TÜZÜN ve Yrd.Doç.Dr. Gaye TUNCER ile birlikte üniversite öğrencilerinin küresel ve yerel çevre sorunlarına karşı sahip oldukları genel ahlaki uslamlama örüntülerini ve çevresel tutum, çevre okuryazarlığı, cinsiyet, vb. değişkenlerin bu örüntüler üzerindeki etkisini araştırmayı ve katılımcılarımızın küresel çevre sorunlarına ve yerel çevre sorunlarına karşı aynı çevresel ahlaki uslamlama örüntülerini sergileyip sergilemediklerini incelemeyi amaçlıyoruz.

Çalışmaya katılımınız, seçilen örneklemin hedeflenen evreni temsil edebilmesi bakımından oldukça önemlidir. İki basamaktan oluşacak olan bu çalışmanın her bir basamağında sorulan sorulara cevap vermeniz yaklaşık 30-40 dakikanızı alacaktır. Konuyla ilgili sorulan soruları cevaplandırmanız katılımcı olarak size herhangi bir zarar vermeyecektir. Çalışmaya katılım gönüllü olduğundan çalışmaya katılmamanız veya herhangi bir sebepten ötürü katılmaktan vazgeçmeniz durumunda olumsuz herhangi bir sonuçla karşılaşmanız muhtemel değildir. Çalışma sırasında elde edilen bütün bilgilerin gizliliği araştırma ekibinin sorumluluğundadır. Bilgilere sadece belirtilen araştırma ekibinin erişimi mümkün olacaktır.

Araştırmamıza yönelik sorularınız olması durumunda benimle ve/veya tez danışmanlarımla iletişime geçebileceğiniz bilgiler aşağıdaki gibidir:

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Amacı konusunda bilgilendirildiğiniz bu çalışmaya gönüllü olarak katılmayı kabul ediyorsanız, lütfen aşağıda belirtilen yere isminizi ve tarihi yazarak imzalayınız.

Teşekkür ederim

Ad-Soyad:_____ İmza:

Tarih:

APPENDIX F

CONSENT FORM-2

Merhaba,

Ben Büşra TUNCAY. Orta Doğu Teknik Üniversitesi Eğitim Fakültesi, İlköğretim Bölümü'nde araştırma görevlisi olarak çalışıyorum. Aynı zamanda İlköğretim Fen ve Matematik Eğitimi Anabilim Dalı'nda devam ettiğim yüksek lisans eğitimimde tez aşamasına gelmiş bulunuyorum. Bu çalışmada, tez danışmanlarım Doç.Dr. Özgül YILMAZ TÜZÜN ve Yrd.Doç.Dr. Gaye TEKSÖZ ile birlikte üniversite öğrencilerinin küresel ve yerel çevre sorunlarına karşı sahip oldukları genel ahlaki uslamlama örüntülerini ve çevresel tutum, çevre okuryazarlığı, cinsiyet, vb. değişkenlerin bu örüntüler üzerindeki etkisini araştırmayı ve katılımcılarımızın küresel çevre sorunlarına ve yerel çevre sorunlarına karşı aynı çevresel ahlaki uslamlama örüntülerini sergileyip sergilemediklerini incelemeyi amaçlıyoruz.

Bilgi toplamak için planlanan bu birebir görüşmeye katılımınız, çalışma sırasında size daha önceden sorulan sorulara verdiğiniz cevapların altında yatan etmenleri derinlemesine anlayabilmemiz açısından oldukça önemlidir. Kısaca, size daha önceden verilmiş olan çevre sorunları karşısında sizi en çok endişelendiren nedenleri belirlemenizde nelerin etkili olduğu, sizi olaylardan etkilenmiş/etkilenecek olan insanların durumunun mu, yoksa diğer canlıların durumunun mu daha çok etkilediği, sizce verilen durumlarda etik olmayan herhangi bir durumun olup olmadığı, eğer varsa bunun sizin düşüncelerinizi nasıl etkilediği yönünde ayrıntılı sorular sorulacaktır.

Bu noktada, sizden beklenen, sorulara mümkün olduğunca ayrıntılı cevaplar vermenizdir. Söyleyeceğiniz her cümlenin çalışmamıza katkısı çok büyük olacaktır. Birebir yapılacak bu görüşmenin tahminen 30 – 45 dakika arasında süreceği hesaplanmaktadır. Fakat sorulara istediğiniz uzunlukta ve ayrıntıda cevap vermek tamamen sizin insiyatifinizdedir, bu anlamda görüşmemiz sizin belirleyeceğiniz şekilde ilerleyecektir. Görüşme sırasında aynı anda ses kaydı alınması da planlanmaktadır. Görüşme süresince katılımcının vereceği bilgilerin daha sonra özenli bir biçimde analizinin yapılmasını kolaylaştıracak ve sağlamlaştıracak bu işlemden, katılımcı olarak sizin uygun bulmamanız halinde vazgeçilebilir ya da istenildiği anda kayıt durdurulabilir veya yeniden başlatılabilir. Ses kaydını kesinlikle istemediğiniz takdirde görüşme notları tutulacaktır.

Konuyla ilgili sorulan soruları cevaplandırmanız katılımcı olarak size herhangi bir zarar vermeyecektir. Çalışmaya katılım gönüllü olduğundan çalışmaya katılmamanız veya herhangi bir sebepten ötürü katılmaktan vazgeçmeniz durumunda olumsuz herhangi bir sonuçla karşılaşmanız muhtemel değildir. Görüşmemiz sırasında edinilen ve kayıt altına alınan bütün bu bilgilerin güvenliği araştırma ekibinin sorumluluğundadır. Elde ettiğimiz ses kayıtları ve görüşme notlarına sadece araştırma ekibinin erişimi vardır.

Araştırmamıza yönelik sorularınız olması durumunda benimle ve/veya tez danışmanlarımla iletişime geçebileceğiniz bilgiler aşağıdaki gibidir:

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Amacı konusunda bilgilendirildiğiniz bu çalışmaya gönüllü olarak katılmayı kabul ediyorsanız, lütfen aşağıda belirtilen yere isminizi ve tarihi yazarak imzalayınız.

Teşekkür ederim

Ad-Soyad: İmza:
Tarih:

APPENDIX G

ENGLISH AND TURKISH VERSIONS OF THE USED QUOTATIONS

Effect on human life:

- P2: For example, when there is a tanker accident, air that people breath is polluted and people are affected negatively by this.

  P2: Mesela [İstanbul' da] tanker kazası olduğu zaman insanların soluduğu hava falan kirleniyor ve insanlar olumsuz yönde etkileniyor bundan.

- P5: It was said [in the given texts] that e-wastes harm neurological system, this harm is very difficult to be cured and should be taken seriously especially for children.

  P5: İnsanların sinir sistemine hasar veriyormuş, ve tedavi edilemeyecek şeyler bunlar, çocuk gelişiminde çok ciddiye alınmalı.

- P7: Since global warming affect agriculture, people's diets thus their life styles will be affected

  P7: Küresel ısınma tarımı etkilediği için insanların beslenme şekillerini de etkileyecek, dolaylı olarak hayat biçimlerini de.

Formal principles:

- P2: I think governors are also responsible for this [environmental problems]. They should inform us about the problems and encourage us to make the situation better. However, these are not done, so the situation is bad.

  P2: Bunda yöneticilerin payı da var, bilgi vermeleri ya da el birliği ile yapalım gibi şeyler geliştirmeleri gerekiyor. Bunlar yapılmadığı için bu şekilde şey yapılıyor.

- P6: Poor people already do not consume water sources as much as rich people. Therefore, rich ones cause water scarcity. However, poor people had to deal with this problem, rich will pay the money, and nothing will change in their lives. It is very unjust!

  P6: Parası olmayan insanlar zaten suyu çok kullanamıyorlardı, gene parası olanlardı susuzluğa sebep olan ama olan yine fakir insanlara oldu, yine çeşmeden su içmek zorundaydılar. Bunun çok büyük bir adaletsizlik olduğunu düşünüyorum. Aynı şekilde buzulların erimsine en çok sebep olan

zengin insanlar her türlü kendilerini kurtaracaklar. En az sucu olanlar en fazla zararı çekecekler. Bu da hiç adil değil!

- P7: There are people who do not use filters in their factories and are not punished since they bribe to the people who control them.

  P7: İki kuruş para için fabrikasına filtre takmayan, çevre kontrolünden rüşvet falan verip kaçan bir çok kişi var.

Notion of rights:

- P2: We do not have to cause environmental problems because our freedom end when others' begin.

  P2: Çevreye zarar verme hakkımız yok,; çünkü bi başkasının özgürlüğünün başladığı yerde bizimki biter.

- P8: Lets think about two people, although there is water scarcity one spends too much water but the other uses it thrifty. The one who spends too much also grabs others, this is not ethical.

  P8: İki kişi düşünelim biri susuzluk olmasına rağmen çok fazla su harcıyor, diğeri tasarruflu kullanıyor. O çok harcayan tasarruflu kullananın hakkını yemiş oluyor, bu da etik değil.

- P10: People absolutely do not have right to damage nature. We are also a part of nature and we have the same rights as other living things.

  P10: İnsanların kesinlikle doğayı tahrip etmeye hakkı yok. Biz de doğanın bir parçasıyız ve diğer canlılarla aynı haklara sahibiz. Bizim düşünme yeteneğimiz varsa onlara yararlı olacak şekilde kullanmalıyız.

Moral emotions:

- P3: As we do not want our living areas to be intervened by others, we should respect them [animals] in the same way.

  P3: Nasıl kendi yasam alanımıza müdahaleye izin vermiyorsak, onlara [hayvanlara]da saygı göstermeliyiz

- P6: I can at least put myself in place of a polar bear, which is alone on a piece of ice and cannot do anything. I was very influenced by it; it could be us in that situation.

  P6: İzlediğim bir suru belgeselden ötürü hiç olmasa kendimi kutup ayılarının yerine koyabildim. Beni çok etkileyen bir şeydi kutup ayısının

kırılmış bir buz parçasında, tek basına, bir şey yapamaz halde durması. Yani o olmak da var.

- P12: It is unethical to kill an animal in a forest just because his/her pleasure. You will not feel good, if somebody having a gun runs behind you.

  P12: Bir insanın sırf zevki için eline silah alıp, ormana gidip hayvan öldürmesi çok etik değil. Sonuca onun arkasından biri silah alıp koştursa o da hoş şeyler hissetmez.

Potential harm to others:

- P1: The thing that mostly concerns me about melting of glaciers is the threat of penguins being homeless. I am not sure whether they could adapt to the changes or not

  P1: Buzulların erimesinde en çok endişelendiğim penguenler evsiz kalacak olması tabii ki. Yani tekrar bir adaptasyon yasayabilirler mi, ondan pek emin değilim.

- P7: Deforestation for agriculture for example, we harm all of the living things such as birds, foxes, bacteria on trees, algae... just to get more food for ourselves.

  P7: Mesela deforestation-tarım için, sırf biz besin alalım diye oradaki habitatta yasayan bütün canlıları yok ediyoruz (kuşlar, tilkiler, ağacın üstünde yasayan bir bakteri, yosun, vs).

- P15: Spill of oil into the sea for example, dead fish on the surface of water, sinking of oil to the bottom of sea and destroying the living things there... that kind of things come in to my mind.

  P15: Denize petrolün bulaşması mesela, ne bileyim balıkların su yüzüne çıkması, petrolün bir sure sonra dibe çöküp oradaki canlıları yok etmesi…bu tarz şeyler geliyor aklıma.

Popular culture:

- P3: There was a cartoon movie, wall-e, showing that every part of the world was covered by electronic wastes. Maybe after a few years it will be a reality.

  P3: Bir çizgi film izlemiştim, wall-e, orda dünyanın her yeri elektronik atık olmuştu. Belki bir kaç yıl sonra gerçekten olur.

- P10: For global problems, always animals are shown in media. Newspapers, television programs, documentaries are always related to them. I mean, they do not show the people effected from the problems such as fishermen but they say that diversity of environment was destroyed and show visuals related to it. I think, it causes me to perceive the problems in that way. However, when the problems are in Turkey, effects on humans are shown.

  P10: Türkiye dışında, dünyayı etkileyen sorunlarda hep hayvanlar gösteriliyor medyada. Gazetelerde, televizyonlarda, belgeseller hep onların üzerine çekiliyor. Yani tutup da balıklar olduğu için oradaki balıkçılar balıkçılık yapamıyorlar, geçimlerini sağlayamıyorlar diye değil de çevrenin zenginliği yok oldu diye şey yapılıyor. Öyle gösterilince ben de o yönden algılıyorum herhalde. Türkiye'de insanları etkileyen yönden gösteriliyor medyada.

- P11: For example, nowadays there is an advertisement showing how much water is polluted by 10 grams of lead. In such a case, the most important problem is water pollution.

- P11: Mesela son günlerde çıkan bir reklam var 10 gr kurşunun ne kadar büyüklükte bir su kütlesini kullanılmaz hale getirdiğinden falan bahsediyor. Bu durumda su kirliliği en önemlisi.

Economical and social problems:

- P7: People who have to migrate may have problems to get used to the cultures of the places they migrate and thus have psychological, cultural, and economical problems.

  P7: Göç etmek zorunda kalan insanlar gittikleri yerdeki insanların kültürleriyle çakışacak, psikolojik, kültürel ve ekonomik sorunlar yaşanacak.

- P12: These problems affect people economically too, and these economical problems cause other problems in relationships of people with each other, problems in their families...It is like a chain.

  P12: Ya insanları bu ekonomik olarak da etkiliyor, ekonomi çökünce zincirleme diğer şeyler de gidiyor.işte insanların birbirlerine karsı davranışları, aile içi durumları, insanların tutumları…onlar da sarpa sarıyor.

- P8: If we think about the cases in which fishermen could not fish anymore. If they go other places, they will have problems since they will not be able to do their craft in the places they go. If we think them, they most probably

will have economical problems, as well as adaptation problems. This may cause discomfort and chaos in the society.

P8: Balıkçıların zarar gördüğü olayda, insanlar balıkçılık yapamayıp başka yerlere giderlerse kendi zanaatlarını yapamayacakları için diğer yerlerde sıkıntı çekecekler. Onlar açısından düşünürsek hem sosyal, başka yerin kültürüne ayak uydurmakta zorlanabilinir, hem ekonomik yönden sıkıntı çekecekler. Bu sıkıntılar içerisinde anlaşmazlık ve çatışmalar olabilir.

Experiences:

- P1: Although I claim that humans are least important for me... I was here in the water scarcity problem, and nothing came into my mind related to nature. The only thing I thought was not being able to bath.

  P1: Her ne kadar insanlar son sırada desem de...Ankara'daki su sorununda buradaydım ve doğa ile ilgili aklıma en ufak bir şey gelmedi. Sadece lanet olsun banyo yapamıyoruz falan onları düşündüm.

- P5: I, myself, experience the pollution of livers by factories in the city I live. Now, Ergene river's color is black, it smells very bad, and there is no living thing in it.

  P5: Fabrikaların yer altı sularını kirletmesinin bariz örneğini ben yasadığım çevrede bizzat görüyorum. Ergene nehrinde siyah bir görüntü var ve içinde hiçbir canlı yasamıyor

- P16: In my hometown, we have a huge solid waste collection center. My aunt in the village also gives her jerry cans, tins, and solid wastes to there. It is very fascinating.

  P16: Benim şehrimde, Sakarya'da kocaman bir katı atık toplama deposu oluşturulmakta ve çok güzel. Benim köydeki teyzem de bidonlarını, tenekelerini o geri dönüşüm kutularına atıyor yani.

Knowledge:

- P1: Graphs also show the situation, the world has warmed up in the history but the amount was never as big as this .

  P1: Grafikler de bunu gösteriyor, tamam daha önce de ısınmış ama hiç bu kadar olmamış.

- P6: I was not aware that there is a kind of chain relation, and everything is connected to each other. Becoming aware of this made me to understand the importance of other living things.

P6: Bunun bir zincir olduğunun, her şeyin birbirine bağlı olabileceğinin frakında değilmişim, bunun farkına varmam diğer canlıları öne almama sebep oldu.

- P14: When we were in the elementary school, nobody taught us that we might run out of water one day. The things that were thought us was that: ¾ of world is composed of water.

  P14: Ya ilkokulda bize kimse su bir gün bitebilir demedi, biz dünyanın 4te3 ünün su olduğunu falan örgendik.

Disrupting natural order:

- P6: Disrupting natural ecosystems will create a chain and everything will be effected due to this disruption.

  P6: Ekosistemlerin yok olması zincire dönüşecek bir şey, bundan sonrası hep ona bağlı olarak gelecek.

- P11: We have to think everything because everything is dependent on each other like a chain. When something is affected, it affects others .

  P11: Her şeyi düşünmemiz gerekiyor, çünkü her şey birbirine bağlı, tam bir zincir, bir şey etkilendiği zaman diğerleri de etkilenecek.

- P12: In ecosystems, many living things kill each other but it has an order, there is a maintained ratio in their number. When humans intervene to the nature, this order is destroyed by affecting many species.

  P12: Ekolojik sistemde bir sürü canlı birbirini avlıyor, öldürüyor ama onun bir düzeni var, sayıları arasında korunan bir oran var. İnsan müdahale ettiğinde biz zincirleme bir şekilde bir sürü türü etkileyerek o oranla oynamış oluyoruz.

Locality :

- P4: When I generalize the events to the world plants and animals seem to be a bit more important than humans but when I think them in the context of Turkey I consider humans in the first place.

  P4: Olayları dünyaya genelleştirdiğim zaman bitkidir, hayvandır biraz daha onlara kayıyor; ama Türkiye'de düşündüğümde ilk planda insan geliyor.

- P5: When events are local, our emotions affect us more and we behave according to our emotions instead of our logic. However, when the events

are global we can think more logically, and we can consider nature as a whole and we can regard animals as equal to humans.

P5: Local olanlarda daha çok duygularımızla hareket ediyoruz o yüzden çevremizdeki insanları, kendimizi ön plana çıkarıyoruz, yani mantıkla değil de direk hislerimizle. Global olarak baktığımızda biraz daha mantıklı düşünebiliyoruz hayvanlarla insanları biraz daha eş değer görebiliyoruz, tüm çevreyi düşünebiliyoruz.

- P16: For example, I can see pollution of Bosporus directly so I am concerned about it, worried about it emotionally more than a global problem. When problems are global, I may not be aware of its importance as much as a local problem.

  P16: Mesela İstanbul Boğazı'nın kirlenmesini ben direk gördüğüm için, mesela bir küresel ısınmayı o kadar idrak edemeyebilirim, çok ciddiyetinde olamayabilirim ama İstanbul Boğazı'ndan daha çok etkileniyorum, beni duygusal olarak daha çok üzüyor.

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  P2: In fact, I do not distinguish between local and non-local environmental problems. I could live in another place in the world but now I live in Turkey. There is certainly no difference.

  P2: Açıkçası yerel-genel diye ayırmıyorum yani. Hani dünyanın başka bir yerde de yaşayabilirdim ama şu anda yaşadığım yer Türkiye. Öyle bir ayrım yok kesinlikle.

Slippery slope:

- P4: I do not think that we are in an irreversible way because the world has already experienced these kinds of problems previously. It could have coped with them without us, and I believe that it can achieve it with us too.

  P4: Geri dönülemez bir yolda olduğumuzu düşünmüyorum, çünkü dünya daha önce bu tür olayları başından çok atlatmış. Biz olmadan atlatmış, bence yine atlatabilir.

- P12: We have right to cut a tree because we use it in many ways. However, we should not exaggerate it; there should be a limit to it.

  P12: Tabii ki bir insanın bir ağacı kesmeye hakkı var, bir ağaçtan bir dünya şey yapıyoruz, kullanıyoruz ama bunu yaparken de çok fazla abartmamak lazım. Hani belli bir yere kadar evet yapıyoruz ama abartmaya hakkımız yok.

- P14: I believe that the world will always meet our needs; oxygen will never finish for example. The world provides us these kinds of things but we should also favor it, I mean we should try to sustain it.

  P14: Dünya bizim ihtiyacımızı her zaman karşılayacaktır, oksijen hiçbir zaman bitmeyecektir. Dünya bize bunları sağlıyor ama bizim de doğaya iyilik yapmamız, yani onu sürdürmeye çalışmamız lazım.

Next generations:

- P2: Next generations will really have to live in hard conditions. Aside from economical problems, the will not be enough space for them to live, to breath for example.

  P2: Gelecek nesli hakikaten çok zor şartlar bekliyor. Ekonomik sıkıntıları bir kenara bıraktım, yaşama alanları daralacak, nefes alamayacak hale gelecekler mesela.

- P6: I am mostly concerned about future children, there will not be enough fresh air, water, or clean places to do walking.

  P6: En çok gelecekteki çocuklar için endişeleniyorum, ilerde yasayacak alanları bile olmayacak, temiz hava, temiz su, dolaşılacak temiz bir alan bile olmayacak.

- P10: I am very concerned about my children in the future. What will they eat, drink or do?

  P10: İlerde çocuğum olursa ne yiyecek, ne içecek, ne yapacak? Ben korkuyorum öyle şeylerden.

Endangered species:

- P5: One of the cases was talking about diversity of bird species in Konya basin, it affected me very much.

  P5: Konya havzasındaki kuş çeşitliliğinden bahsediliyordu, o beni çok etkilemişti.

- P6: Since their habitats will be destroyed, many species will become extinct. This is an end point, nobody will be able to reverse it. It is very very upsetting.

  P6: Yaşam alanları azalacağı için bir çok canlı türü yok olacak, olayın en sonu olduğu, geri dönüşü olmadığı için o üzer beni en çok.

- P12: From now on there will be much less species because many species have already come to the brink of extinction.

  P12: Bundan sonra çok çok daha az tur olacak çünkü birçok tür şu anda yok olma eşiğine gelmiş durumda.

Aesthetics:

- P4: I enjoy from the being of plants and animals very much. When I see a flower, or when the wind blows I like it very much, I become happy.

  P4: Ben bitkilerin, hayvanların olmasından çok fazla lezzet alan birisiyim, bir çiçeği falan görünce, ya da bir rüzgar estiğinde mutlu oluyorum, çok hoşuma gidiyor.

- P11: Think about walking in forest and walking on a pavement. They will never give the same taste.

  P11: Ya ormanda dolaşmak var, bir de kaldırımda dolaşmak var, aynı zevki vermez kesinlikle.

- P13: When we look old days... there are forests everywhere, everywhere and everything is clean...How nice! Isn't it?

- P13: Bir eskiye bakıyoruz, her yer ormanlık falan, yeşillik her yer tertemiz…Ne kadar güzel, değil mi?

Intuitionism:

- P1: In fact, I think there was a change in my inner world.

  P1: Aslında benim orda tamamen kendi iç dünyamda değişiklik oldu.

- P5: I can not see animals as being equal to humans, maybe I should see but I can not see. I do not know why, maybe due to my emotions.

  P5: İnsanlarla hayvanları pek eşit göremiyorum, belki görmem gerekiyor ama duygularımdan ötürü belki de, pek eşit göremiyorum.

- P13: At first humans. Why? I do not know... maybe it is instinctive but it is like this .

  P13: İlk olarak insan. Neden? Yani bilmiyorum belki içgüdüsel olarak, ama öyle.