CURRENT STATE OF ENVIRONMENTAL EDUCATION IN TURKEY: A CASE FROM ANKARA

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ABSTRACT

CURRENT STATE OF ENVIRONMENTAL EDUCATION IN TURKEY: A CASE FROM ANKARA

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The purpose of this study is to explore the current state of implementation and the needs of elementary school program and teacher education program in Turkey in the words of the people who engage in teaching; university lecturers, pre-service science teachers and in-service science teachers. Mixed methods research design, which includes both qualitative and quantitative data collecting strategies, is utilized in this study. The steps followed for the study involves reviewing the related literature, constructing the sample, developing the instruments for data collection, pilot testing of the instruments and data collection. The participants of the study is composed of 4 university lecturers, 150 pre-service science teachers and 250 in-service science teachers that was selected from Ankara by convenient-sampling. Two instruments, which have been developed

by the researcher, were used in this research. One of them is EE SoAQ that aims to follow up the progress and determine the needs about EE implementations in elementary schools in Turkey. The other instrument is EE-U IP that aims to recognize current state and the needs about EE applications in both elementary schools and teacher education program in Turkey. For data collection, pre-service science teachers and in-service science teachers were implemented the questionnaire, and university lecturers were applied the interview. As a result, perceptions of the participants were investigated, and intersecting and distinctive points was revealed in order to contribute to the development of EE implementations in Turkey.

Keywords: Environmental Education, Needs Assessment, Elementary Science Program, Teacher Education Program

ÖZ

TÜRKİYE'DE ÇEVRE EĞİTİMİNİN MEVCUT DURUMU: ANKARA ÖRNEKLEMİ

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Bu çalışmanın amacı, öğretim üyeleri, fen bilgisi öğretmen adayları ve fen bilgisi öğretmenlerinin Türkiyede ilköğretim ve üniversite eğitimi boyutunda çevre eğitimi ile ilgili yapılan uygulamaların ve ihtiyaçların mevcut durumu hakkında görüşlerini araştırmaktır. Bu çalışmada hem nicel hem nitel veri toplama stratejilerini içeren karma yöntem kullanılmıştır. Bu çalışma, ilgili alanyazını tarama, örneklem oluşturma, veri toplama araçlarını geliştirme, pilot çalışma ve veri toplama basamaklarından oluşmaktadır. Örneklem olarak, Ankaradaki ulaşılabilir olan 4 öğretim üyesi, 150 fen bilgisi öğretmen adayı ve 250 fen bilgisi öğretmeni seçilmiştir. Çalışmada, araştırmacı tarafından geliştirilen iki veri toplama aracı kullanılmıştır. Bunlardan birincisi Çevre Eğitimi Gelişme Seviyesi Anketi (EE SoAQ) olarak adlandırılan, Türkiyede

ilkokullarda çevre eğitimi içeren uygulamalar ve ihtiyaçlar ile ilgili mevcut durumu ortaya koymayı hedefleyen ankettir. İkinci veri toplama aracı olarak, hem ilkokul hem de üniversite eğitiminde yer alan çevre eğitimi ile ilgili mevcut durumu ortaya koymak için görüşme protokolü (EE-U IP) geliştirilmiştir. Veri toplamak için, anket fen bilgisi öğretmen adaylarına ve fen bilgisi öğretmenlerine; görüşme protokolü ise öğretim üyelerine uygulanmıştır. Çalışmada toplanan veriler sonucunda, katılımcılarıngörüşleri çalışılarak kesişen ve ayrışan noktalar ortaya konmuştur ve Türkiyedeki çevre eğitiminin geliştirilmesine katkı sağlanmıştır.

Anahtar Kelimeler: Çevre Eğitimi, İhtiyaç Analizi, İlköğretim Fen Programı, Öğretmen Yetiştirme Programı

To my little sister who always be there for me &
To my brother who always provide full support

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CHAPTER 1

INTRODUCTION

Most of the environmental problems, such as global warming, environmental pollution and deforestation are caused by the human behavior. Therefore, environmental problems constitute one of the most significant difficulties that the humankind could face in recent decades. With the development of technology and industrialization, human beings have begun to overuse the natural resources and have started to cause remarkable damage to the environment. The factors such as population growth, unplanned urbanization, industrialization, and insensitiveness of humans have a crucial impact on the environmental problems and these problems have started to threaten the human lives throughout the entire world (WCED, 1987).

Environmental Education (EE) is recommended as one of the major solutions in order to overcome the above mentioned threat. Thus, providing a healthier and safer environment for future generations and bringing up individuals having environmental consciousness can be barely possible by EE (UNESCO & UNEP, 1978; 1987). The purpose of EE is to increase environmental literacy of students (Chu et al., 2007) by providing detailed information about environmental issues (NEETF & Roper, 2005). UNEP & UNESCO (1987) states that the man-made damage on the environment will create a similar destruction for the lives of the other living organisms since the human beings are the products of the environment to which it belongs. Therefore, the environmental issues have been regarded as an important consideration during the 21st century (UNCED, 1992). Accordingly, EE has become one of the most notable concerns to attain sustainable development as one of the solutions for the environmental problems and EE have begun to include the concept of Education for Sustainable Development (ESD)

(Tilbury, 1995) which emphasizes the link between economic, social and environmental components that all together constitute the usage of nature by human beings (Goldman, Assaraf & Shaharabani, 2013). Thus, EE is needed to ensure a sustainable future (Smati, 2004; McKeown, 2002).

EE was included into the formal school setting as a detached entity for approximately 60 years (Lord, 2011). The schools have a major role in achieving the main purposes of EE and encourage the students to be more sensitive towards the environment (Stevenson, 2007) and education system plays a considerable role in order to reach this target (Smyth, 2006). Moreover, since the existence of the human beings and animals depends predominantly upon the environment, the environment itself and the interaction between living organisms and the environment should be considered as one of the main concerns of the education system (Salmani, Hakimzadeh & Khaleghinezhad, 2015). Therefore, education system and its key elements comprising the teachers and students should be considered in the general scope of EE (McNaughton, 2012).

Teachers who have an influence on the students' personality by being a role model (Stanisic & Maksic, 2014) are thought to be a fundamental portion of the key elements for fostering environmental interest of the students (Teksöz, Şahin & Ertepınar, 2010). Furthermore, growing up individuals possessing environmental responsibility will not be possible unless the environmental issues are taught by the teachers (Plevyak, Bendixen-Noe & Henderson, 2001) and hence the in-service teachers have a noteworthy role in providing adequate knowledge about the environmental issues in schools (Khalid, 2001; Dhawan & Joshi, 2011). Starting from pre-schools, EE encourages the students to act in a responsible manner to the environment which comprises the basic goals of the EE including awareness, knowledge, values and skills (Tucker, Kiser, Sivek & Daudi, 2002).

Accordingly self-efficacy and perceptions of the teachers have an influence on the effectiveness of the EE. Thus, it is important to have teachers with high self-efficacy

in order to reach the aim of EE. Self- effiacy is defined as a perceptions of peoples on their ability to perform a behavior and hence self-efficacy has an influence on the choices of activities, effort and persistence (Bandura, 1977). For example, Czerniak (1990) found that the teachers with high self-efficacy tend to use inquiry and student-centered methods, whereas teachers with low self-efficacy tend to prefer teacher-centered methods (e.g. lecturing and reading from the textbooks). Moreover, Moseley, Reinke & Bookout (2002) stated the importance of self-efficacy on their potentiality for continuing to teach EE. Thus, teachers having more teaching skills for EE and perception on the significance of integrated science to EE are more likely teach EE (Ko & Lee, 2003). Therefore, the teachers should have sufficient knowledge to teach EE effectively (Schmidt, 1996).

EE in Turkey is at the very beginning of the development progress that basically aims to improve the environmental literacy of the individuals (Kahyaoğlu, 2011). EE in elementary schools is mainly included in the science program rather than being as a separate course. The Ministry of National Education (MoNE, 2005) has had an intention to make scientific subjects include environmental issues in the curriculums of schools and thus the recently built and applied elementary science curriculum involves such environmental issues comprising endangered species, recycling, water pollution, energy use and deforestation. Topics related with EE were involved more in the science curriculum of this program when compared to the previous one (Derman, 2013).

In spite of several attempts to include environmental issues in the education programs, the studies conducted so far with the elementary school students in Turkey indicated that their environmental knowledge is not sufficient (Alp, Ertapınar, Tekkaya & Yılmaz, 2006, 2008; Darçın, Bozkurt, Hamalosmanoğlu & Köse, 2006). Furthermore, according to the National Reports, (Ministry of Development, 2012; Ministry of Environment and Urban Planning, 2010; Ministry of Environment and Forestry, 2010-2011) for combating Rio'1992 conventions, the

priority areas of action in Turkey includes revising education programs in line with the international acts by considering increase knowledge, awareness of teachers and students towards major environmental challenges. Accordingly, a new science curriculum has been developed for elementary schools and started to be implemented gradually starting from 5th grade, in 2013-2014 education year (MoNE, 2013).

Considering teacher education programs, inadequate teacher education is regarded as a vital aspect which causes a failure in the curriculum (UNESCO, 1997). The programs have an effective role in developing skills for implementing effective EE and thus, enhancing the pre-service education and professional development of teachers is one of the major challenges that EE has being confronted nowadays (Goldman, Yavetz & Peer, 2006). Since the lack of environmental subjects in the scope of teacher education programs depends mainly on the fact that the environmental education is not an obligatory part of such programs for the education of teachers, assessment of not only the comprehension of pre-service teachers on environmental education but also the idea of incorporating the environmental education into the teacher education program has become essential (Teksöz et al., 2010). National and international studies emphasize the significance of teacher training having the purpose of improving their pedagogical and methodical knowledge concerning the environmental issues and of gaining necessary skills in order to teach EE (Ferreira, Ryan & Tilbury, 2006; Özdemir & Yapıcı, 2010; Stanisic & Maksic, 2014). Therefore, EE has started to be an integral part of the lectures that are being given in universities recently (Dobrinski, 2008). However, the studies have shown that providing a qualified course aiming to train pre-service teachers could be considered as one of the most significant necessities in the field of EE (UNESCO & UNEP, 1988).

Studies assessing the needs related to the environmental issues could be an effective tool not only for detecting the issues which are mostly needed but also for

perceiving the current information regarding EE (Ardoin & Sivek, 2002). Such studies was conducted by Meichtry, 2001; Monroe, Scollo & Bowers, 2002; Meichtry & Harrell, 2002; McDuff, 2002; Ardoin & Sivek, 2002, Njeru, 2010; Yangın & Filik İşçen, 2013. Their findings mainly include the needs and barriers for EE concerning the lack of time, funding, coordination, sufficient EE programs, adequate teacher training, in-service training offered during the school year, field trip opportunities and curriculum resources.

Research in assessing the current state, the needs and the barriers for EE have so far realized on a single level; either with teachers, candidate teachers or students. Although the results of such studies are useful for evaluating the state of EE, it is needed to see how perceptions of individual levels (students, teachers, university lecturers) coincide.

For example, Ko & Lee (2003) examined the science teachers' perceptions on EE by means of both interview and survey and concluded that their environmental attitude had affected their actual way of teaching. In another study, Hoeg (2010) conducted an interview and questionnaire with concluding that the environmental perceptions of pre-service teachers are in the favor of the environment. Dobrinski (2008) also conducted a mixed method study in order to assess the perspectives of environmental educators on environmental knowledge, skills and willingness to teach EE and found the importance of outdoor experiences on EE. Furthermore, McMillan (2003) and Frederick (2012) investigated the effect of an undergraduate EE course on students and the results showed that the course enhanced the environmental values, knowledge and the concerns of students. Hence, the research in EE so far is mainly at one level; the use of multi-level sampling is uncommon in EE literature.

However as Hudson (2001) reported, "*as we enter a new century and millennium, environmental educators must come up with new knowledge and techniques that address the demands of a constantly evolving social and*

technological landscape, while ensuring that environmental education stays relevant to the needs and interests of the community. These challenges to environmental education require that we reexamine the way we do research and train environmental professionals and educators, as well as the way we communicate environmental information to the general public "(p.283). That is to say, environmental education research needs to go beyond the current trend to tackle with the challenges that have been met frequently today.

Similarly, Saylan & Blumstein (2011) argued in their book titled "The Failure of Environmental Education" that environmental education today has failed to reach its target in fighting climate change, biodiversity loss, and environmental degradation. According to the authors, although scientists have warned us for decades about the potentially devastating consequences of climate change for example, serious problems still emerge. According to conservative approaches, we would be acting to mitigate these potential threats, but this is not the case. Thus the authors reported the reason for "this inability to act" as because of "educational institutions that generally do not provide the tools necessary for critical thinking and for understanding the modern World".

Furthermore, as Iozzi (2009) wrote in his article on the challenges facing K-12 environmental education that, for EE to be successful at the elementary level, not only is teacher preparation crucial, but EE concepts, activities, etc., must be built into the curriculum itself. According to the writer, John Dewey in 1914 had proposed a core curriculum that focused on the environment. Moreover, Iozzi concluded that, the EE curriculum must be carefully designed and made available to all teachers so that each will know what the others are teaching at each grade level so to ensure a "spiral curriculum" just as recommended by Jerome Bruner many years ago.

Similarly, referring to the public school system, Orr (1992) complains that "what passes for environmental education is still mostly regarded as a frill to be cut when

budgets get tight". Mark Burch (1994) reports to the lack of "pedagogically sound environmental education materials suitable for the general education of adults". According to Meadows (1989), environmental education is meant to expose misconceptions about the laws of the planet, but she finds that people still live "as if there were an endless treasury of resources to draw from, and an infinite and far-removed sink into which to throw our wastes", suggesting that educators have been unwilling or unable to move people past society's ecological deceptions. According to Orr (1992), experiential education is vital. Pure book learning, he says, "produces half-formed or deformed persons: thinkers who cannot do and doers who cannot think".

Therefore the lesson learnt from the above mentioned ideas of the environmental educators and researchers, as well as the defined challenges of environmental education and lead to construct the background of this thesis that, it is needed a new approach to explore the current state, needs, barriers and thus the new approach for EE.

As a result, a multi-level sampling approach is used in this thesis to explore the current state, needs and for better understanding the challenges faced by EE in the words of three actors engaged in EE: in-service teachers, pre-service teachers and university lecturers.

A different approach is proposed in this thesis in order to evaluate the results gathered from multi -level mixed method: As-Is & To-Be Model. As-Is & To-Be model is mainly used as a tool for business process management (BPM). Such models are used for producing flowcharts and process maps that reflect the current situation and to develop the future presentation. Interest in BPM from practitioners and researchers grew rapidly. A wide variety of paradigms and methodologies from organization management theory, computer science, mathematics, linguistics, semiotics, and philosophy were adopted, making BPM a cross-disciplinary “theory in practice” subject (Ko, Stephen and Lee, 2009). Moreover it is an

interdisciplinary method that is defined as a detailed presentation of the current situation, collecting data and highlighting opportunities for improvement. Accordingly, the To-Be can either be a new way for addressing the problems from the AS-IS analysis or a completely new design that takes into account information from the AS-IS analysis.

Therefore, it is proposed in this thesis to use AS-IS & To-Be approach for education to better present the current state and needs data gathered from the words of 3 levels of actors engaged in EE. In general terms, the approach used in this thesis is to present the data gathered from multi-level mixed method through As-IS & TO-BE approach in order to present the current situation and the needs in EE.

1.1 The Main Problem

The purpose of this study is to examine the current state of implementations and the needs concerning EE in elementary school program and teacher education program in Turkey in the words of university lecturers, pre-service science teachers and in-service science teachers.

1.1.1 The Sub-Problems

1. What is the current state of EE in elementary schools science program in Turkey in the words of in-service science teachers?

    1.1 What is science teachers' perception on EE in the elementary science program in Turkey?
    1.2 What is science teachers' self-efficacy on EE applications?
    1.3 What is the science teachers' current practices in teaching EE in their classroom?
    1.4 What is the science teachers' perception about needs for EE in elementary schools in Turkey?

2. What is the current state of EE in elementary schools science program in Turkey in the words of pre-service science teachers?

    2.1 What is pre-service science teachers' perception on EE content of the elementary science program in Turkey?
    2.2 What is pre-service science teachers' self-efficacy on EE applications?
    2.3 What is pre-service science teachers' perception on practices in teaching EE?
    2.4 What is the pre-service science teacher's perception about needs for EE in elementary schools in Turkey?

3. What is the current state of EE in elementary schools science program and pre-service science teacher education programs in Turkey in the words of university lecturers?

    3.1 What is the perception of university lecturers' on EE in the elementary science program in Turkey?
    3.2 What is the perception of university lecturers' on EE in the teacher education program in Turkey?
    3.3 What is the university lecturers' perception on needs for EE in teacher education programs in Turkey?
    3.4 What is the university lecturers' perception on suggestions for improving EE in Turkey?

4. Is there a significant difference between in-service teachers' and pre-service teachers' perceptions on the current state of implementations and needs about EE in the elementary school science program in Turkey?

5. How does EE content of science teacher education program meet the needs of EE in the elementary school science program in Turkey as reported by people who engaged in education?

1.2 Significance of the study

Education is necessary to have a more sustainable future, which broadly involve reorientation to enhance sustainability and improve awareness of human being (UNESCO, 2005). Also, as reported in Tbilisi Conference goals of EE are mainly to provide opportunities for individuals to gather knowledge, values, attitudes, commitment and skills necessary for protecting the environment and to become positive towards environment (UNESCO, 1977).

From Tbilisi (UNESCO, 1977) to Kiev (2003) education has been acknowledged worldwide as a fundamental tool for environmental protection and sustainable development. To this end, formal education systems have integrated environmental education (EE) and education for sustainable development (ESD) into school curricula, particularly at primary and secondary levels. The modalities by EE and ESD are implemented in schools are various from country to country depending on a number of social, economic, cultural and institutional factors (Scoullos and Malotidi, 2004).

Although there are a considerable number of research, discussions and implementations on EE, it has been discussed beginning especially from 2000's that the efforts are not enough to grow environmentally literate generations (Kollmuss & Agyeman, 2002; Robelia & Murphy, 2012; Ardoin, Clark & Kelsey, 2013). Therefore, the debate is going to be placed on the visions of future and their implications for environmental education (Kopnina, 2014).

One of the visions of the EE research, as proposed in this research, may be to handle the issue with the implementers' perceptions in a multidimensional way. That is to

say, exploring the perceptions of the people who engage in teaching EE, on the needs and implementations would be helpful to set up the future trends.

Therefore, the basic idea of this research is to explore the current state of implementations and needs of EE in the words of the people who engaged in teaching EE in 3 levels (university lecturers, pre-service science teachers and in-service science teachers); so as to propose visions of future for EE.

In accordance with the above mentioned milestones EE agenda, this study has the following significances;

The fundamental significance of this study lies in the fact that how it is designed: multi-level mixed method design is used for presenting the implementations and needs for EE in the words of people who engaged in the education process in 3 levels which are the in-service science teachers, pre-service science teachers and the university lecturers. Using multi-level mixed method design in this study has contributed to the way of pointing out the current state of EE in a more suitable way when compared to the utilization of limited quantitative or qualitative approaches. With this unique structure the current study presents, not the whole but most important parts of the picture, thus promises to put this new approach into discussion for exploring the needs for an effective EE.

Monitoring EE is suggested as an effective tool to recognize the needs and the current state (Ardoin & Sivek, 2002). Therefore, as a second significance, the current study will contribute initiate a national EE strategy and action plan, by means of developing a questionnaire (EE SoAQ) that explores needs and implementations of EE in the national context. Moreover, by the questionnaire developed, it will be possible to reveal the state of art on EE implementations in elementary science program at first hand; in the words of in-service teachers, which in turn may be promising to set up and improve in-service training programs.

As-Is & To-Be Analysis is the term utilized to generate flowcharts and process maps that illustrate the current situation and continue to improve future presentation. In the As-Is portion, the process, in which the data are introduced and the opportunities for progress are emphasized, is presented thoroughly. However, the To-Be part might be a process focusing on the problems related to the As-Is analysis or it could be an utterly new process that allows to evaluate the data coming from the As-Is analysis. Therefore, when it comes to the third significance, by evaluating the results of this study by means of adopted As-Is & To-Be analysis, new perspective is suggested for presenting the obtained perceptions of university lecturers, pre-service science teachers and in-service science teachers, and the intersecting and distinctive points among their perceptions on the current state of implementations and the needs concerning EE in elementary school program and teacher education program in Turkey, which may be accepted as a new insight in engaging the current challenges.

As another significance, since this study questions environmental education implementations in the teacher education programs, by means of exploring perceptions of pre-service teachers and university lecturers, this research may be inspiring in terms of discussing and revising the needs and implementations of EE in higher education level.

CHAPTER 2

REVIEW OF THE LITERATURE

This chapter involves review of studies concerning Environmental Education (EE). This part is composed of four subheadings which are historical development of EE; national and international implementations about EE; EE and ESD in international and national curriculum; and critique of elementary school second level science and technology curriculum in terms of EE issues.

2.1 Environmental Education and the Historical Development

The importance of environmental education to improve environmental awareness and enhancing people to act in the favor of environment arose when it was realized that human activities have major impact on the issues contributing to the environmental degradation. Environmental education is defined by the International Union for the Conversation and Nature and Natural Resources (IUCN, 1972) as:

> *The process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relationship between man, his culture and his biophysical surroundings.*

The term EE is firstly used at the IUCN Conference in 1948 and then continued its development by other conferences (Palmer, 1998). The first Intergovernmental Conference on EE that is organized by UNESCO in 1977 was held in Tbilisi which has created the turning point of the environmental education in terms of integrating

it into human education. In 1987, World Commission on Environment and Development (WCED) prepared the 'Bruntland Report' that is also known as 'Our Common Future', which drew attention to increase in the global awareness of the second half of the century about the huge environmental problems the earth face and expanding change toward the environmental action. The term "sustainable development" that is defined as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p 43), is evolved with this report (Fien & Tilburry, 2002). The arguments in this report prepared the grounds for another conference about environment and development, which is the UN Conference on Environment and Development called "The Earth Summit", held in Rio de Janeiro in 1992. After this conference the committees created "Agenda 21" that is a major action program composed of 40 chapters offering the way of achieving sustainable development for the nations (Palmer, 1998). To assess the consequences of the plan stated in the Earth Summit and turn it into action, Johannesburg Summit was held in 2002, which is aimed to provide a new movement for commitments of resources and specific action towards global sustainability (United Nations, 2002). Recently, UNESCO declared the Decade of Education for Sustainable Development for 2005-2014 period, in which the significance of education to have sustainable future and integration of sustainable development into all levels of education system is emphasized (UNESCO, 2005).

2.2 Environmental Education in Elementary School Programs

The individuals, organizations for EE and educators believed that integration of EE into school curriculum may lead to solution for environmental problems (Mosothwane, 2012). Environmental education is necessary to gain the responsibilities for protecting the environmental problems, and in this direction, education system has the major role to enhance the teachers and the students, who are the main components of the schools (UNCED, 1992). Moreover, the teachers,

who have an influence on the personality of the students by being a model, have a significant function on improving environmental attitudes of the students (Stanisic & Maksic, 2014). Implementations concerning EE in elementary schools depend on the school curriculum. Since involving EE and sustainable development into the curriculum is not mandated, it is not easy to reorient the curriculum (UNESCO, 2005). EE has become a significant part of the school programs as being mainly integrated into the geography and science courses in several countries, such as New Zealand, Scotland and several other countries (Hart, 2003).

Moreover, the inclusion of EE varies in countries; for example, EE is provided as a compulsory subject, part of a compulsory subject area or as an interdisciplinary area in most of the European countries (Stanisic & Maksic, 2014). Science, within the all other subjects in secondary schools, is generally perceived as the subject that may have an important influence on EE (Ko & Lee, 2003). Most of the secondary schools in Hong Kong have a tendency of teaching EE as being integrated to science, geography and biology or within the moral, civic and religious education programs in the formal education (Ko & Lee, 2003). Environmental issues concerning living things, energy, need of energy for living, water, the need to save water and the importance of water to man, air, energy and life were included in the science program. In UK also, with the revision of the National Curriculum in 2000, EE and ESD issues become more important and schools are wanted to direct students to commit sustainable development (Office for standards in education, 2003). One of the major aims of the school curriculum in there is to direct students to gain responsibility for sustainable development at a personal, national and global level (DfES, 2005), and EE is formally linked to Science, Citizenship, Design and Technology and Geography subjects (Department of Education and Skills, 2006). Moreover, the schools are suggested to have connections to all subjects (e.g. using data about bird observations or traffic congestion in math problems), such that in the science curriculum of 11-16 age students it is expected that the students

recognize human impact on the earth, necessity of diversity and importance of the protection (DfES, 2005).

As another example, The Citizenship curriculum for 14-16 years old students involve knowledge and understanding of global imperative of SD and lifestyles of SD, while improve values and attitudes for concerning environment for the future and commitment to a lifestyle based on SD (Oxfam, 2006). More specifically in England, one of the purposes of the science curriculum is to supply opportunities for students to comprehend the significance of sustainable development, in addition to realize the effect of scientific and technological developments on individuals and society (Baker & Smith, 2008). In Scotland also, ESD is suggested to be a natural part of the whole curriculum rather than being a separate subject and the teachers are enhanced to plan teaching strategies to help students to gain sensitivity and understanding toward social and natural environment, improve skills to explore environmental issues and develop responsibility (McNaughton, 2004). Also, UK sustainable development strategy planned by government wants all of the schools to be a model in terms of using natural resources sustainably; even the government wants all of the schools in UK to be a sustainable school, which is a term used for schools that can show sustainable development during their progress and teaching provision such as by collecting rainwater from roof, recycling paper towels, using low-energy lightening with movement sensors and directing the pupils to sustainable life (Department of Education and Skills, 2006). Furthermore, most of the primary schools grounds are organized in a way that students can observe diversity of animals, insects and plants, even some of the schools has a wildlife area such as butterfly garden (Office for standards in education, 2003). Also, to show environmental issues in curriculum using opportunities of school buildings should be take into account such as mentioning the reason of collecting rainwater and its benefits to environment (Bunn, 2006).

Environmental education in schools is mainly involved in the science curriculum in Turkey (Erdoğan et al., 2009). The elementary school curriculum in Turkey has been developed in 2004 and started to be implemented in 2005-2006 academic year, in which student-centered teaching methods are given more importance (Bıkmaz & Akben, 2007). Although more attention to the environmental related concepts was started to be provided with this curriculum, which mainly focus on improving the environmental knowledge of the students, to be able to achieve a sustainable future, our education system should train citizens who can link environmental, economic and social disciplines (Erdoğan & Tuncer 2009). Also, the studies conducted with the elementary school students in Turkey showed that their environmental knowledge is not uniformly sufficient (Alp et al., 2006, 2008; Darçın et al., 2006,). Moreover, the conventions (biological diversity, deforestation, climate change) that Turkey be a party, strategies, goals, actions, needs and gaps prepared by Ministry of Environment Urban Planning (2011) with the help of stakeholders indicated the deficiencies in the curriculum in terms of environmental education and education for sustainable development. Therefore, the importance of education is emphasized and the studies for improving the national science curriculum are started. New curriculum started to be implemented gradually in 2013-2014 education year starting form 5^{th} grade (MoNE, 2013). The environmental issues involved in the science curriculum with the objectives mentioned by Ministry of National Education are represented in Table 2.1. As displayed in the table, environmental issues in the science program of 5^{th}, 6^{th} ,7^{th} and 8^{th} grade mainly include soil, erosion, water, ecosystems, biological diversity, food chain, environmental problems, matter cycle and recycling. In the Science Textbook, these issues are explained by providing their definitions with some examples and some activities concerning them, without directing the students to think of the influence of their actions on the related issue or producing solutions and contribute to sustainable development. The activities are mainly composed of making investigations or experiments about related issues, describing their findings, discussions with the peers, presentations and producing posters either individually or in groups.

Table 2.1 The environmental education issues in the elementary science program

Grade	Unit	Topic	Objectives
5th Grade	5.5. Exploring Living Organisms/Living organisms and Life	***5.5.2. Relationship of Human and Environment*** Topic/Terms: interaction of human and environment	5.5.2.1. Investigates the environmental problems that arise through the human actions and suggests solutions for reducing these problems. 5.5.2.2. Design and present a project concerning solutions for a local environmental problem.
	5.7. The mystery of the Earth Crust/ The Earth and the Universe	***5.7.4. Air, Soil and Water Pollution*** Topic/Terms: air pollution, water pollution, soil pollution	5.7.4.1. Discuss the reasons of air, soil and water pollution, their causes and protections to reduce them.
6th Grade	6.6. Matter and Temperature/Matter and Transition	***6.6.1. Matter and Temperature*** Topic/Terms: Thermal conductivity, insulation, heat insulation materials	6.6.1.2. Discuss the importance of the insulation in the buildings in terms of national economy, family economy and effective use of the sources.

Table 2.1 (continued)

		6.6.2. Fuels Topic/Term: Solid fuels, liquid fuels, gas fuels	6.6.2.1. Give example to the common fuels used by people by classifying the fuels as solid, liquid and gas. Recognize the importance of renewable energy sources by remarking that the fossil fuels are limited and hence qualified as renewable energy sources. 6.6.2.2. Investigates and presents the affects of fuels used for heating on the human and environment.
7th Grade	7.3. Structure and Properties of Matter/Transition of Matters	***7.3.5. Domestic wastes and recycling*** Topic/Term: solid domestic wastes, liquid domestic wastes, recycling, reusing	7.3.5.1. Distinguishes the recyclable and non-recyclable domestic wastes. 7.3.5.2. Designs a project about recycling of solid and liquid domestic wastes. 7.3.5.3. Examines the recycling in terms of effective usage of sources. 7.3.5.4. Develops sense of responsibility on the local waste disposal. 7.3.5.5. Develops a model the refinement of waste waters and presents it. 7.3.5.6. Reveal the contribution of recycling facilities on the economy. 7.3.5.7. Develop projects to share the reusable objects with people who needs.

Table 2.1 (continued)

	7.5. Human and Environment Interaction/ Living organisms and Life	***7.5.2. Biodiversity*** Topic/Term: Local and global environmental problems, endangered species, extinction, unconscious hunting, protection of the species	7.5.2.1. Examines the importance of biological diversity for nature. 7.5.2.2. Investigates and discuss the threatening factors for biological diversity and provides solutions. 7.5.2.3. Investigates the extinct and endangered species in our country and in the world and give related examples.
	7.7. Solar System and Beyond/The Earth and the Space	***7.7.3. Investigations about Space*** Topic/Term: Space technology, space pollution	7.7.3.4. Estimates the causes of the space pollution by explaining the reasons of space pollution.
8th Grade	8.5. Living Organisms and Energy/ Living Organisms and Life	***8.5.2. Matter Cycles*** Topic/Term: water cycle, oxygen cycle, nitrogen cycle, carbon cycle	8.5.2.3. Examines the reasons of depletion of ozone layer and its effects on the living organisms, and suggest solutions to reduce it.
		8.5.3. Sustainable Development Topic/Term: Sustainable life, economic usage of natural resources, recycling	8.5.3.1. Designs and plans projects for economic usage of natural resources. 8.5.3.2. Investigates the significance of disposing solid wastes and its economic contribution, and suggests solutions related to this.

Table 2.1 (continued)

		8.5.4. Bio-Technology Topic/Term: Bio-technologic studies, the effects of bio-technologic studies on the environment	8.5.4.1. Examines the negative and positive effects of recent studies on bio-technology.
	8.8. Earthquake and Weather Events/The Earth and the Universe	***8.8.4. Climate*** Topic/Term: climate, climatology, climate scientist, global climate changes	8.8.4.3. Investigates and presents the reasons of global climate change with its potential impact.

In addition to formal science program in Turkey, Ministry of National Education and Ministry of Environment and Forestry have several attempts to increase the knowledge and awareness of the people by means of projects or publications (e.g. limited journals, newspaper or brochure) (Ministry of Environment and Forestry, 2007). For instance, the projects held by Ministry of National Education called "Small things renew the nature", "Fruit gardens of the children" and "Improving environmental protection consciousness" respectively has the aims of training the participants about renewable sources, sustainable consumption, recycling and waste management to protect environment; informing children about how to grow fruit and providing opportunities to grow their fruits; educating children about the global warming, its negative impact on the earth and solutions to prevent it. Ministry of Environment and Forestry also have a project called "Environment education tools" that majorly seeks to progress public awareness about conscious use of water resources, protecting plant and animal species and saving forests.

In addition to the above mentioned projects, Turkish Environment and Education Foundation (TÜRÇEV) also coordinates several programs titled as "Eco-schools" and "Learning about forests". The former aims to provide training about environmental consciousness, environmental management and sustainable development, while the latter aims to improve knowledge of students and teachers concerning forests by providing field trips. Nevertheless, as mentioned in the section above, research held about environmental knowledge or awareness of the students indicate their insufficiency and make us argue the impact of the attempts mentioned above on environmental awareness, attitudes and behaviors of the students.

2.3 Environmental Education in the International Conventions

In order to realize the current situation in Turkey, the conventions that Turkey be part are analyzed in addition to the national science curriculum. Convention on

Biological Diversity (1992) and United Nations Framework Convention on Climate Change (1992) have been signed in Rio de Janerio in 1992. United Nations Convention to Combat Desertification (1994) has been prepared under the agenda 21 which take part in Rio Conference. The education related parts of these conventions are listed in Table 2, below. By taking consideration of these conventions some reports have been prepared that includes strategies, goals, actions, needs and gaps by Ministry of Environment Urban Planning (2011) with the help of stakeholders. The deficiencies related with climate change, biological diversity and desertification and the necessity of improving education programs concerning these issues are emphasized in these reports (Table 2.2).

Table 2.2 Conventions, Strategies and Future Goals and Gaps in Environmental Education in Turkey

Conventions	Strategies and Future Goals	Needs and Gaps
United Nations Framework Convention On Climate Change ***Article 6. Education, Training and Public Awareness*** (a.i) Development and implementation of the public education and awareness programs about climate change and its affects (b.i) Development of educational materials concerning climate change and its affects to increase consciousness of society. (b.ii) To strengthen the national institutions and to develop and implement education and training for education of experts that will involve personal assignment and exchange. **Convention On Biological Diversity** ***Article 12. Research and Training*** The Contracting Parties, taking into account the special needs of developing countries, shall: (a) Establish and maintain programmes for scientific and technical education and training in measures for the identification, conservation and sustainable use of biological	**Targets and actions related with the education mentioned in Clımate Change National Actıon Plan (2011-2023):** ***Target Y9.1.*** To enhance education programs in order to improve consumption patterns in the favor of climate until the end of 2012. **Intersecting topics mentioned in National Capacity Action Plan:** ***Intersecting Topic 5.*** Researching, Development, Education, and Technical Collaboration: ***Synergy Area 4.2.*** Reviewing in-service training programs and improving education system in terms of all of the three conventions	**Capacity needs and synergy areas mentioned in the National Thematic Report:** ***Systematic capacity needs:*** To create environmental biological diversity system starting from schools to all part of the society. To involve all stakeholders and public, academic, nongovernmental, private instutions that can provide education into education system. ***İnstitutional capacity needs:*** Ministry of National Education and related departments in universities should be wanted to enhance environmental and biological diversity education

Table 2.2 (continued)

diversity and its components and provide support for such education and training for the specific needs of developing countries ***Article 13. Public Education and Awareness*** The Contracting Parties shall: (a) Promote and encourage understanding of the importance of and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes **Convention On Combat Desertification** ***Article 19. Capacity Building, Education and Public Awareness*** 1.(b) Strengthening training and research capacity at the national level in the field of desertification and drought; 1.(f) By providing appropriate training and technology in the use of alternative energy sources, particularly renewable energy resources, aimed particularly at reducing dependence on wood for fuel;	***Action:*** To update and improve education programs and system ***Intersection Topic 6.*** Active Participation, Raise Awareness and Education of Stakeholders: ***Synergy Area 6.1.*** To raise awareness and knowledge of society concerning climate change, desertification and biological diversity. ***Actions:*** To mention a strategy for raising awareness and knowledge, To prepare materials such as publications and documents, To extend the certificate programs for increasing awareness and knowledge.	**Synergy areas:** Integration of three of the conventions into the education system ***Capacity needs through intersection topics in conventions:*** Review of applications in current national curriculum **Capacity gap mentioned in the Intersection Topics Synergy Report:** Lack of program or lecture about climate change in national education and high education

Table 2.2 (continued)

3. (e) Assess educational needs in affected areas, elaborate appropriate school curricula and expand, as needed, educational and adult literacy programmes and opportunities for all, in particular for girls and women, on the identification, conservation and sustainable use and management of the natural resources of affected areas; and	
3. (f) Develop interdisciplinary participatory programmes integrating desertification and drought awareness into educational systems and in non-formal, adult, distance and practical educational programmes.	

As displayed in Table 2.2, strategies, goals, actions, needs and gaps prepared by Ministry of Environment and Urban Planning and the conventions, of which Turkey is a part, regarding the biological diversity, deforestation and climate change emphasized the necessity of trainings for improving environmental knowledge and consciousness of individuals, inclusion of these conventions into education system, revision of in-service training programs, improvement of the cooperation among NGO's, academicians and government for the education system, giving sufficient importance to EE in elementary schools and related departments in universities and the revision and progress of the current national programs (Ministry of Environment and Forestry 2010-2011; Convention on Biological Diversity, 1992; United Nations Framework Convention on Climate Change, 1992; United Nations Convention to Combat Desertification, 1994).

2.4 Environmental Education in the Teacher Education Programs

Environmental education is an interdisciplinary, life-long period, which develops environmentally responsible humans with necessary environmental knowledge, awareness, attitudes and skills to contribute solving the environmental problems (Moseley et al., 2002), and it is affected by factors of informal education, rather than being limited to the formal curriculum (Kışoğlu et al., 2010). Thus, EE begins within the family of the individuals and continues through the informal and formal education during their entire life (Özgür & Yılmaz, 2013). Within this period teachers have a significant responsibility to reach the aim of the environmental education, that it will not be possible to raise environmentally responsible individuals if the teachers are not equipped with necessary skills and knowledge (Plevyak et al., 2001). In other words, availability of the teachers who have been trained on environmental education increase the efficiency of EE (Dhawan & Joshi, 2011). Therefore, the classroom teachers form a significant part for providing sufficient knowledge about environmental issues in schools (Khalid, 2001; Dhawan & Joshi, 2011).

Hence, the teachers should be trained to improve their environmental knowledge as pedagogically and methodically (Stanisic & Maksic, 2014). The teacher candidates should graduate with necessary skills and knowledge that enhance them become responsible and conscious toward environment, since they will raise students with environmental consciousness in the future by being a role model (Şahin, Cerrah, Saka, & Şahin, 2004; Özdemir & Yapıcı, 2010). Furthermore, including EE in teacher education programs will lead the teacher candidates to graduate with capability to insert EE into their daily practices, and so be able to widen their learnings among their future students (Ferreira et al., 2006). However, since the schools are not constrained to teach EE as a subject, teacher preparation and material improvement is not uniform, which leads the teachers to feel as incompetent for teaching EE (Tal & Abramovitch, 2013). Thus, since the main source of environmental education applications in schools are the teachers, the importance of searching about pre-service teachers preparations for EE is emphasized (Lin, 2002).

The international studies state that environmental education should include effective teaching methods, which will make the students listen willingly, help them understand easier and gain necessary skills; classroom practices; combined theoretical and practical implementations; creative activities and local activities on the base of global perspective (Guixin, 2010). Qualified materials for EE should focus on rational theories and well-documented facts concerning environmental issue, inclusion of various perspectives and theories equally, and enhancing students to examine different viewpoints and develop their own perspectives (Sanera, 1997). Integration of EE into teacher education programs indicates varieties in thorough the countries. For example, in Chine, the aim of the environmental education for university students, who are the teachers of the future, includes increasing environmental awareness and knowledge, developing practical abilities, improving necessary sensitivity, attitudes and values towards nature (Guixin, 2010). Moreover, pre-service teachers in Wisconcin are expected to

demonstrate competencies such as knowledge concerning energy, natural sources, and conservation methods for them; therefore, the teacher candidates have to attend EE courses that includes the characteristics such as using problem solving and issue-centered education, being concerned with attitudes, values and facts, and support cooperation between individuals, governments and agencies in order to contribute to the solutions for environmental problems (Sanera, 1997). EE programmes in higher education level in Bangladesh aim to improve curriculum related with environmental studies in various education levels, examine educational materials, improve the specific curriculum for universities, organize seminars and workshops on the different issues, and hence to grow up experts on EE (Mohammad, 2014). On the other hand, EE is missing in Flemish teacher education program, such that it is provided by some of the higher education institutions limited to ecological subjects or geography topics (Petegem, Blieck, Imbrecht & Hout, 2005). In Australia, also little attention is given to EE in most of the teacher education institutions (Firth &Winter, 2007; Nolet, 2009; Quinn, Littledyke, Taylor & Davies, 2010).

Higher education has the responsibility to expend the EE, provide relevant policies and funding for EE, to reinforce innovation and variety concerning teaching methods, and to set up novel evaluation techniques (Baohua, Rongzhen, Jie, & Qiao, 2010). The aims, objectives, contents and teaching methods of EE, as well as the necessary skills to expose the values to students should be understood to reveal effective teacher training for EE (Dhawan & Joshi, 2011), and the role of education faculties is very important in providing relevant EE training (Özdemir & Yapıcı, 2010).

The education faculties in Turkey offer elective or must courses to improve necessary skills of the students concerning environmental knowledge, attitude and behavior of the students. One of the courses is titled “Environmental Science”, which is provided to the students in elementary science education departments, and

the context of the course is as given by the Council of Higher Education is related to historical development of environmental science, humans and environment, population growth, local environmental problems, biological diversity, endemic and endangered species, associations related with environment, environmental education and sustainable development. However, this course varies in terms of how it is offered (must/elective) and the year of study according to universities. The aims and objectives of the course as mentioned in various universities in Turkey are listed in Table 2.3, below. However, there is no research related to the impacts of this course on the teacher candidates' environmental knowledge and skills. As well the course content does not comprise how to teach environmental issues and there is no specific explanation on the background and skills of the lecturers who teach the course. Therefore, there appears a strong need to explore the outcomes of "Environmental Science" course thought in the Faculties of Education throughout the country; in line with the impacts and needs.

Table 2.3 The aims and objectives of Environmental Science Course

Target of Environmental Science Course	Objectives of Environmental Science Course
To improve environmental knowledge	Describe the environmental science and basic concept of environment
To increase consciousness for protection of environmental values.	Describe the historical development of environmental science
To develop environmental consciousness and environmental responsibility	Perceive the relationship between the people and natural environment
	Design behavior oriented activities in order to raise the environment consciousness

Table 2.3 (continued)

	Act responsibly towards human-induced environmental problems
	Identify and discuss local environmental problems and industries cause environmental pollution
	Connect causes of environmental problems and their solutions with daily life
	Gain awareness and maintain positive attitude to environmental problems
	Understand the importance of voluntary agencies to be a part of the solution of environmental problems
	Realize the terms “recycling” and “waste utilization”
	Understand the factors that cause environmental pollution and describe their effects on organisms
	Describe ecosystem and basic concept of ecology
	Define the terms “biological diversity” and “endemic species”
	Explain the importance of environmental education and prepare an education plan for elementary schools
	Identify the terms “renewable and non-renewable energy sources” and “sustainability” with examples

2.5 Implementations and Perceptions on Environmental Education

There are numerous researches on the teachers' perceptions of EE throughout the world and in Turkey. The reason for this issue being very popular is due to the importance of teachers in EE. Although the research focus varies as exploring perceptions on EE, environmental issues or the impact of an EE course on the perceptions, the outcomes display a similar trend that, attending an EE course improves perceptions and both teacher candidates and teachers have positive perceptions toward EE and environmental issues.

In an exploratory study, including both survey and interview for example Ko & Lee (2003) examined secondary school science teachers' perceptions on EE in Hong Kong. The results revealed that teachers' environmental attitudes, EE teaching skills, beliefs, intentions to teach EE had an influence on their actual EE teaching. The authors concluded accordingly that, teachers with positive environmental attitudes, having teaching skills of EE and who integrated science into EE content, tend to teach EE and want to integrate more issues related to EE science classes.

In another study related to educators' opinions on integrating sustainability issues into teacher education programs is conducted by Sydow (2012). The sample of the study was composed of six sustainability experts from Brazil, Turkey, and the US that have or operates a sustainable village and teaches a sustainability education program. Data collected through interviews indicated that education is necessary to integrate sustainability into higher education, and the methodology preferred for teaching and learning sustainability is the experiential learning.

Similarly, an impact of an EE course on the environmental perceptions of pre-service teachers, who study in the teacher education program of an Ontario University, were investigated in 2010 by Hoeg, through both questionnaire and interviews. The findings indicated that the perceptions of pre-service teachers were

mainly in the favor of environment and their perceptions developed after attending an EE course.

Another study on the impact of an EE course on the students' values is a mixed method design which was conducted to investigate the effect of an undergraduate EE course in Dalhousie University. The study included questionnaires, interviews, and observations for data collection and an increase in the environmental values of the students was found during the course year (McMillan, 2003).

Hanchet (2010) explored the degree to which EE is integrated into teacher education programs in Canada through a quantitative research. Questions were sent to 58 pre-service teacher education institutions. The results indicated that the number of pre-service teacher education institutions that provide EE courses were low in the late 90's in Canada and the research suggested that revision of the teacher education should be prior policy.

Frederick (2012) examined an undergraduate course in terms of the processes, curriculum, pedagogies, and methods, in order to reveal if the learning outcomes in education for sustainable development are attained. The data collected through the course observations and students surveys indicated that the knowledge level and self-assessment of the perceived knowledge of the students concerning sustainable development increased after attending the course.

Likewise, a qualitative research was conducted with 15 science students in order to find out the ways that college students perceived the contribution of participating in environmental science courses on their environmental decisions and ecological intelligence. Focus groups, individual interviews, and student discussions were used for data collection, which took 3 months period, and the results indicated that science curriculums in colleges need to include prior environmental experiences of students into science courses and focus on offering practical experiences to enhance knowledge for addressing environmental problems (Lord, 2011).

As another example, pre-service science teachers' perceptions on the concept of ESD was examined with 30 participants, who have an education degree from a small regional university in Australia, by a phenomenographic approach. The results of the study pointed out four categories concerning the description of the ESD as "education that is continue", "education about ecological systems and environmental systems", "education that is active, hands-on, local and relevant" and "education for the future" (Evans, Whitehouse & Hickey, 2012).

Littledyke (1997) investigated the perception and practices of primary managers and teachers on science and environmental education and the effect of attitudes and practices on each other in primary National Curriculum of England, by means of survey and interview. By evaluating the data, one can come to the conclusion that the development of the environmental education is usually inadequate and there exists restrictions owing to the pressure resulted from the crowded National Curriculum and from the main concerns of the administration. Despite the curriculum precedence of science and the core status, the improvement of the environmental education is regarded as an outstanding chance in order to incorporate it in a more detailed manner into the science curriculum.

Likewise, the mixed method study was conducted including survey (n=377) and in depth interviews (n=24) with teachers in Ontario in order to point out the self-reported views of teachers, aiming, to some extent, to describe the restricted applications and encounters of environmental education that are faced in Ontario classrooms. These tensions have been concluded as crucial access points or possibilities for positive interferences and they have been examined for the way that they could be utilized having the purpose of triggering the pedagogical improvement throughout this discipline. (Pedretti & Nazir, 2014).

Concerning the implementations on EE, Christie, Miller, Cooke & White (2013) conducted a study with 1819 teaching academics from every discipline at Australian universities and the findings of the study indicated that academicians prefer to use

lectures, tutorials, critical thinking and discussions in their teaching and they are willing to teach the lessons in a more interactive way despite the low support for adapting pedagogies and teaching methods.

As another example, environmental educators' perspectives on the knowledge and skills that are important for teaching EE, experiences that effects educators' interest and willingness to teach EE, and the preparation of the educators to better integrate EE into their teaching practices were examined through electronic survey (n=148) and semi-structured interviews (n=11). The findings of the study revealed the significance of outdoor experiences and having the skills of engaging students as very important themes (Dobrinski, 2008).

Taylor and Caldarelli (2004) conducted a qualitative research, including interviews and video records, was conducted to examine the views of 13 environmental educators who work in non-formal settings such as outdoors in U.S. state or local nature park settings. The common results mentioned by the educators included that they characterize themselves as dexterous for their work, use student-centered approach, and make the experience fun.

Andrades (2015) analyzed integration of the environmental issues in curricula and the main environmental topics covered by curriculum of Spanish universities by means of web content analysis of the curricula of undergraduate degrees at all universities in Spain. The outcomes have shown that the most prevalent method while instructing the environmental subjects in Spain is accomplished by the comparison of entrenched issues (horizontal integration) with the detached subjects (vertical integration). From this point of view, environmental controlling, sustainable tourism, environmental economy or environmental influence are the fundamental subjects that are included in curriculum.

As a similar study, the curriculum competences of the Primary School Education Departments of Spanish Universities concerning environmental sustainability and

the extent that these competences monitor the aims and content of the topics were investigated by Negre, Trobat, Fernandez & Forgas (2014) including 23 Spanish Universities curriculum. The results of the analysis of these curriculums displayed that all of them include three competences that are directly related with the environmental sustainability; in 73% of them environmental sustainability were also integrated to other competences; 26% of them included environmental education as specific topic.

Lane (1994) also investigated the teachers' perceived competencies, attitudes and class time devoted for EE with 1.545 participants from Wisconsin. The results of the study indicated that although the teachers have positive attitudes toward environment they spend less than half an hour per week for environmental issues and the lack of training in EE is the major reason for not including environmental issues into their instruction.

Sia (1992) developed and implemented an Environmental Education Efficacy Belief Instrument to the 40 pre-service elementary teachers. The results indicated that the participants have negative self-efficacy such that they do not have adequate knowledge, training and skills to teach EE more effectively and they do not feel confident in responsing the questions of the students.

In another study, Moseley et al. (2002) examined the effect of a three days outdoor environmental education program on the self-efficacy of pre-service teachers towards EE with 72 elementary teacher candidates. The findings of the study revealed that the pre-service teachers' self-efficacy did not changed by the program, but decreased 7 weeks after the implementation of the program.

A longitudinal study about teacher education and teacher professional learning for sustainability in primary education in Australia was revealed by Green & Somerville (2014). Data collected through photographs of school grounds and sustainability projects, focus groups with teachers and principals, and field notes of

school staff meetings indicated that sustainability education is a developing practice comprising of the relation among teachers, students and community members and the local places materiality. The pedagogic learning progression including creative problem-solving and inquiry made the students capable of leading the way.

Current state of EE in United States was investigated by Holtz (1993) in order to expose a broad view of EE requirements, staff and teacher education requirements, guidelines and resource materials with 43 state EE coordinators. The findings of the study indicated that the requirements varies in states such that EE is taught as a requirement in less than 50% of the states, a small number of states provides manual for helping the educators to develop an EE program.

Similar studies are conducted in Turkey in terms of examining perceptions of in-service teachers, pre-service teachers and academicians and the implementations concerning EE. For instance, Uzun & Sağlam (2007) investigated efficiency of EE in secondary education schools and perceptions of teachers on EE by implementing a questionnaire to 84 teachers in Ankara. The findings of the study indicated that the elective course "Environment and Human" is not held in most of the secondary schools and necessary knowledge and skills is not provided in this course. Moreover, the teachers perceived that there is not sufficient opportunities for implementing EE and field trips, current environmental problems are not mentioned enough in the course, and hence the education program is not adequate to grow up students with environmental responsibility.

As another example, pre-service teachers' views on EE were examined through implementation of interview with 210 last grade participants from education faculties in Turkey, and it was found as pre-service teachers perceive that improving positive behavior toward environment should be the major goal of EE (Günay, Cavas & Hamurcu, 2015).

Cavas, Ertepınar and Teksöz (2014) also investigated the implementations and scholarly activities concerning sustainability in higher education institutions by questionnairing 232 university lecturers from Turkey. The findings of the study showed that sustainability has been thought rarely in the universities as well it is not involved in their structure or the mission.

As an example to the studies concerning EE implementations, Şahin et al. (2004) investigated the effect of an EE course on the basis of the teaching methods and the active participation of the students that are from the biology department (n=23) and primary school teacher department (n=29) in Karadeniz Technical University. The 14 weeks EE course implemented to the biology department students by means of student-centered methods while it was implemented primary school teacher department students by the teacher-centered method by the same lecturer, and the results displayed that student-centered teaching methods influence more and these lecture should be implemented through the active participation of the students in the university.

Behavior pattern of academic personnel on education for sustainable development was investigated by questionnaire implemented to the 649 participants, and it was found that gender, age and title has a significant impact; such that, females, participants in the age between 41-50, and having title of Associated Prof. Dr. have more positive behavior comparing to Research Assistants (Demirci Güler, 2013).

The effect of study field and being close to nature on the teacher candidates' environmental awareness and level of concern was investigated with 240 students from Faculty of Education and Faculty of Arts and Science. The findings of the study indicated that teacher candidates in the departments of Geography and Physics perceive the soil pollution as more serious problem comparing to the ones in Science Department, and concern level for environmental problems is higher for the students in Geography and Fine Arts departments comparing to the Primary

school students. Moreover, ecocentric and altruistic concern of the participants who live more in the nature is found to be higher (Özdemir & Yapıcı, 2010).

2.6 Needs for more effective Environmental Education

Studies assessing the needs about environmental issues could be an effective tool for detecting the mostly needed issues and perceiving the current situation of EE (Ardoin & Sivek, 2002). Needs assessment assist the educators to develop planning, application and the program evaluation by learning assessing opinions of the community regarding the targets and priorities, detecting probabilities of improving new programs or improving existing ones, realizing the current conditions in a population (Veisi & Zarandian, 2011).

For instance Meichtry & Harrell (2002) conducted a needs assessment study with forty-five K−12 teachers by both survey and interview. The precedence of environmental education program and needs of teachers for training were detected as a result of this study mainly as need of field trip opportunities, curriculum resources, and lesson plan and curriculum ideas.

Moreover, graduate students in University of Florida, attending the course "Environmental Education Program Development", conducted a mixed method research for need assessment, which aims to offer assistance for program improvement, and to help students gain experience about improving tools and designing strategies for conducting evaluations of the programs. The results of the collected data through the focus group interviews and survey from teachers in northeastern Florida indicated that teachers have positive attitudes toward environmental education (EE), their perceptions on EE varies due to the school administration actions and educational philosophy (Monroe et al., 2002).

Ardoin and Sivek (2002) performed another example for needs assessment via survey with 89 teachers in order to identify EE needs, current situation of EE

programs and to suggest subsequent actions for EE, and as a result reported lack of environmental sensitivity as the most important environmental problem, and lack of time, funding, coordination and adequate teacher training as the most significant barriers for EE.

McDuff (2002) also conducted a needs assessment study to contribute the design and application of participatory evaluation in Wildlife Clubs of Kenya through document review, observation and interviews with 120 stakeholders and as a result needs reported included the lack of financial resources, time, human resources for evaluation.

As another example, current situation of EE and needs in teacher education programs was examined by Yangın & Filik İşçen (2013) by implementation of a survey with 836 pre-service teachers from primary school department and elementary science department. Their findings indicated that amount and duration of the EE courses, content of the EE course program, sufficiency of educational materials, physical facilities of the universities, textbooks for EE, teaching methods used for EE are the major needs for EE.

The needs and the practices for the evaluation of the current program of residential environmental education centers (REEC) were examined via mixed method case study including survey with the 114 REEC directors, and a residential environmental center in US. The results of the study indicated the need for a more effective evaluation method and a quantifiable information (Bourke, 2011).

The needs of EE and innovative teaching methods in Kentucky were investigated by Meichtry (2001) by including the teachers, and the result indicated the existence of need for need for environmental education centers and professional development through training workshops.

The barriers for implementation of ESD in Kenyan secondary schools was examined by Njeru (2010) with a mixed method design and found that insufficient access to teaching, financial and other material resources, insufficient time for in-service training for secondary teachers, and the poor implementation of Government policies are the major barriers.

To sum up, the literature concerning investigation of perceptions, implementations and competencies on EE as well as the needs and barriers of EE mainly includes investigation on just one sample such as teachers, academicians or students. These studies implied the importance of in-service trainings, improving environmental knowledge, attitude and awareness of educators, as well as developing their teaching skills for EE implementations and increasing its effectiveness. However, the studies on the needs, barriers, implementations regarding EE and the current state of EE is limited in Turkey. The literature emphasized the necessity of such studies to increase the effectiveness of EE.

CHAPTER 3

METHOD

This chapter is mainly composed of five sections as Research Design of the study, Sampling, Instruments, Procedure and Data analysis.

3.1 Overall Research Design

In this study mixed methods research design is utilized. Mixed methods research design includes both qualitative and quantitative data collecting strategies. Qualitative research provides descriptive and explanatory data in nature, and mentions results in narrative form while quantitative research includes definitive statistical outcomes and provides results in numerical form (Creswell, 2007). According to Creswell (2007) mixed methods design is defined as; "procedures for collecting, analyzing, and linking both quantitative and qualitative data in a single study or in a multiphase series of studies".

The usage of mixed method design is based on five principal reasons which can be listed as follows; a. triangulation, b. development, c. complementarity, d. initiation, e. value diversity. However, the complementarity, that is enhancing the inclusiveness of evaluation outcomes obtained from different methods that could expand and widen the attained comprehending and also the initiation, which is emerging new visions and perceptions into the evaluation outcomes obtained from different methods causing a call for understanding through extended analysis, reframing or changing the viewpoint are the two leading reasons for handling the mixed method design in this study (Greene, 2005).

Even though the increasing rate of the presentation of numerous journals, books, handbooks and websites proves the fast rising interest and awareness of the mixed method approaches, a large percentage of the mixed method evaluation designs are performed by a single level such as interviews with teachers or students. Nevertheless, multi-level programs that are used in the fields of health, education or other services which are conducted and evaluated at different levels could be considered as one of the most practical applications of mixed methods. These programs necessitate the assessment of the communications including perceptions, attitudes or qualifications etc. between different levels such as the university lecturer, teacher and the student. For this reason, mixed methods are relatively suitable in order to study and observe the above mentioned interactions when compared to the limited quantitative or qualitative approaches.

Accordingly the mixed method used in this study is multi-level mixed method design. Multi-level mixed method design is a design in which qualitative data are collected at one level (university lecturer) and quantitative data were collected at another level (in-service and pre-service teachers) in a concurrent manner to answer interrelated research questions with multiple approaches. Both types of data were analyzed accordingly, and the results were used to make multiple types of inferences that are pulled together at the end of the study in the form of national inferences. (Tashakkori & Teddlie, 2003).

Reminding the purpose of this study; to explore the current state of implementation and the needs of EE in elementary school program and teacher education program in Turkey in the words of the people who engage in teaching; university lecturers, pre-service science teachers and in-service science teachers and using the multi-level mixed method design, the research is designed as of three dimensions in order to set up a whole picture of the current state of implementation and needs of EE in Turkey.

The dimensions however, are constructed on the basis of the actors/levels that engage in EE:

a. In-service science teachers who already engaged in teaching EE in elementary level,
b. Pre-service science teachers as future EE educators in elementary level,
c. Lecturers in the Elementary Science Education Departments who engage in teaching EE.

Accordingly, the first dimension aims to define in-service science teachers' perceptions about current state of EE applications and the needs concerning EE in elementary schools in quantitative terms. The second dimension aims to describe pre-service science teachers' perceptions on current state of EE implementations and needs about EE in elementary schools program in quantitative terms. The third dimension aims to expose university lecturers' perceptions on the same issue with the second dimension through qualitative methods. Figure 3.1 illustrates how multi-level mixed method design is used to evaluate the current state implementation and needs of EE in Turkey that operates three different levels.

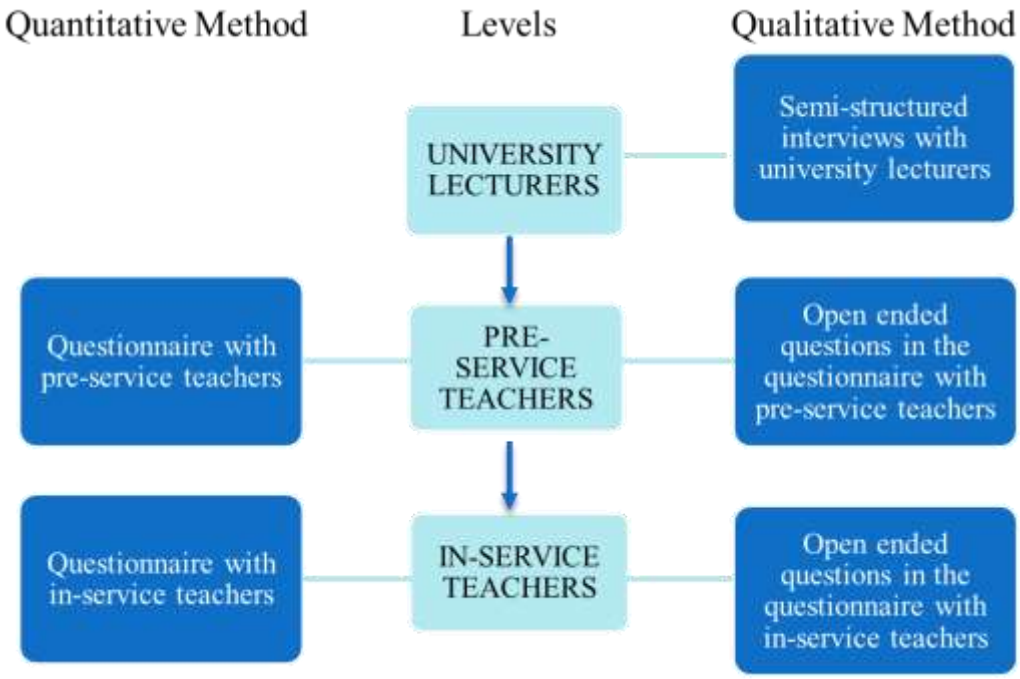

Figure 3.1 Multi-level mixed method design: Evaluating the current state of EE in Turkey

The research has been realized according to the following steps according to the framework given in Figures 3.2 and Figure 3.3.

There were 7 major steps in realizing the research:

1. **Initiating the major ideas, claims and hypothesis and research questions**: As is presented in the figure, the study was initiated by reviewing related literature. Current situation of EE in the world and in Turkey, views about EE, current state of EE and problems, needs about EE, teaching methods used for EE, barriers/obstacles to EE, self-efficacy in teaching EE were identified and considered in this study while constructing the framework and research questions.

2. **Exploring the general needs and implementations on EE through literature:** The current implementations and needs related to on EE were explored through an extensive literature survey, the results of which were used for developing the instruments of the study.
3. **Constructing the sample**: University lecturers, pre-service science teachers and in-service science teachers that represent the dimensions of this study were selected by convenient-sampling.

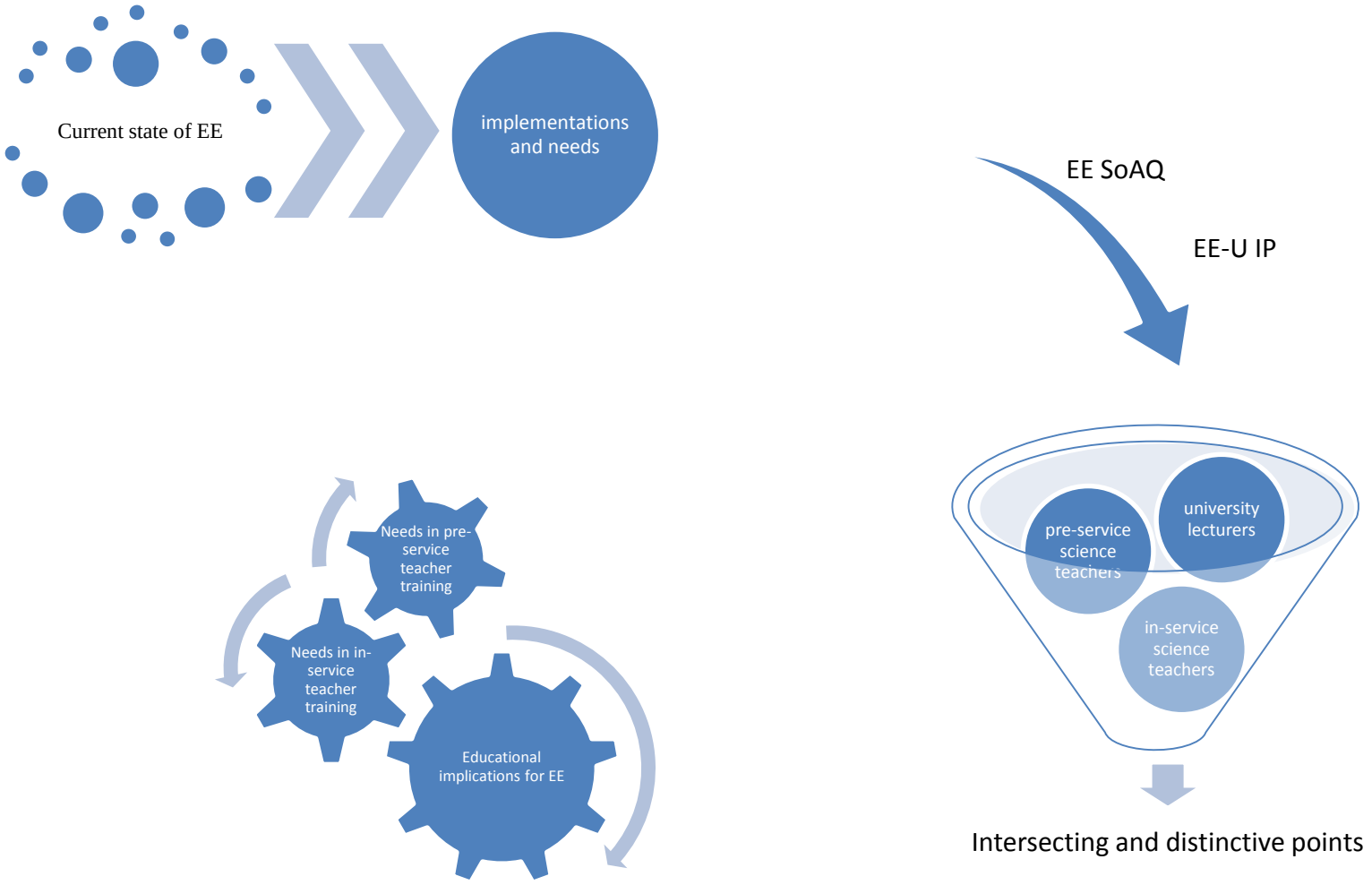

Figure 3.2 The study context

4. **Developing instruments for data collection**: Data collection instruments were developed through the steps mentioned in Figure 3.3. There are 2 instruments used in this research. One is titled as "Environmental Education State of the Art (SoA) Questionnaire (EE SoAQ)" and was developed by the researcher to follow up the progress and determine the needs about EE implementations in elementary schools. The second instrument is titled as "EE in Universities Interview Protocol (EE-U IP)"which is an interview protocol that was developed to recognize current state and the needs about EE applications in both elementary schools and teacher education program.
    a. Pilot testing of the instruments: Pilot testing of the instruments was held in order to ensure their reliability and validity. For EE SoAQ, expert opinion was asked, factor analysis was conducted and Cronbach's alpha was calculated. Reliability for EE-U IP, however was tested through, expert opinions.
    b. Revising the instruments in line with the pilot test results and expert opinions.
    c. Permissions for implementation: Permissions were obtained from Research Center for Applied Ethics in METU and Ministry of Education (Appendix A).
5. **Data collection**: Data collection was held for three dimensions of the study, to explore the perceptions of university lecturers', pre-service science teachers' and in-service science teachers' on the current implementations and needs of EE in Turkey. All the participants were from Ankara and the implementation was realized during the 2013-2014 academic year. Detailed information about data collection procedure will be presented in the following sections.

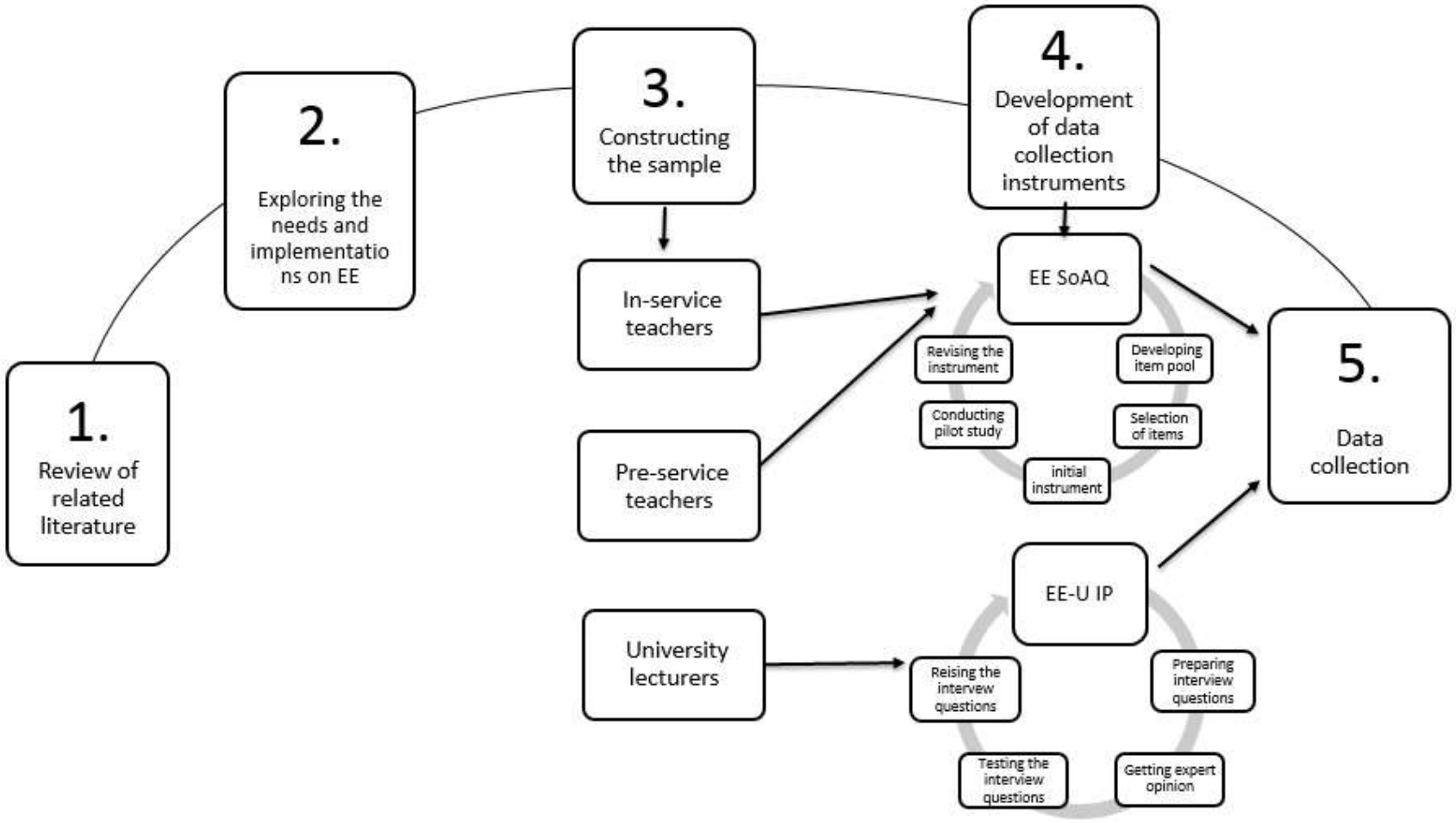

Figure 3.3 Steps involved in the study

3.2 Population and Sample

Target population of this study was composed as to reflect the 3 levels feature of the study. The population of the study covers in-service science teachers in public elementary schools, pre-service science teachers and university lecturers who teach environmental science in education faculties in Turkey. However, accessible population for this study is described as in-service science teachers in elementary schools, pre-service science teachers and university lecturers of environmental science in education faculties located in Ankara. The constructed sample has been presented in the Table 3.1 below.

Table 3.1 Participants of the study

	Site	**N**
In-service science teachers	Elementary schools in Ankara (Altındağ, Çankaya, Gölbaşı, Etimesgut, Keçiören, Mamak, Sincan and Yenimahalle)	250
TOTAL		**250**
Pre-service science teachers	Hacettepe University	84
	Gazi University	36
	Middle East Technical University	30
TOTAL		**150**
University lecturers	Hacettepe University	1
	Gazi University	3
TOTAL		**4**

Nevertheless, the sample has been confined by convenient sampling due to their availability (Fraenkel & Wallen, 2006). Accordingly, in-service science teachers were chosen from the public schools located in different districts in Ankara. The districts chosen, depending on their easy accessibility and closeness to city center, are Altındağ, Çankaya, Gölbaşı, Etimesgut, Keçiören, Mamak, Sincan and Yenimahalle.

Pre-service science teachers, on the other hand, were chosen from the universities with Elementary Science Education Department in Ankara. Thus the pre-service science teachers of this study are the ones who attend one of the Elementary Science Education Departments in Ankara and had taken the must course titled "Environmental Science".

University lecturers were also selected from the universities with Elementary Science Education Department in Ankara. Thus the university lecturers of this study are the ones who teach "Environmental Science" lecture in one of the Elementary Science Education Departments in Ankara. The demographic characteristics of the sample has been presented in the Table 3.2 below.

Table 3.2 Demographic Characteristics of Participants

In-service science teachers		
Gender	**N**	**%**
Female	167	66.8
Male	83	33.2
TOTAL	**250**	**100**

Table 3.2 (continued)

Pre-service science teachers		
Gender	**N**	**%**
Female	133	88.7
Male	17	11.3
TOTAL	**150**	**100**
University lecturers		
Gender	**N**	**%**
Female	1	25
Male	3	75
TOTAL	**4**	**100**

3.3 Instruments

The instruments of this study were developed by the researcher in accordance with the outcomes of the literature survey, context and the research questions of the study. Therefore, item/s in the instruments has been constructed to refer research questions. Hence, in this mixed study, the instruments have been developed to explore the perceptions of (1) in-service science teachers, (2) pre-service science teachers, and (3) university lecturers who teach environmental science, on the implementation and needs for EE.

Depending on the number of participants and their availability, in-service and pre-service science teachers' perceptions have been explored by quantitative means. Whereas since they are very few in numbers, university lecturers' perceptions have been explored through interviews.

The instrument developed to explore in-service science teachers' and pre-service science teachers' perceptions, quantitatively is titled as "Environmental Education and State of the Art (SoA) Questionnaire (EE SoAQ)". The semi-structured interview protocols developed for exploring university lecturers' perceptions, however is titled as "Environmental Education in Universities Interview Protocol (EE-U IP)" (Table 3.3).

Table 3.3 Instruments and participants

Participants	Instruments
University Lectures	EE-U IP
Pre-service Science Teachers	EE SoAQ
In-service Science Teachers	EE SoAQ

Hence, five major research questions of the study have been attempted to be answered through two instruments, three different samples and through corresponding data analysis (Table 3.4).

Table 3.4 Participants, research questions, data collection instruments and data analysis

Research Questions	Instrument	Participants	Data Analysis
1. What is the current state of EE in elementary schools science program in Turkey in the words of in-service science teachers?	EE SoAQ	In-service science teachers	Descriptive Analysis (Frequencies and means) Content Analysis
2. What is the current state of EE in elementary schools science program in Turkey in the words of pre-service science teachers?	EE SoAQ	Pre-service science teachers	Descriptive Analysis (Frequencies and means) Content Analysis
3. What is the current state of EE in elementary schools science program and pre-service science teacher education programs in Turkey in the words of university lecturers?	EE-U IP	University Lecturers	Content Analysis
4. Is there a significant difference between in-service teachers' and pre-service teachers' perceptions on current state of implementations and needs about EE in the elementary school science program in Turkey?	EE SoAQ	In-service science teachers Pre-service science teachers	Causal-comparative: MANOVA
5. How does EE content of science teacher education program meet the needs of EE in elementary school science program in Turkey as reported by people who engaged in education?	EE SoAQ EE-U IP	In-service science teachers Pre-service science teachers University lecturers	Descriptive Analysis (Frequencies and means) Content Analysis

3.3.1 Environmental Education State of the Art Questionnaire (EE SoAQ)

EE SoAQ has been developed by the researcher in order to reveal current state of EE and needs about EE applications in elementary schools. EE SoAQ (see Appendix B) involves 3 open ended; 4 multi choice and 51 5-point Likert scale items. The items were constructed under 5 dimensions to explore science teachers' and pre-service science teachers' general perceptions about EE, EE in the elementary science program, needs for more effective EE; science teachers' current practices and self-efficacy in teaching environmental education; teaching methods and sources they use for environmental education. However, because there are dimensions in the instrument related with the current practice of the teachers, those were adapted for the pre-service science teachers as asking their perception on how the practices should be for teaching EE. Thus, there are two versions of EE SoAQ for in-service and pre-service science teachers (Table 3.5).

The items and dimensions of the EE SoAQ are listed in Table 3.5. Details related to the instrument development procedure will be presented in the next section.

Table 3.5 Dimensions of the EE SoAQ

Dimensions of the EE SoAQ for in-service science teachers	**Dimensions of the EE SoAQ for pre-service science teachers**	**Items**
Demographic information (Age, gender, teaching experience, general perception on EE)	Demographic information (Age, gender, general perception on EE)	Items 1-8 A-B-C (Multiple choice items)
Perception on EE in the elementary science program	Perception on EE in the elementary science program	E (Items 1-7)

Table 3.5 (continued)

Self-efficacy on EE applications	Self-efficacy on EE applications	F (Items 1-6)
Teaching Practice	Perception on teaching practice	D (Open ended question)
		G (Items 1-5)
		H (Items 1-14)
Perception on needs for more effective EE	Perception on needs for more effective EE	I (Items 1-19)
		J (Multiple choice items)
		K (Open ended question)
		L (Open ended question)

3.3.1.1 Developmental Process of EE SoAQ

The steps that followed during the instrument development were: 1. Determining the context of the questionnaire, 2. Analyzing the international and national literature, 3. Developing an item pool, 4. Constructing the items of the questionnaire, 5. Asking expert opinions, 6. Revising the items according to the expert opinions, 7. Conducting pilot study, 8. Constructing the final version of the instrument.

1. Determining the context of the questionnaire

   The context of the questionnaire was decided considering the research questions of the study, which mainly includes items to recognize the perceptions of in-service science teachers, pre-service science teachers and university lecturers about the EE applications and needs in Turkey; current state of EE in the world and in Turkey, views, problems, needs, and barriers/obstacles about EE were considered as underlying issues while constructing the context.

2. Analyzing existing international and national literature

   International and national literature related with EE was reviewed and took as the beginning point to identify the main dimensions and items of EE SoAQ. The review indicated that the surveys in the literature mainly involves the dimensions "needs about EE" (Wade, 1996; Meichtry, 2001; Meichtry & Harrell, 2002); "teaching methods used for EE" (Lane, 1994; McKeown-Ice, 2000; Ko & Lee, 2003; Yangın & Filik İşçen, 2013) "barriers/obstacles to EE" (McKeown-Ice, 2000; Monroe et al., 2002; Ko & Lee, 2003; Moghaddam, Maknoun & Tahershamsi, 2008); "self-efficacy in teaching EE" (Ko & Lee, 2003); "issues that should be emphasized in a new EE curriculum" (Mayeno, 2000); "current state of EE and problems" (Yangın & Filik İşçen, 2013); " views about EE" (Tuncer et al., 2009; Kahyaoğlu, 2011); "factors influencing EE"(McKeown-Ice, 2000); "reasons for not infusing EE" (Lane, 1994). The item pool constructed as a result contained items as consisting; needs of EE dimension, for example, includes items such as funding for activities & resources, field trip opportunities, curriculum resources, professional development & EE training, development of teacher networks, outdoor school site, student EE clubs (Meichtry, 2001), content knowledge about the environment, EE teaching strategies, availability and use of curriculum resources, integrating EE with other subjects, technology use relating to EE, development & use of outdoor EE site (Meichtry & Harrell, 2002). Items mentioned under the dimension barriers to EE, on the other hand, involves dimensions/items like, lack of time to plan, budget, lack of class time, lack of available materials, lack of support from parents, lack of support from teachers or administration (Monroe et al., 2002; Ko & Lee, 2003; De Carvalho, Filho & Hale, 1998), lack of co-operation, lack of motivation (De Carvalho et al., 1998). Moreover, under the dimension related to factors influencing EE there are items related to faculty interest/knowledge and student interest/demand (McKeown-Ice, 2000) and school setting (Lane, 1994) (Table 3.6).

Table 3.6 Dimensions came out as a result of analyzing the literature

Dimensions in the literature	Sample items (content)
Needs about EE	Funding for activities & resources
	Field trip opportunities
	Curriculum resources
	Professional development & EE training
	Development of teacher networks
	Student EE clubs (Meichtry and Harrell, 2002)
Teaching methods used for EE	Cooperative learning, Discussion, Discovery, Field trips, Experiments (Lane, 1994)
Barriers/obstacles to EE	Lack of funding
	Lack of class time
	Lack of support from parents
	Lack of support from teachers or administration
	Lack of co-operation
	Lack of motivation (Ko & Lee, 2003; Monroe et al. , 2002)
Self-efficacy in teaching EE	I have the necessary skills to teach EE
	I am able to answer students' EE questions
	I teach EE as well as I do most subjects (Ko & Lee, 2003)
Views about EE	EE is very important and it should be provided
	EE is not necessary
	I can not reach necessary materials for EE (Tuncer et al., 2009; Kahyaoğlu, 2011)
Factors influencing EE	Faculty interest/knowledge
	Student interest/demand
	School setting (McKeown-Ice, 2000)
Reasons for not infusing EE	Do not have background
	Not enough prep time
	School setting not conductive (Lane, 1994)
Sources of information	Publications, Internet, Books, Films and documentaries on TV (Veisi & Zarandian, 2011)

Moreover, national reports concerning strategies, goals, actions, needs and gaps about EE prepared by Ministry of Environment and Forestry (Convention on Biological Diversity, 1992; United Nations Framework Convention on Climate Change, 1992; United Nations Convention to Combat Desertification, 1994) and objectives and textbook of national science program of science and technology course at elementary schools were analyzed. Analysis of the reports, conventions and national science program were especially important on evaluating the needs/gaps about EE issues in Turkey. For instance, items included in the conventions indicated the importance of programs and trainings for improving knowledge and consciousness of people on climate change and its effects; biological diversity and its protection; desertification, aridity, using renewable energy sources (Convention on Biological Diversity, 1992; United Nations Framework Convention on Climate Change, 1992; United Nations Convention to Combat Desertification, 1994). Furthermore, integration of these conventions into the education system, revision of in-service training programs in terms of these conventions, providing EE and education on biological diversity starting from schools, inclusion of NGO's, academicians and government to the education system, giving sufficient importance to EE and education on biological diversity in elementary schools and related departments in universities, and revision and improvement of present national programs, preparation of publications, documentations and materials are the needs mentioned by the reports prepared by Ministry of Environment and Forestry (2010; 2011).

As a result of the literature review, it has been evaluated that there is a strong need of research and data to improve EE in Turkey. However it has also been decided that there is a stronger need to develop an instrument to assess the current state and the progress of EE (Ministry of Environment and Forestry, 2010; Ministry of Environment and Urban Planning, 2011; Teksöz et al., 2010). The scale that will measure the current state of EE in Turkey

and that will be used – with periodical revisions – to monitor the progress. Therefore, the result of the literature survey on the EE in Turkey and in the world resulted in deciding about the need for a current state of the EE survey, which has not been developed so far.

Therefore, the questionnaire developed in this study mainly aimed to figure out the current state of implementations and needs for EE, which is suggested to be used for monitoring EE progress periodically.

3&4. Developing an item pool and constructing the items of the questionnaire

As the third step of the instrument development process, item pool was constructed based on the results of the first and second steps. Accordingly, the initial instrument was constructed as composed 5 dimensions and including 64 Likert-type items.

5&6. Asking expert opinions and revising the items according to the expert opinions

Three experts from Faculty of Education evaluated the dimensions and the items of the EE SoAQ. Some items were deleted or revised according to their suggestions. As a result of the revisions, EE SoAQ has been developed as of 6 dimensions comprised of 3 open ended; 4 multiple choice and 51 5-point Likert-type items.

The dimensions of the pilot study are mainly composed of general perceptions on EE (3 multiple choice items); perception on EE in the elementary science program (9 Likert-type items); science teachers' current practices in teaching EE in their classroom (9 Likert-type items); teaching methods and sources used for environmental education (14 Likert-type; 1 open-ended item); needs for EE (19 Likert-type items; 1 open-ended item); environmental issues that are not sufficient in science program (1 multiple choice item). Some draft items of the pilot version of EE SoAQ were listed in Table 3.7.

Table 3.7 Initial EE SoAQ dimensions and sample items

Dimensions	Sample Items
General perceptions on EE	Item A. Which one of the following statements the best describe your ideas concerning EE? a. EE is not necessary b. EE is necessary and should be provided by formal and non-formal education c. Although EE is necessary, providing it at school is not necessarily d. Undecided
Perception on EE in the elementary science program	Item E.2. Environmental issues involved in science program is not sufficient for increasing environmental knowledge of students. Item E.3. Environmental issues involved in science program is not sufficient for increasing environmental awareness of students. Item E.4. Environmental issues involved in science program is not sufficient for enhancing the positive behaviors of students towards environment. Item E.5. Environmental issues involved in science program is sufficient for students to understand that environmental problems are part of their life
Science teachers' current practices in teaching EE in their classroom	Item F.1 Theoretical knowledge I gathered during the university education is adequate for teaching environmental issues Item G.6. I use the related activities of the science book while teaching the environmental issues in the science program. Item G.7. I use the activities that I create or find from other sources while teaching the environmental issues in the science program. Item G.8. I teach environmental issues by linking with other disciplines. Item G.9. I teach environmental issues in the science program by linking with daily life.

Table 3.7 (continued)

Needs for Environmental education	Item I.1. Increasing the duration of EE in elementary schools
	Item I.3. Organizing in-service training concerning EE
	Item I.6. Developing sources and materials related with EE
	Item I.7. Providing financial sources for field trips

7. Conducting pilot study

   Two pilot tests were conducted for the EE SoAQ. The first pilot test was held with 118 (99 science teachers; 19 primary school teachers) elementary school teachers who teach science from different regions of Turkey, that mainly includes Ankara, Antalya, İstanbul and Karabük.

   The instrument was revised in accordance with the reliability and validity analysis, and then second pilot study was held with 144 (132 primary school teachers and 12 science teachers) elementary school teachers who teach science to 4th graders and who were mainly from Ankara, İstanbul and Kastamonu.

8. Constructing the final version of the instrument.

   The final version of the instrument was constructed according to the reliability and validity analysis utilized for the second pilot test, which will be presented in the following sections.

3.3.1.2 Validity of EE SoAQ

Validity is defined as "the appropriateness, meaningfulness, and usefulness of the specific inferences researchers make based on the data they collect" (Fraenkel & Wallen, 1996). Validity has several types. The one that is the extent to which an instrument seems to measure an intended variable and can be decided by expert

opinion is called as content-related evidence; while the one that is the extent to which an instrument measures expected hypothetical psychological construct and can be decided by applying statistical procedure is called construct related evidence (Fraenkel & Wallen, 1996). The procedures of content-related validity and construct-related validity are described in the following sections.

3.3.1.2.1 Content-Related Validity

For the content-related validity of EE SoAQ, expert opinions were asked. Three experts from Elementary Education Department of Faculty of Education, who has several research studies concerning environmental education, reviewed initially prepared 64 Likert-type items.

11 items were deleted, 6 items were rewritten and question type of some items was changed according to their suggestions. As a result of the revision, 3 open ended; 4 multiple choice and 51 5-point Likert-type items were decided to use for the pilot study.

3.3.1.2.2 Construct-Related Validity

For the construct-related validity of EE SoAQ, two pilot implementations were realized and exploratory and confirmatory factor analyses was conducted for the dimensions perception on EE, EE in elementary science program and needs for EE in Turkey. Statistical Package for the Social Sciences (SPSS) version 20 was performed to analyze dimensionality of the scale. Kaiser-Meyer- Olkin (KMO) value, which should be above .60 (Pallant, 2007) was found as .814 meaning that factor analysis is appropriate. Analysis of principle component factor method with varimax rotation was used and eigenvalues, scree plot and rotated factor loadings were measured. More detailed information about the pilot studies including the sample characteristics and the results of the factor analysis are provided below.

Characteristics of the Sample

Hundred and eighteen (118) in-service teachers participated the first pilot implementation of EE SoAQ. The second pilot implementation was conducted with 144 in-service teachers. The data were collected through e-mails and on-site implementations. The participants were from 10 and 21 cities for the first and second implementations respectively (Table 3.8). As the characteristics of the participants presented in Table 3.9 display, most of them were female with more than 10 years of teaching experience and did not attend any in-service training related to EE.

Table 3.8 Pilot implementations of EE SoAQ – The participants

	Pilot Study 1	Pilot Study 2
Province	N	N
Ankara	24	93
Antalya	42	-
İstanbul	13	11
Karabük	18	-
Şırnak	8	1
Hatay	9	-
Bursa	1	2
İzmir	1	1
Ardahan	1	-
Çanakkale	1	-
Konya	-	1
İzmit	-	1
Elazığ	-	1
Mersin	-	3
Batman	-	1

Table 3.8 (continued)

Bolu	-	2
Balıkesir	-	1
Düzce	-	1
Samsun	-	1
Kastamonu	-	20
Diyarbakır		3
TOTAL	118	144

Table 3.9 Characteristics of the Participants

	Pilot Study 1	Pilot Study 2
Gender	**N**	**N**
Female	68	93
Male	50	51
Age Group	**N**	**N**
22-30	38	6
31-36	30	14
37-43	28	41
44-50	12	47
Over 50	10	36
Teaching experience	**N**	**N**
0-3	16	5
4-7	20	3
8-12	28	12
13-20	32	50
Over 20	22	74
Education Level		**N**
Associate degree program		18
Science education program		9
Primary school education program		83

Table 3.9 (continued)

Different from education faculty		29
Master Program		4
PhD Program		-
Missing		1
Attendance to in-service training	**N**	**N**
Yes	40	35
No	78	107
Missing	-	2
TOTAL		**144**

Exploratory Factor Analysis

Results for Pilot Implementation No.1

Exploratory Factor Analysis (EFA) was conducted to measure the construct validity of the EE SoAQ through calculating the interrelationships between a set of variables (Pallant, 2005). EFA was conducted with the method Principle Component Analysis (PCA). Moreover, rotated solution was not used at first stage in order to determine the number of factors. After determining the factor number, as a second stage, PCA was repeated by using rotated solution with varimax rotation method. Varimax rotation is preferred since it tries to maximize loading distributions among factors, which makes interpretation of the factors easier (Field, 2005).

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy value should be above .60, and The Bartlett's Test of Sphericity value should be significant ($p < .05$) fort the factorability of the data (Tabachnick & Fidell, 2001). KMO Measure of Sampling Adequacy value was found as .800 and The Bartlett's Test of Sphericity value was calculated as .000, meaning that factor analysis is suitable (Pallant, 2005).

Considering the Kaiser's criterion technique, factors that have eigenvalue 1.0 or above are retained for EFA (Pallant, 2005). According to this criteria, 10 factor components were reported in the first stage of the EFA, explaining 72,7% of the variance (Table 3.10).

Table 3.10 Initial Eigenvalues of Dimensions

Component	**Initial Eigenvalues**		
	Total	% of Variance	Cumulative %
1	10,385	28,068	28,068
2	3,843	10,386	38,454
3	2,445	6,608	45,062
4	2,111	5,704	50,766
5	1,908	5,158	55,924
6	1,467	3,965	59,889
7	1,393	3,766	63,655
8	1,217	3,289	66,944
9	1,103	2,980	69,925
10	1,056	2,854	72,779

According to the results of both the scree plot and parallel Analysis (Pallant, 2005) the instrument was accepted to comprised of 5 factors (Figure 3.4 and Table 3.11)

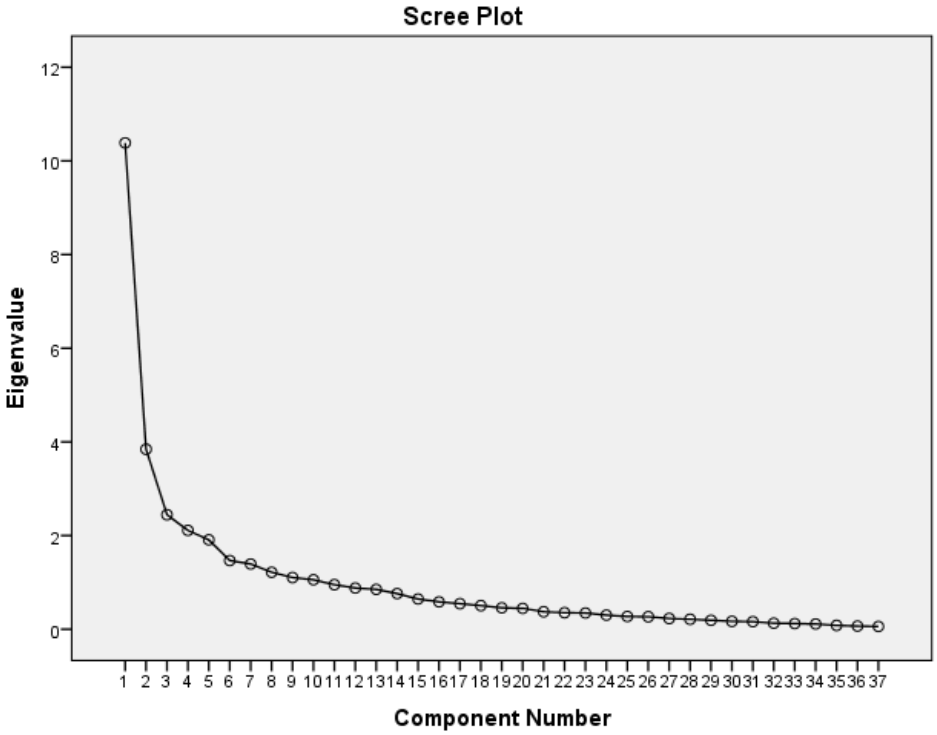

Figure 3.4 Screeplot for Pilot Study 1

Table 3.11 Results of parallel analysis

Component	Initial Eigenvalues	Criterion value from parallel analysis	Decision
1	10,385	2,2605	Accept
2	3,843	2,0992	Accept
3	2,445	1,9616	Accept
4	2,111	1,8480	Accept
5	1,908	1,7568	Accept
6	1,467	1,6759	Reject

Taking these results into consideration, as a second stage, EFA was reconducted with varimax rotation method by extracting to five factors. As a result, 55,9% of the total variance.

Revision of the Instrument

According to the results of the EFA, the instrument (EE SoAQ) was revised. Three items were deleted after running EFA, since they did not provide consistency in the dimensions they loaded and four items were added in order to improve the loadings in factor 2 and factor 3. Thus, the number of items were increased from 37 to 38.

Exploratory Factor Analysis for Pilot Implementation No. 2

Since there have been several changes were made on after the first pilot implementation, a second pilot implementation was found necessary in order to strengthen the construct validity of the EE SoAQ.

Exploratory Factor Analysis (EFA) with Principle Component Analysis (PCA) method was conducted in order to realize the construct validity of the items for the revised version of EE SoAQ. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy value that was calculated as. 851 (>.60) and The Bartlett's Test of Sphericity value was found as significant (p=.000≤ .05), meaning that factor analysis is appropriate (Pallant, 2005).

The results of the EFA, considering the Kaiser criterion, indicated that there are 7 factor components that have eigenvalue above 1.0, explaining 72,6 % of the variance (Table 4.5). According to the scree plot and the results of parallel analysis (Pallant, 2005), four factors were resulted explained 61,07% of the total variance (Figure 3.5, Table 3.12 and Table 3.13).

Table 3.12 Initial Eigenvalues of Dimensions

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	10,397	27,360	27,360
2	6,733	17,719	45,080
3	3,924	10,327	55,407
4	2,370	6,238	61,645
5	1,604	4,221	65,866
6	1,432	3,769	69,635
7	1,142	3,005	72,639

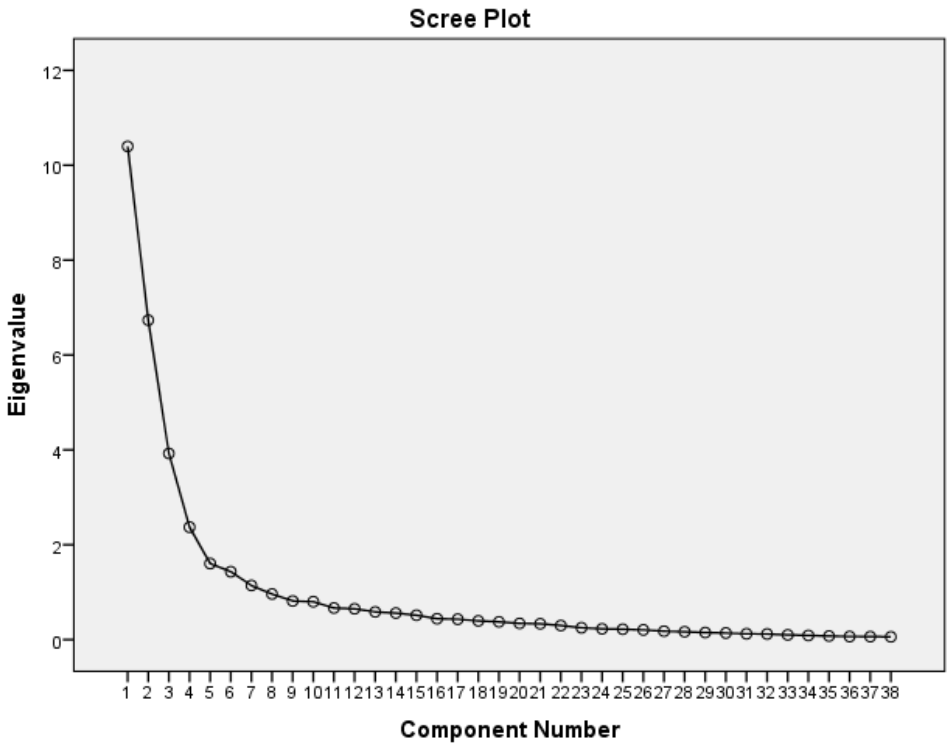

Figure 3.5 Scree Plot for Pilot Implementation No. 2

Table 3.13 Results of parallel analysis

Component	Initial Eigenvalues	Criterion value from parallel analysis	Decision
1	11,085	2,1413	Accept
2	6,169	2,0048	Accept
3	3,705	1,8896	Accept
4	2,248	1,7908	Accept
5	1,596	1,7059	Reject

As a result of two pilot implementations and revision process four factors were determined in the final version of the EE SoAQ including 4 factors and 37 items as displayed in Table 3.14 and Appendix B.

Table 3.14 Names of the factors and item numbers

Factors	Number of Items
Needs for more effective EE	19
EE in the elementary science program	7
Self-efficacy on EE applications	7
Current practices in teaching EE in their classroom	5

3.3.1.3 Reliability of EE SoAQ

Reliability is defined as consistency of the scores (Fraenkel & Wallen, 2003). In order to measure the reliability of EE SoAQ, Statistical Package for the Social Sciences (SPSS) version 20 was performed. Cronbach's alpha, which should be

above .70 stated by Hair et al. (1998), was calculated as .873 for the pilot study and .895 for the main study, meaning that the questionnaire is reliable.

3.3.2 Environmental Education in Universities Interview Protocol

Data about current state of EE and needs/gaps about EE applications in elementary schools and universities was collected by means of semi-structured interviews. The interview protocol, titled as Environmental Education in Universities Interview Protocol (EE-U IP), was developed by the researcher considering the related literature, national reports about strategies, goals, actions, needs and gaps about EE, agreements on EE that Turkey is part, and national science education program. Therefore, the categories and sub-categories of the interview were determined before the implementation of the interview. The five main categories of the instrument with sub-categories and item numbers are listed in Table 3.15.

Table 3.15 Categories of EE-U IP

Categories	**Sub-Categories**	**Items**
Perceptions on EE in the elementary schools science program	Necessity of including environmental issues in the elementary science program	Item 1
	Teaching strategies	
	Teaching practice	
Perception on EE in the teacher education program	Target of Environmental Science Course	Items 2-4
	Objectives of Environmental Science Course	
	Context of Environmental Science Course	

Table 3.15 (continued)

	Teaching methods used in Environmental Science Course Opportunities provided by the University	
Perception about needs for practicing EE in the university campus	-	Item 5
Perception on needs for EE in Turkey	-	Item 6
Perception about suggestions for improving EE	Suggestions for individuals to improve EE Suggestions for authorities to improve EE Suggestions for cooperation between local authority, NGOs and universities authorities to improve EE	Item 7

The items basically included questions about perceptions of university lecturers on EE in elementary science program and teacher education program. Thus they were composed of perceptions on necessity of including environmental issues in the elementary science program, teaching strategies and teaching practice for environmental issues in elementary science program; target, objectives and context of "Environmental Science" course, teaching methods and teaching strategies used for this course and opportunities provided by the university for this course; needs/gaps in elementary schools and universities; suggestions to fulfill these needs. Sample items for both interview protocols are presented in Table 3.16.

Table 3.16 EE-U IP: Categories and items

Categories	EE-U IP Items
Perceptions on EE in the elementary schools science program	1. Could you please explain why environmental issues should be involved in elementary science program?
	a. How do you think that EE should be included in the elementary science program?
	b. How should EE be designed to increase its effectiveness?
	c. Which teaching methods would be useful for EE?
Perceptions on EE in the teacher education program	3. Questions about Environmental Science Course:
	a. What is the main target of the environmental science course?
	b. What are the objectives of environmental science course?
	c. What are the topics included in the environmental science course?
	d. Which teaching methods and activities do you use in the environmental science course?
	e. Do you use daily life examples during environmental science course?
	4. What are the opportunities provided by the university within the scope of the environmental science course?
Perceptions on needs for practicing EE in the university campus	5. What type of EE needs do you think exists in your university?
Perceptions on needs for EE in Turkey	6. What are the most significant three needs regarding EE in Turkey?
Perceptions on suggestions for improving EE	7. What should individuals, local authority, universities, NGOs do to improve EE?

After the formulation of interview protocols and taking expert opinions, the researcher contacted the participants to arrange interview schedule. Four interviews were held and each of them took about 25 minutes. The participants were encouraged by additional follow-up questions and prompts. Moreover, the interviews were recorded with the consent of the participants.

3.3.2.1 Validity and Reliability of EE-U IP

Validity refers to the degree to which the findings of the study make sense (Miles & Huberman, 1994). To provide the validity, the findings of the interviews were coded by two researchers, and the codes they created were compared to have more sensible results.

Reliability is defined as if the progression of the research is consistent, and it is constant over time and among the different researchers and methods (Miles & Huberman, 1994). Therefore, inter-rater (coder) reliability was confirmed. Thus, the results was coded by two researchers, who are the researcher of this study and a doctoral candidate in the education faculty having interest to environmental education. After coding the data in their own, a inter coder reliability analysis was performed using the formula stated by Miles and Huberman (1994);

> Reliability = number of agreements / (total number of agreements+ disagreements)

Accordingly, the inter coder reliability was calculated as .94. Since it was found as higher than the level suggested by Miles and Huberman (1994) (.80), it was ensured that the inter coder reliability was fulfilled.

3.4 Data Collection Procedure

After getting permission from Research Center for Applied Ethics in METU for collecting data, pilot implementation of the questionnaire was initiated.

Also, a request was made to Ministry of National Education in order to get permission for conducting the EE SoAQ in selected 300 elementary schools in the six districts of Ankara. After getting the permission, the administration of EE SoAQ was realized in elementary schools for in-service science teachers by visiting the schools. EE SoAQ was also realized in universities for pre-service science teachers at the end of the "Environmental Science" course. While school visits had been continuing, implementation of EE-U IP with university lecturers were in progress.

Implementing the questionnaire took about 20 minutes and interviews took about 25 minutes, and all the participants were informed about the aim of the study.

3.5 Data Analysis

Before performing Statistical Package for Social Sciences version 20 to analyze data collected through in-service and pre-service science teachers, data cleaning was done in order to detect missing data and manipulate them. After that, the mean, standard deviation, skewness and kurtosis values of the variables were calculated as descriptive statistics, to provide statistical foundation for hypothesis testing. Frequencies and percentages were also calculated for all items in the questionnaire. In addition to the descriptive analysis, Multivariate Analysis of Variance (MANOVA) were conducted to investigate the differences between the in-service teachers' and pre-service teachers' perceptions about current state of EE in elementary science program and the needs for more effective EE. Furthermore, correlation analysis was conducted in order to examine the relationship between the characteristics of participants and their perceptions.

For the interpretation of data gathered through EE-U IP and open ended questions in the EE SoAQ, list of categories were developed considering the research questions. After transcribing the video records for interview, the data gathered was coded by two researchers and peer check was done to be able to provide reliability. Majority of the categories and the sub-categories derived after the content analysis

were similar with the previously determined ones. Moreover, the sub-category "Needs for the supporting opportunities for EE in the campus" under the category of perceptions on needs for practicing EE in the university campus and the sub-category "Teaching strategies used in Environmental Science Course" under the category of perceptions on EE in the teacher education program were resulted after the data analysis.

As well, As-Is & To-Be approach was used in order to interpret the results of qualitative and quantitative data analysis together and point out the similarities and discrepancies between perceptions of university lecturers, in-service science teachers and pre-service science teachers on the current state of EE in elementary schools and teacher education programs.

3.6 Assumptions

Assumptions of the study that was considered by the researcher are mentioned below.

1. The implementation of the questionnaire and interviews will be under standard conditions for all of the groups.
2. The responses of the participants for the items in the instruments will be honest.
3. The participants from the same school or university did not interact and communicate on the questions.
4. The participants realized that their participation in the treatment was voluntary.
5. The participants recognized that their responses will be confidential.

3.7 Limitations

1. The sample of the study is limited to 250 in-service science teachers, 150 pre-service science teachers and 4 university lecturers studying at the 2013-2014 education year.
2. The results of the current study are limited to the sample that was derived from Ankara/Turkey.
3. Validity of the study is limited to the honesty of the participants in their responses for the instruments.
4. Validity of the study is limited to reliability of the instrument used in this study.
5. This study is limited to assignment of the samples, which is not random assignment.

3.8 External and Internal Validity

External validity is defined as the extent to which the results of a study can be generalized (Fraenkel & Wallen, 2006). Since the participants of this study is selected by convenient sampling, results of the study cannot be generalized to in-service science teachers, pre-service science teachers and university lecturers in elementary education departments in Turkey, however provides evidences for further studies to be carried out with participants from different regions of Turkey.

Internal validity is defined as "observed differences on the dependent variable are directly related to the independent variable, not due to some other intended variable" (Fraenkel & Wallen, 2006). Subject characteristics, location and instrumentation threats are possible internal validity threats for this study. Subject characteristics (such as, age, experience, gender, ability, socioeconomic status, view about EE) may have an impact on this study, which is one of the limitations of this study. Location threat may occur during the data collection process since the questionnaire was conducted in different schools. In order to minimize this threat

administration of the questionnaire was tried to be done in similar environment and at the beginning of the second semester. Instrumentation threat such as data collector characteristics and data collector bias is another threat that may impact internal validity. In order to minimize the threats instrument was implemented by the researcher.

As a summary of all, the purpose of this study is to investigate the current state of implementations and the needs regarding EE in elementary school program and teacher education program in Turkey in the words of university lecturers, pre-service science teachers and in-service science teachers.

Multi-level mixed method research design is utilized in this study. For the quantitative phase of the study, EE SoAQ that was developed by the researcher implemented to the 250 in-service science teachers from public schools and 150 pre-service science teachers from public universities in Ankara. Descriptive statistics is used to present the perceptions of in-service science teachers and pre-service science teachers on EE in the elementary science program, self-efficacy on EE applications, practices in teaching EE and needs for more effective EE. Moreover, MANOVA is conducted to compare their perceptions, and correlation analysis is ran to investigate the effect of sample characteristics on their perceptions. For the qualitative phase of the study, EE-U IP was implemented to 4 university lecturers who instruct "Environmental Science Course" at the elementary science departments of public universities in Ankara. After transcribing the interviews content analysis is conducted in order to obtain the categories and sub-categories concerning their perceptions on current state of EE in elementary science program and teacher education program.

CHAPTER 4

RESULTS

Results of this thesis are presented in seven sections addressing the research questions of the study and in parallel with the structure of the multi layered mixed research method: (1) Characteristics of the sample, (2) The current state of EE in elementary schools science program in Turkey in the words of in-service and pre-service science teachers, (3) The difference between in-service teachers' and pre-service teachers' perceptions, (4) Relationship between the characteristics of in-service and pre-service teachers and their perception on need for more effective EE (5) The current state of EE in teacher education programs in Turkey in the words of university lecturers (6) Evaluation of the results in line with As-is & To-be approach and (7) Summary of the results.

4.1 Characteristics of the Sample

The main study was conducted as a 3 layered mixed method through implementation of the instruments to in-service science teachers, pre-service science teachers and university lecturers. Accordingly, characteristics of the sample will be presented as of 3 sub-headings.

4.1.1 Characteristics of In-service Science Teachers

In-service science teachers of the study are comprised of 250 teachers (167 females and 83 males) from elementary schools in Ankara. According to the data given by the Ministry of Education (MoNE, 2014), the number of the in-service science

teachers involved in the current study constitutes the 13% of the in-service science teachers in Ankara (Figure 4.1).

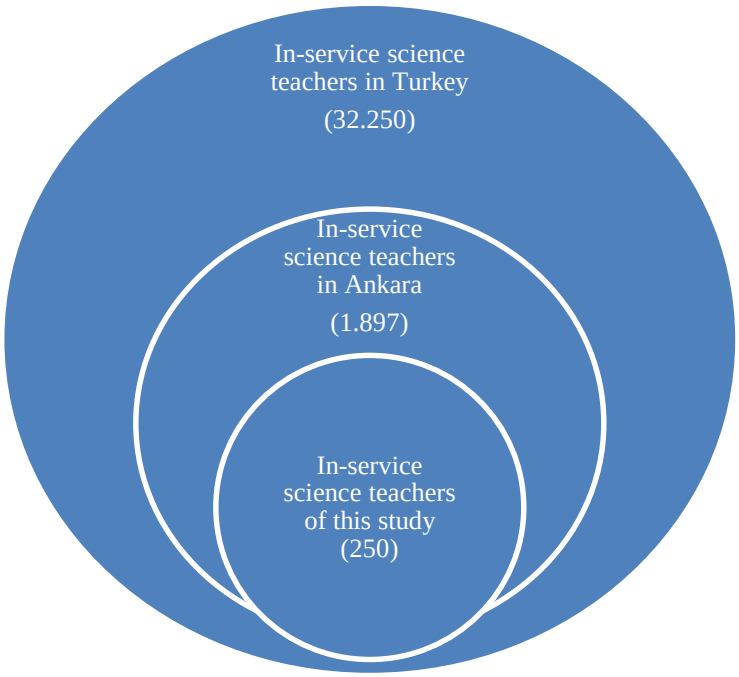

Figure 4.1 Number of in-service science teacher of the study: in terms of target population and accessible population

Gender

Hundred and sixty seven (167; 66.8%) of the 250 in-service science teachers of the study were female and 83 (33.2%) of them were male (Figure 4.2).

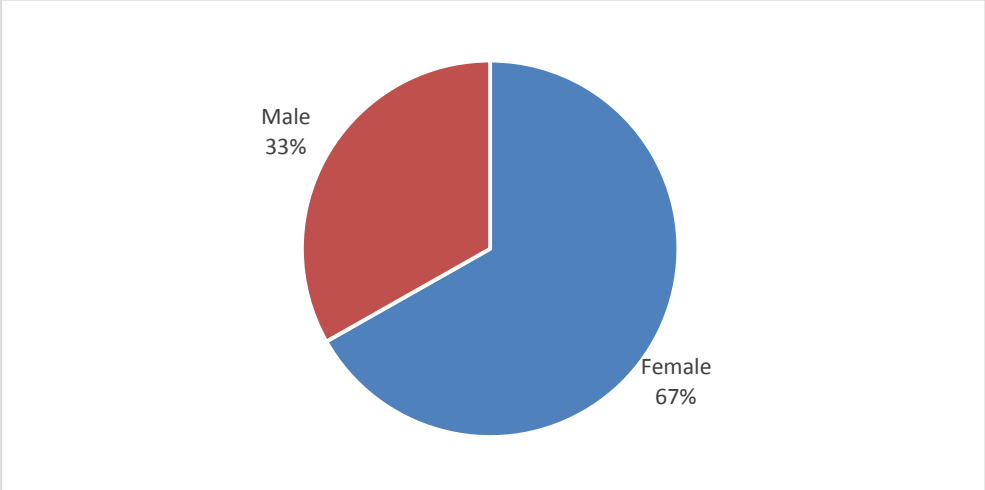

Figure 4.2 Gender Distribution of the in-service science teachers of the study

Age

The age range of the in-service science teachers participated this study is between 23 and 61. As represented in Figure 4.3, almost half of the participants (n=129, 51.6%) are above 43 years old, less than 20%, however (n=46, 18.4%) are below 32 years old and the rest (n=73, 19.2%) is between the 33-43 years old.

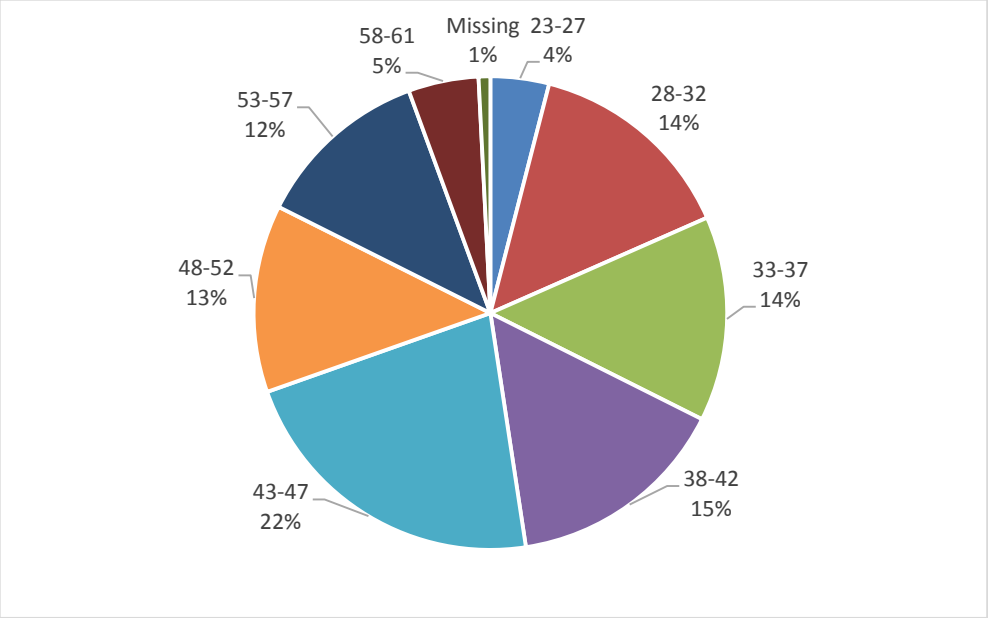

Figure 4.3 Age Distribution of the in-service science teachers of this study

Teaching Experience

As illustrated in the Figure 4.4, almost half of the participants (n=123, 49.2%) have teaching experience more than 20 years, while almost one fifth of them (n=53, 21.2%) have teaching experience less than 10 years and the rest have teaching experience between 11-20 years.

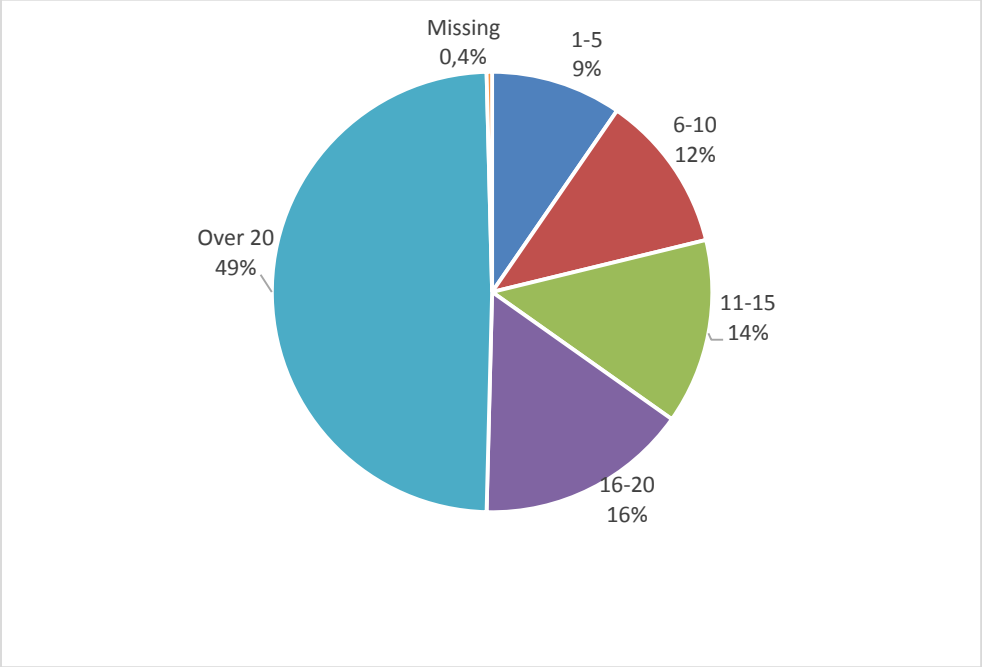

Figure 4.4 Teaching experience of the in-service science teachers of this study

Education

Figure 4.5 indicates education of in-service science teachers of this study. According to the results, most of the participants (n=179, 71.6%) are graduates of an education faculty. However, 40 (16.0%) of the teachers are graduates of faculties other than education and 29 (11.6%) of the total number of teachers have MS degree. Moreover, the percentages for the in-service science teachers graduated from two years associate degree program and for those who completed a PhD program is .4 (n=1).

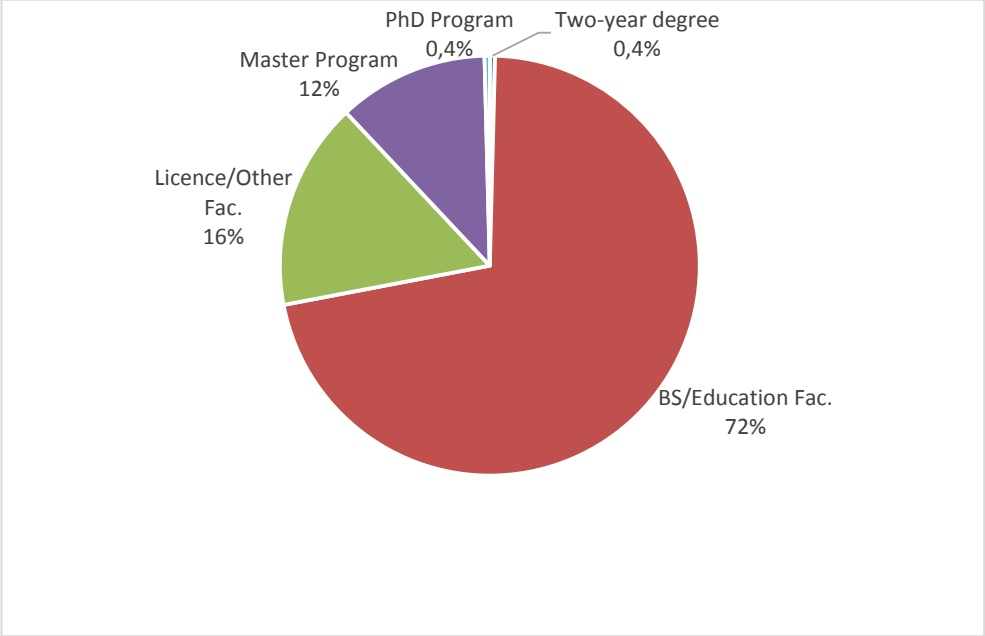

Figure 4.5 Education of the in-service science teachers of this study

In-Service Training

Figure 4.6 presents relevant data related with the answers of the in-service science teachers regarding their attendance to an in-service training program on EE. As the results displayed, 78.4 % (n=196) of the participants did not attend an in-service training program, while 21.6 % (n=54) of them attended an in-service training program.

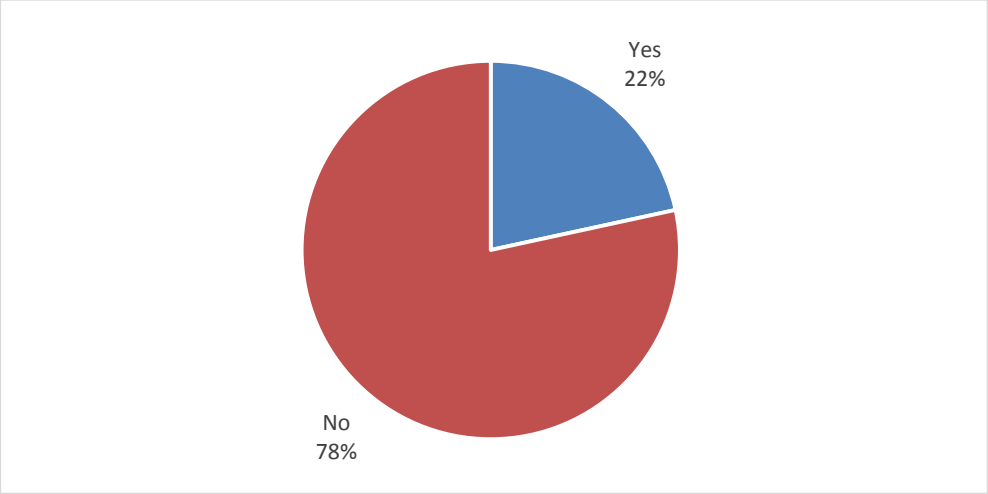

Figure 4.6 Attendance to in-service training

General perceptions on EE

In the demographic information section of the questionnaire (EE SoAQ) teachers were asked about their general perceptions on EE and ESD in Turkey through two open ended questions and three multiple choice questions. According to the results of multiple choice questions, almost all the in-service science teachers of this study (n=240, 96.0%) were agree about the necessity of EE through formal and non-formal education. The number of in-service science teachers who agree with the item that states, "*Although EE is necessary, it may not be necessarily given in schools*" was 8 (3.2%). Only 1 of the participants however, mentioned that "EE is not necessary" (Table 4.1; Figure 4.7)

Table 4.1 General perceptions of in-service science teachers on EE and ESD

Items	N	%
Perception on EE		
A.1 EE is not necessary	1	.4
A.2 EE is necessary and should be provided by formal and non-formal education	240	96.0
A.3 Although EE is necessary, providing it at school is not necessarily	8	3.2
A.4 Undecided	1	.4
Perception on ESD	**N**	**%**
B.1 ESD is not necessary	1	.4
B.2 ESD is necessary and should be provided by formal and non-formal education	228	91.2
B.3 Although ESD is necessary, providing it at school is not necessarily	18	7.2
B.4 Undecided	2	.8
Missing	1	.4

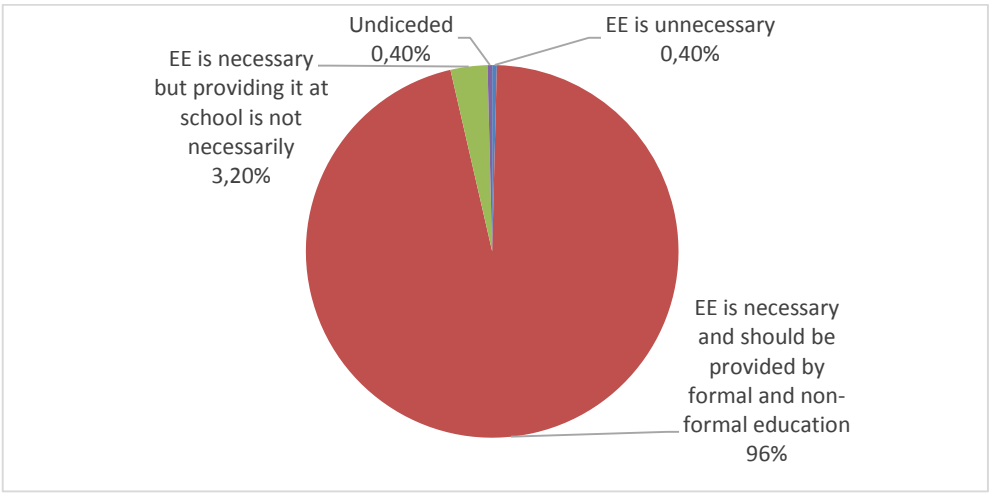

Figure 4.7 In-service science teachers' perceptions on EE

Similarly, more than 90% of the participants (n=228) mentioned that "*ESD is necessary and should be provided by formal and non-formal education*", while 18 (7.2%) declared that they agree with the necessity of ESD but it may not necessarily be given in schools. Moreover, one of the participants reported that ESD is not necessary (Table 4.1 and Figure 4.8).

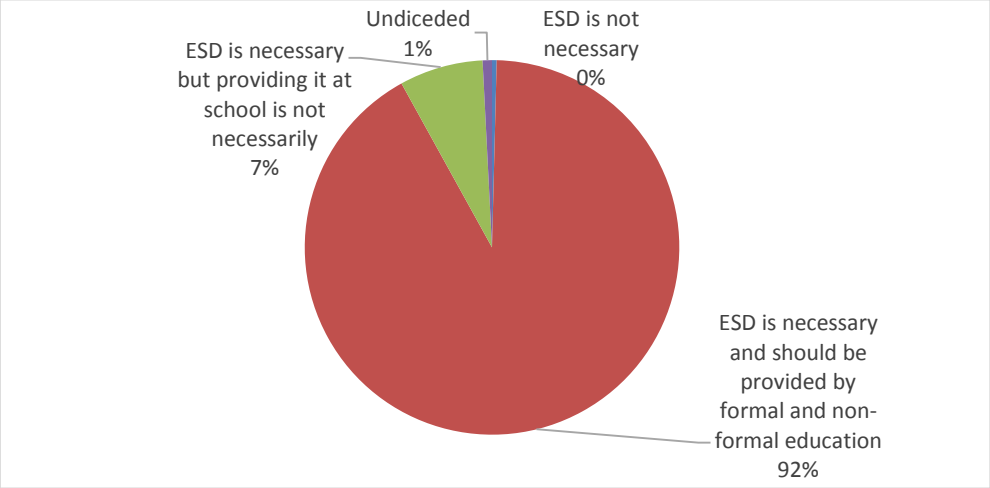

Figure 4.8 In-service science teachers' perception on ESD

In-service science teachers' perception on the implementations of EE, however was obtained through the last multiple choice item in the EE SoAQ, where they were asked to choose among the seven choices they had been given. The answers were evaluated as follows (Table 4.2):

Majority of the in-service science teachers of this study (n=186, 74.4%) think that EE should be integrated to all courses in elementary schools.

Forty six percent of the participants (n=115) were agreed that the theoretical and practical knowledge they were given for teaching environmental issues during their university education is adequate.

Less than half of the in-service science teachers (n=100, 40.0%) were positive in taking compulsory Environmental Science course during their education in the university.

Twenty two percent (n= 55) of the in-service science teachers agreed that there are sufficient sources of information about EE in Turkey and 28.4% (n=71) mentioned that they can easily reach the sources about EE in Turkey.

Twenty four percent (n =60) of the in-service science teachers agreed that EE should be given only in science program and 5 participants (2.0%) stated that EE given through schools is sufficient.

Table 4.2 In-service science teachers' general perceptions on EE

General statements about EE	**N**	**%**
C.1 EE provided by formal education institutions is sufficient.	5	2.0
C.2 EE should be given only in science program	60	24.0
C.3 EE should be integrated to all courses in elementary education.	186	74.4
C.4 Theoretical and practical knowledge I gathered during the university education is adequate for teaching environmental issues	115	46.0
C.5 Compulsory EE lecture should be provided to pre-service teachers during their license education.	100	40.0
C.6 There are sufficient sources (book, article, journal, internet, video, etc.) about EE in Turkey	55	22.0
C.7 I can easily reach the sources about EE in Turkey	71	28.4

4.1.2 Characteristics of Pre-service Science Teachers

The total number of pre-service science teachers participated the study was 150 (133 female and 17 male) who were students in the Elementary Science Education Departments of three public universities in Ankara (Table 4.3).

Table 4.3 Distribution of the pre-service science teachers among universities

University	**N**	**%**
Hacettepe University	84	56
Gazi University	36	24
Middle East Technical University	30	20

Elementary Science Department is included in 3 universities in Ankara with total of 265 students as mentioned by Council of Higher Education (2014). Therefore, number of the pre-service science teachers involved in the current study constitutes 56% of the pre-service science teachers in Ankara (Figure 4.9).

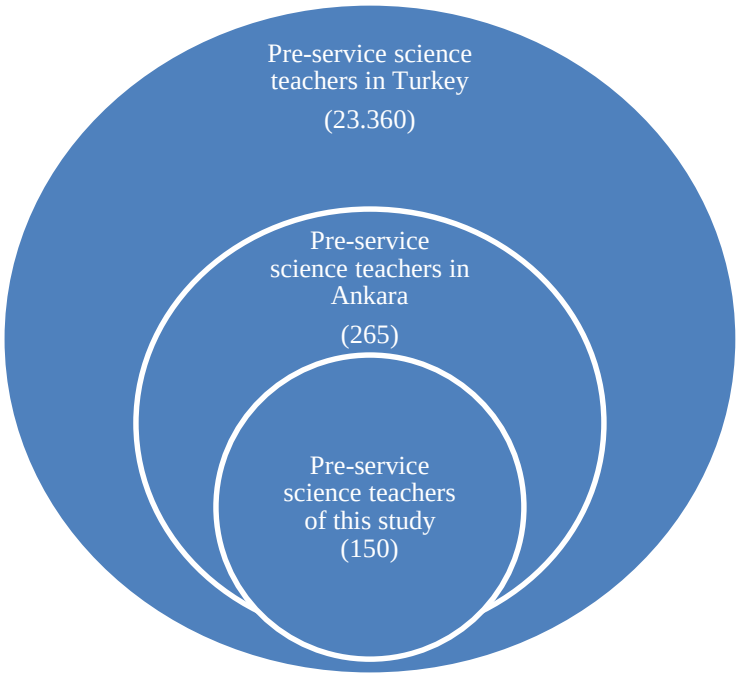

Figure 4.9 Number of pre-service science teacher of the study: in terms of target population and accessible population

Gender

Hundred and thirty three pre-service teachers of this study, out of 150 was female (88.7%) and 17 was male (11.3%) (Figure 4.10). The percentage of the females and males involved in this study are close to the percentages in Turkey (70% females and 30% males)

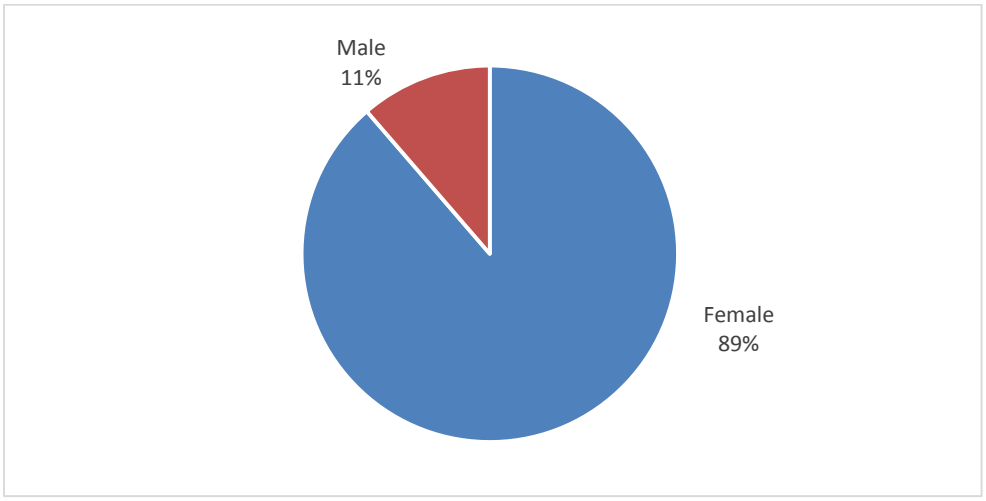

Figure 4.10 Gender distribution of the pre-service science teachers of this study

General perceptions of pre-service science teachers on EE

General perception of pre-service science teachers about EE and ESD in Turkey is presented in this section through the answer given for two open ended and three multiple choice questions in EE SoAQ. The results of descriptive statistics are presented in Table 4.4.

Table 4.4 General perceptions of pre-service science teachers on EE and ESD

Item	n	%
A.1 EE is not necessary	1	.7
A.2 EE is necessary and should be provided by formal and non-formal education	144	96.0
A.3 Although EE is necessary, providing it at school is not necessarily	4	2.7
A.4 Undecided	1	.7

Table 4.4 (continued)

Perception on ESD	**n**	**%**
B.1 ESD is not necessary	1	.7
B.2 ESD is necessary and should be provided by formal and non-formal education	130	83.3
B.3 Although ESD is necessary, providing it at school is not necessarily	12	8.0
B.4 Undecided	7	4.7

As the results display, almost all of the participants (96.0%) stated that "*EE is necessary and should be provided by formal and non-formal education*", while 2.7 percent of the pre-service science teachers mentioned that "*Although EE is necessary, providing it at school is not necessary*", only 1 participant stated that "*EE is not necessary*" (Table 4.4 and Figure 4.11).

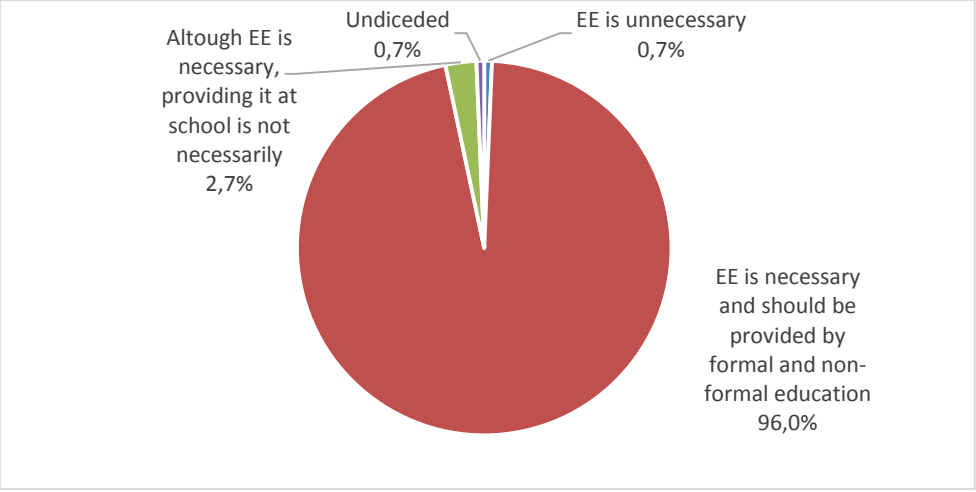

Figure 4.11 Pre-service science teachers' perception on EE

For the case of ESD however, 86.7% of the participants (n=130) stated that "*ESD is necessary and should be provided by formal and non-formal educatio*n", while 8.0% of them (n=12) declared that "*ESD is necessary but providing it at school is not necessary*". Only one participant reported that ESD is not necessary while 4.7 % of the participants were undecided (Table 4.4 and Figure 4.12).

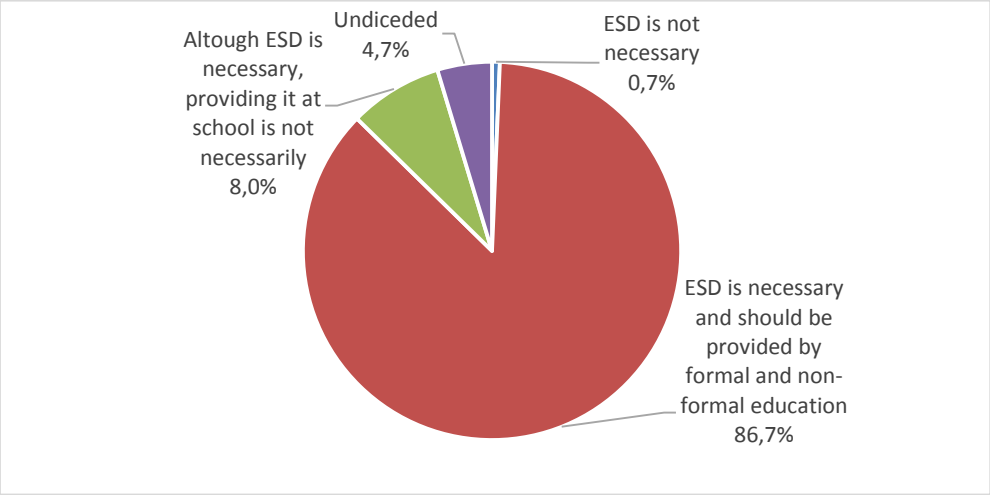

Figure 4.12 Pre-service science teachers' perception on ESD

Pre-service science teachers were also asked about their general perceptions on the implementations of EE through 7 questions and the responses were reported as follows (Table 4.5):

86.7% of the pre-service science teachers agreed on integration of EE to all courses in elementary education (n=130, 86.7%).

More than 70% of the participants were positive towards taking compulsory Environmental Science course during their education (n=115, 76.7%), and agreed on the adequacy of theoretical and practical knowledge they were given for teaching environmental issues during their university education (n=112, 74.6%).

Related to the sources for EE, 23.3% of the participants (n=35) stated that there are sources for their use, and 26.7% of them (n=40) mentioned that reaching the sources of EE is possible and easy.

Less than 10% of the participants agreed that EE should be given only through science program (n=11, 7.3%) and EE provided during formal education is adequate (n=14, 9.3%).

Table 4.5 General perceptions of pre-service science teachers on the EE implementations in Turkey

Item	**n**	**%**
C.1 EE provided by formal education institutions is sufficient.	14	9.3
C.2 EE should be given only in science program	11	7.3
C.3 EE should be integrated to all courses in elementary education.	130	86.7
C.4 Theoretical and practical knowledge I gathered during the university education is adequate for teaching environmental issues	112	74,6
C.5 Compulsory EE lecture should be provided to pre-service teachers during their license education.	115	76.7
C.6 There are sufficient sources (book, article, journal, internet, video, etc.) about EE	35	23.3
C.7 I can easily reach the sources about EE	40	26.7

4.1.3 Characteristics of University Lecturers

University lecturers of this study have been selected among the ones who give the must course (Environmental Sciences) of the science teacher programs in the universities in Turkey (Table 4.6).

Table 4.6 Distributions of university lecturers among universities

University	**N**	**%**
Hacettepe University	1	25
Gazi University	3	75

There are 60 Faculties of Education in turkey with Science Education programs and there are 68 lecturers in these universities who give "Environmental Sciences" lecture. Therefore, 4 university lecturers (1 female and 3 male) from two public universities in Ankara that constitute the sample of this study correspond to 6% of the target population and 57% of the accessible population (Table 4.6 and Figure 4.13).

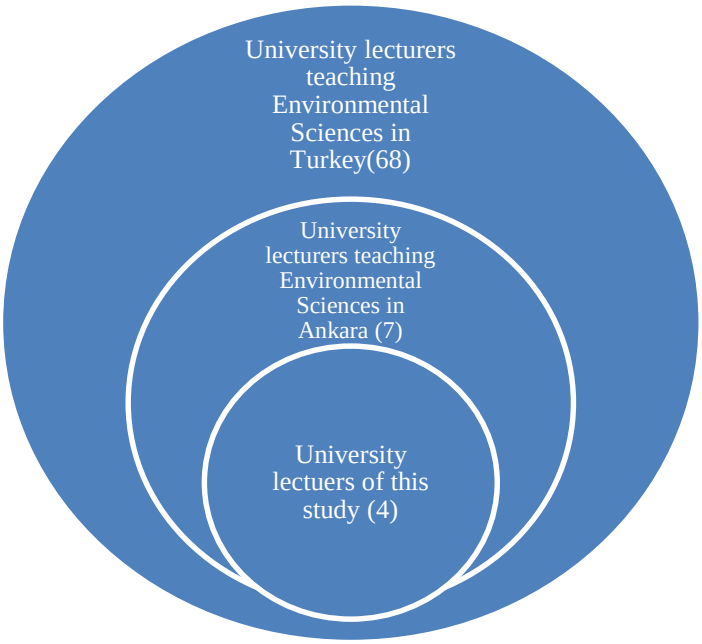

Figure 4.13 Number of university lecturers of the study: in terms of target population and accessible population

Ages of the university lecturers ranges between 40 and 63. Two of them were graduated from Biology Department, while the other two were graduated from Biology Education Department. Their teaching experience at the university varies; such that, one of them is university lecturer for 6 years, the other one is for 9 years, another one is for 14 years and the last one is for 36 years.

4.2 Current State of EE in Elementary Schools in Turkey in the words of in-service and pre-service science teachers: Results of Quantitative Analysis

Current state of EE in elementary schools in Turkey has been investigated through the actors involved in teaching science through EE-ESD SoAQ. Therefore the

results will be presented according to the 4 factors of the questionnaire and the 3 research questions related to this part (Figure 4.14).

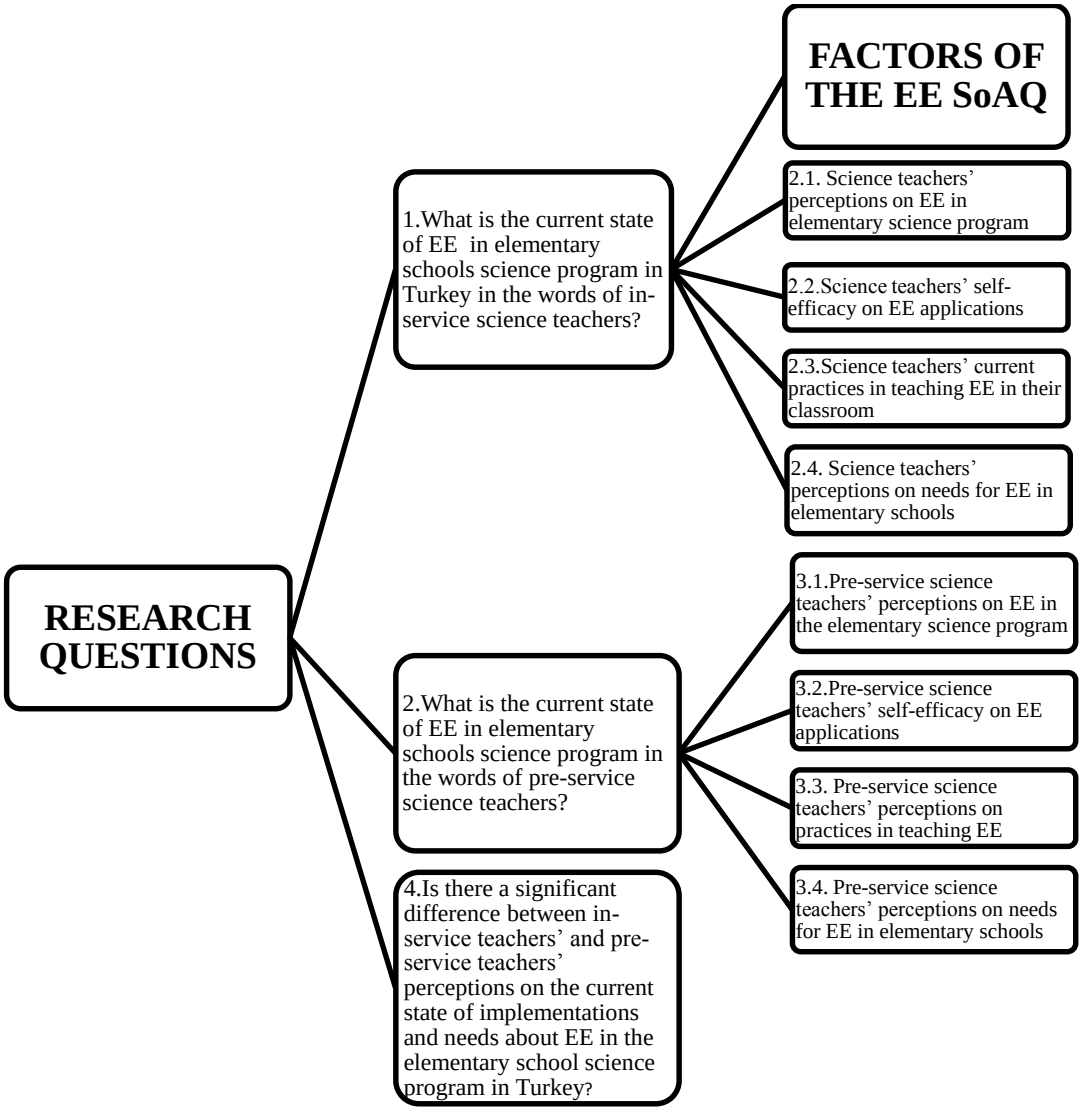

Figure 4.14 Current State of EE in Elementary Schools in Turkey in the words of in-service and pre-service science teachers: Results presentation schedule

4.2.1 Current state of EE in elementary schools science program in the words of in-service science teachers

The Mean values and standard deviations for the answers of in-service science teachers for the four factors of EE SoAQ are presented in Table 4.7. According to the results, the lowest Mean value obtained from the responses of in-service science teachers is for their perceptions on the EE in the elementary science program (M = 2.99; SD = .92); meaning that the majority of the in-service science teachers are undecided about the EE content of the elementary science program. They display high self-efficacy (M=3.85, SD=.54). The current practices mainly involve student centered teaching methods, daily life examples, integration with other disciplines and use of activities involved in textbook and other sources (M=4.00, SD=.58). The Mean score in-service science teachers contained for the needs for EE is 4.21 and standard deviation is .54, indicating that in-service science teachers' tend to perceive that the items involved in this factor should be enhanced.

Table 4.7 Means and Standard Deviations for the Factors of EE SoAQ – in the words of in-service science teachers

Factor	**M**	**SD**
Perceptions on EE in the elementary science program	2.99	.92
Self-efficacy on EE applications	3.85	.54
Current practices in teaching EE	4.00	.58
Needs for more effective EE	4.21	.54

4.2.1.1 Perception of in-service science teachers on EE in the elementary science program

As was defined by the first factor of the EE SoAQ, perceptions of the in-service science teachers on EE in the elementary science program has been tested by means of seven items (Table 4.8).

Table 4.8 Perceptions of the in-service science teacher on EE in the elementary science program

Items (part E)	Percentage (%)					
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1. Environmental issues involved in the science program are sufficient for increasing environmental knowledge of students.	4.0	41.6	12.4	38.8	2.0	1.2
2. Environmental issues involved in science program are sufficient for increasing environmental awareness of students.	5.2	39.6	14.8	36.8	3.2	.4
3. Environmental issues involved in the science program are sufficient for enhancing the positive behaviors of students towards the environment.	5.2	39.2	15.2	35.2	4.8	.4
4. Environmental issues involved in the science program are sufficient for students to understand that environmental problems are part of their life.	5.6	34.4	20.4	32.0	7.2	.4
5. Environmental issues and activities involved in science program reflect daily environmental problems.	4.8	25.6	19.2	43.6	6.8	

Table 4.8 (continued)

6.	Environmental issues and activities involved in the science program involve the concept of sustainable development.	8.0	31.6	19.6	34.0	5.6	1.2
7.	The science program sufficiently covers environmental issues and activities.	7.2	34.4	19.2	33.2	5.6	.4

According to the frequencies presented in Table 4.8, in-service science teachers' perceptions of EE in the elementary science program are described as follows;

Almost half of the in-service science teachers perceive that the environmental issues and activities involved in science program reflects daily environmental problems (Item E.5).

Almost 45% of the participants perceive that environmental issues involved in science program are not adequate for increasing environmental knowledge of students (Item E.1). Whereas, 40% of the science teachers perceive that the program is adequate.

Almost 45% of the teachers perceive that the science program is inadequate for increasing students' environmental awareness (Item E.2), whereas 40% perceived the program as adequate as far as increasing students' environmental awareness.

Percentage of the teachers who perceive the science program for enhancing the positive behaviors among of students towards environment as inadequate was approximately 45% (Item E.3), whereas, 40% of the teachers found the program adequate for developing positive behaviors among students.

Distribution of the disagree and agree answers of the teachers was almost equal (40 %) for the items related to inclusion of the concept of sustainable development in

the science program (E.6), the adequacy of the science program for helping students realize that environmental problems are part of their life (Item E.4) and that of the content of environmental issues and activities (Item E.7).

Looking at the scattered answers for the above mentioned items, percentages for "undecided" items and the M value for this factor (2.99), it is possible to infer that, in-service science teachers do not have a common perception on the current state of EE in elementary science program. The major disagreement among the teachers is due to their perceptions on the adequacy of the issues involved in the elementary science education program to equip students with environmental knowledge, awareness and behavior. As well, in-service science teachers of this study have not a consensus on the items related to the adequacy of the science program to reflect the idea that environmental problems are part of our lives. Moreover, almost 20% of the in-service science teachers seem to be "undecided" on the above mentioned items, reflecting the low M value of the factor.

Hence, the first result related to in-service science teachers' perception on the current state of EE in elementary science program is that, although 20% of them are "undecided", they are not satisfied with the current science education program as far as its EE context is concerned.

4.2.1.2 In-service science teachers' self-efficacy on EE applications

As defined as the 2nd factor of the EE SoAQ, self-efficacy of in-service science teachers were evaluated by 6 Likert-type items.

The mean score calculated for self-efficacy of in-service science teachers on EE applications is 3.85 with standard deviation .54 (Table 4.7). Therefore, it can be revealed that in-service science teachers involved in this study have high self-efficacy.

Table 4.9 In-service science teachers' self-efficacy on EE applications

Item (Part F)	Percentage (%)					
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1. I have adequate knowledge to teach the environmental issues involved in the science program.	.4	10.8	12.0	60.4	16.4	
2. I have the necessary skills to teach the environmental issues involved in the science program.	.8	4.8	15.2	58.8	20.0	.4
3. I have difficulty in controlling the students while teaching environmental issues involved in the science program.	10.0	23.2	5.2	44.8	16.4	.4
4. I can answer the questions of students about the environmental issues involved in the science program.	.4	3.6	6.8	68.0	20.0	1.2
5. I can teach the environmental issues involved in the science program as well as the other issues involved in the science program.	.8	5.6	8.4	61.6	23.6	
6. I can use various activities while teaching environmental issues involved in the science program.	.8	6.4	9.6	62.4	20.4	1.4

According to the frequencies presented in Table 4.9, more than 75% of the participants stated that they have adequate knowledge to teach the environmental issues involved in the science program (Item F.1), they have the necessary skills to teach the environmental issues involved in science program (Item F.2), they can answer the questions of students about the environmental issues involved in science program (Item F.4), they can teach the environmental issues involved in science program as well as the other issues involved in the science program (Item F.5) and

they can use various activities while teaching environmental issues involved in science program (Item F.6).

Therefore, the second result related to in-service science teachers' self-efficacy on EE applications is that, they are confident for most of the cases in teaching EE.

4.2.1.3 Current practices of in-service science teachers in teaching EE in the classroom

As was defined as the 3rd factor of the EE SoAQ, current practices of in-service science teachers in teaching EE has been tested under 3 sub-headings: a. EE implementations used in the classrooms (5 items), b. teaching methods and activities used by teachers (14 items), and c. the source of information (1 item).

a. EE implementations used in the classrooms

Mean score for the items in this dimension was calculated as 4.00 and the standard deviation was .58. (Table 4.7) Therefore, current practice of teachers mainly involve student centered teaching methods, daily life examples, integration with other disciplines and use of activities involved in textbook and other sources (Table 4.10).

Results of descriptive statistics for the in-service science teachers' current practices are presented below through the related items:

Majority (95%) of the teachers teach the environmental issues in the science program by linking them with daily life (Item G.4).

Almost 85% of the participants teach environmental issues by linking them with other disciplines (Item G.3).

The percentage of the in-service science teachers who use student-centered approach while teaching the environmental issues in the science program is approximately 85 (Item G.5).

More than 80 percent (83 %) of the participants use activities in the science textbooks (Item G.1) and activities that they develop or adapt from other sources EE (Item G.2) (Table 4.10).

Table 4.10 EE implementations in the classroom: in the words of in-service science teachers

		Percentage (%)					
	Items (Part G)	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1.	I use the related activities in the science text book while teaching environmental issues in the science program.	1.6	9.6	5.6	70.4	12.5	.4
2.	I use the activities that I develop or adapt from other sources while teaching the environmental issues in the science program.	1.6	6.0	10.4	65.6	16.4	
3.	I teach environmental issues by linking them with other disciplines.	1.2	3.2	10.4	64.0	20.8	.4
4.	I teach the environmental issues in the science program by linking them to daily life.	1.2	1.6	1.6	62.8	32.8	
5.	I use student-centered approaches while teaching the environmental issues in the science program.	2.0	3.6	7.6	59.6	25.6	1.6

b. Teaching methods and activities used for EE in the words of in-service science teachers

Results related to the teaching methods used for EE applications display that (Table 4.11), discussion takes the first rank with 55.2 % (Item H.5), doing research on a certain topic has the second rank with the response of more than half of the participants (Item H.13). Questioning has the third rank by approximately 50 percent of the participants (Item H.6), which is followed by individual or group projects reported as being usually used by 50.8% of the in-service science teachers (Item H.14). The ranges for the other teaching methods are between 20-50, and the teaching method the least reported as usually used is field trips (Item H.2) with 15.2% of respondents.

Table 4.11 Teaching methods used by in-service science teachers for EE

	Percentage (%)					
Items (Part H)	Never	Seldom	Sometimes	Usually	Always	Missing
1. Lecturing	1.2	19.2	38.8	30.4	7.2	3.2
2. Field trip	8.0	32.8	37.6	15.2	2.8	3.6
3. Role playing	5.6	19.2	39.6	24.8	8	2.8
4. Drama	8.4	19.6	36.4	23.6	8.8	3.2
5. Discussion		3.2	20.0	55.2	18.8	2.8
6. Questioning		4.8	16.0	51.2	26.0	2.0
7. Video	1.2	9.6	30.8	37.6	18.8	2.0
8. Experiment	1.2	7.6	36.8	41.2	10.8	2.4
9. Problem-based learning	2.4	8.4	35.2	38.8	11.2	4.0
10. Case study	2.0	9.6	45.2	27.2	10.0	6.0

Table 4.11 (continued)

11. Computer based activity	1.6	12.0	29.2	34.8	19.6	2.8
12. Presentation	.4	6.0	30.0	42.8	18.4	2.4
13. Doing research on a certain topic		1.6	18.4	54.8	24.0	1.2
14. Individual or group project		5.2	22.4	50.8	19.6	2.0

c. Sources used by in-service science teachers for EE

The results for the responses of the in-service science teachers for the sources they use for EE displayed that, 36% of the participants use internet, 20% use book, 15 % use TV Programs and journals and 2% of the participants stated that they use textbooks (Figure 4.15).

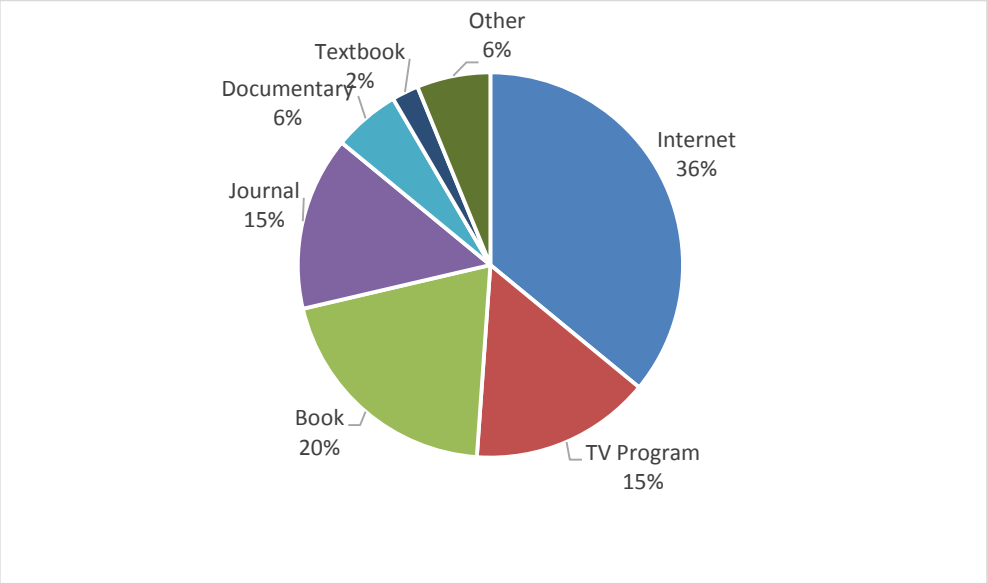

Figure 4.15 Sources used for EE by in-service science teachers of this study

Therefore the third result related to in-service science teachers' implementations on EE in the classroom is that, they teach environmental issues by linking with daily life and with other disciplines, use student-centered approach through the activities in the science textbooks they develop or adapt from other sources. Moreover, discussion, research, questioning, individual or group projects are the methods used by the majority of them. The major source of information of in-service science teachers of this study, however is internet and book.

4.2.1.4 The needs for more effective EE in the words of in-service science teachers

As defined by the 4th factor of the EE SoAQ, needs for more effective EE is examined under four sub-headings: a. perception on needs (19 items), b. perception on missing environmental issues (19 items), c. perceptions on the most significant three needs (1 item), d. perceptions on the most significant barriers to EE (1 item).

a. Perception on needs for more effective EE

The mean score for the perception on more effective needs about EE items was calculated as 4.21 with standard deviation .54 (Table 4.7). According to the frequencies presented in Table 4.12, in-service science teachers perceive that the EE in elementary science education needs to be enhanced in terms of:

- Cooperation with the universities (94.4%)
- Support from parents (91.6%)
- Importance given to EE (90.4 %)
- Improving the physical structure of schools (90.4%)
- Improving financial sources provided for field trips (89.6%)
- Enhancing the motivation and interest of students for EE (89.2%)
- Integration of EE to other lectures in elementary school program (88.0%)
- Participation of students to national/international projects (88.0%).

Table 4.12 Perceptions of in-service science teachers' for more effective EE

	Items (Part I)	Percentage (%)					
		there is not any need	there is no need	there is less need	there is need	there is strong need	Missing
1.	Increasing the time spent for EE in elementary schools	1.6	2.8	20.0	44.8	30.8	
2.	Transforming EE issues in science program to sustainable development issues	.4	2.8	18.0	52.4	26.4	
3.	Organizing in-service training for EE	2.4	4.4	16.4	43.6	33.2	
4.	Improving teachers' knowledge on environmental issues	3.2	3.2	16.8	49.2	27.6	
5.	Improving teachers' knowledge on teaching methods for EE	1.6	4.4	15.6	48.8	29.6	
6.	Developing sources and materials for EE	.8	.8	11.6	50.8	36.0	
7.	Providing financial sources for field trips	.4	.4	9.2	37.6	52.0	.4
8.	Support of the school administration for EE implementations	1.6	1.2	10.0	38.4	48.8	
9.	Increasing the importance given to EE in schools	.8	.8	8.0	42.8	47.6	
10.	Improving the physical structure (forestation, forming cultivation areas, laboratory, etc.) of schools	.4	1.6	7.6	36.0	54.4	
11.	Enhancing the motivation and interest of teachers for EE	.8	2.4	9.6	47.2	40.0	
12.	Enhancing the motivation and interest of students for EE	.4	1.2	9.2	41.2	48.0	
13.	Improving support of parents for EE	.4	.4	7.6	32.0	59.6	
14.	Enhancing the cooperation with universities in the context of EE	1.2	.4	4.0	42.8	51.6	
15.	Establishing student clubs on environment at schools	1.6	3.6	14.0	50.8	30.0	

Table 4.12 (continued)

16. Integration of EE to other lectures in the school program	.4	2.0	9.6	47.6	40.4
17. Motivating students to participate in national/international projects on EE	.4	1.6	10.0	46.8	41.2
18. Improving the activities about environmental issues in the science textbook	1.6	.8	12.4	46.0	39.2
19. Generating a network for teachers to provide information exchange	1.2	2.0	10.8	49.2	36.8

b. Missing environmental issues in the elementary science program in the words of in-service science teachers

Responses of the participants for the missing environmental issues in the elementary school science program is listed in Table 4.13. The items that mentioned frequently were displayed in Figure 4.16.

Table 4.13 Missing environmental issues in elementary science program in the words of in-service science teachers

Items (Part J)	n	%
1. Environmental pollution (air, water, soil pollution)	118	47.2
2. Climate change and global warming	111	44.4
3. Sustainable development	151	60.4
4. Biological diversity	99	39.6
5. Endangered animals and plants	116	46.3
6. Deforestation	147	58.8
7. Erosion	101	40.4
8. Solutions for environmental problems	128	51.2

Table 4.13 (continued)

9. Use of sustainable sources	107	42.8
10. Renewable energy sources	90	36.0
11. Consumption patterns	154	61.6
12. Population growth	98	39.2
13. Transportation	81	32.4
14. Pesticides	128	51.2
15. Recycling	135	54.0
16. Activities for developing individual responsibilities about environmental problems	148	59.2
17. Case study about environmental problems	138	55.2
18. History of environmental problems	108	43.2
19. Approaches in Turkey to environmental problems	146	58.4

According to the results presented in Table 4.13, consumption patterns is the most mentioned issue by in-service science teachers (61.1%) as it is not adequately included in elementary school science program (Item J.11). The second missing issue reported by the participants was sustainable development with 60.4% of responses (Item J.3). Another issue that does not take part in the science program as stated by 59.2% of the participants is developing individual responsibilities activities about environmental problems (Item J.16). Deforestation is the next one that was mentioned by 58.8% of the participants (Item J.6), which is followed by approaches in Turkey to environmental problems (58.4%; Item J.19).

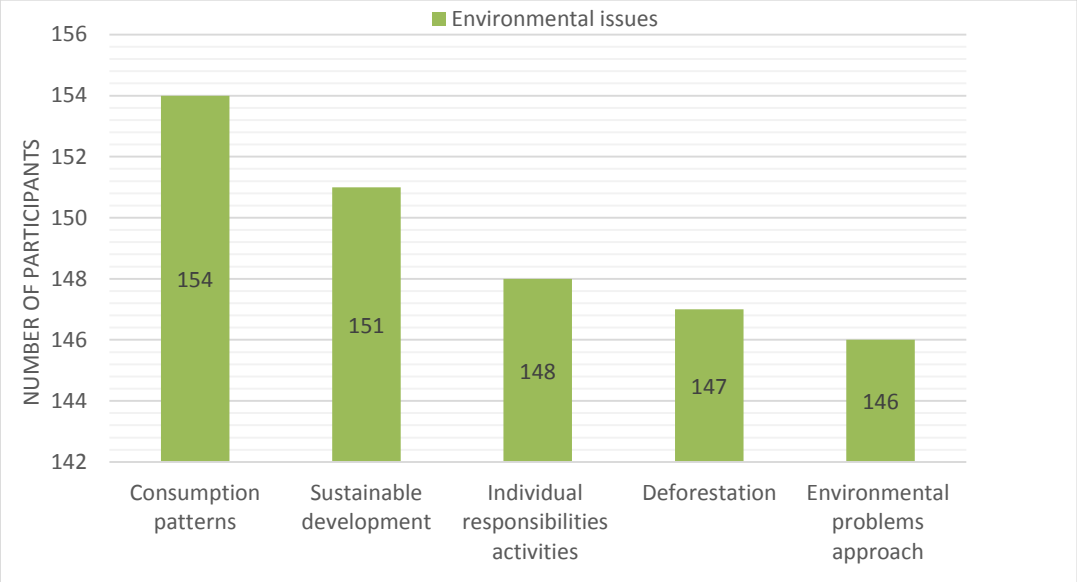

Figure 4.16 Missing environmental issues in the elementary science program in the words of in-service science teachers

c. Perceptions of in-service science teachers on the most significant three needs

In-service science teachers were asked to mention the most significant three needs on EE in accordance with their importance.

A total number of 178 responses were obtained for the **first need**. Among these responses, 'improving environmental knowledge of the individuals' has been mentioned as the primary first need (n=30). The answer of 'trainings for parents' has been in the second priority ranking of this first need (n=25). As the third ranking, the response of 'improving positive behavior' has been obtained (n=24). 'Improving environmental consciousness' (n=23) and 'EE in elementary science program', such as increasing the duration of EE, integration of EE to other courses, including current environmental problems (n=9) were the fourth and the fifth priority rankings, respectively.

144 out of 250 in-service teachers replied the **second need** and the most primary need among these responses were reported as ‘improving positive behavior of the individuals’ (n=25). ‘Improving environmental knowledge’ has been found at the second priority ranking (n=16) and subsequently ‘EE applications’ [(e.g. field trips, increasing the density of practices, providing activities for learning by doing), n=13] has had the third ranking. Then, ‘support of authority’ (n=11) and ‘improving environmental consciousness’ (n=10) have been responded as the fourth and fifth priority rankings, respectively.

Finally, 83 responses have been received for the **third need** and ‘information through media’, ‘training for parents’, ‘improving positive behavior’ and ‘financial sources’ have all shared the first ranking of priority (n=8). ‘Improving environmental knowledge’ has been in the second ranking (n=7) whereas ‘improving environmental consciousness’, ‘importance of EE’ and ‘support of authority’ have all been in the third ranking. For the fourth ranking, ‘EE in elementary science program’, ‘improving environmental sensitivity’ and ‘environmental laws’ have been obtained. Finally, ‘EE applications’, ‘materials for EE’ and ‘priority of authorities’ have been responded and counted as the fifth ranking.

Responses of the participants for the most significant needs on EE are respectively presented in Table 4.14.

Table 4.14 Perceptions of in-service science teachers' on the most significant three needs on EE

Items (Part K)	Frequency		
	K1	K2	K3
1. Improving environmental knowledge	30	16	7
2. Trainings for parents	25	5	8
3. Improving positive behaviour	24	25	8
4. Improving environmental consciousness	23	10	6
5. EE in elementary science program	9	5	4
6. EE applications	7	13	3
7. Importance of EE	7	4	6
8. Environmental problems	6	6	1
9. Improving environmental sensitivity	6	5	4
10. Support of Authority	5	11	6
11. Financial sources	5	7	8
12. Physical Facilities	5	1	2
13. Materials for EE	4	7	3
14. Environmental solutions	4	3	0
15. Improving qualifications of teachers	3	7	2
16. Information through media	3	4	8
17. Priority of Authorities	3	3	3
18. Improving environmental awareness	2	3	0
19. Improving environmental responsibility	2	3	0
20. Trainings for politicians	2	0	0
21. Cooperation	2	0	0
22. Environmental Laws	1	6	4

d. Perceptions of in-service science teachers on the most significant barriers for EE

The most significant three barriers for implementation of EE were asked to in-service science teachers.

Among 161 responses received for the **first barrier**, 'importance given to EE' has been mentioned as the most significant one (n=18). It has followed by 'not having sufficient EE in elementary science program' as the second ranking of the first barrier (n=17) and 'lack of environmental laws', 'lack of environmental consciousness' and 'lack of knowledge of individuals' have all shared the third ranking(n=14). After that, 'behavior toward environment' has had the fourth ranking; whereas 'financial source problems' and 'support of authority' have both been in the fifth ranking of the first barrier for EE.

138 responses have been received for detecting the **second barrier**. 'Behavior toward environment', such as overconsumption and acting as if environment is a part of life, has been mentioned as the most significant second barrier (n=16). 'Lack of environmental consciousness' has been in the second priority ranking (n=13) while 'financial source problems' and 'lack of environmental laws' have shared the third ranking (n=12). At the fourth ranking, 'priority of authorities' (e.g. deforestation, urbanization, being materialistic) has been placed (n=11) and 'discrepancy in environmental attitude, consciousness & knowledge of parents' has been responded as the fifth priority ranking (n=10).

For the **third barrier**, 105 responses were gathered. Among these responses, 'lack of environmental consciousness of the individuals' has been stated as the most significant one (n=12). 'Importance given to EE' and 'behaviour toward environment' have been at the same ranking (n=9), whereas 'insufficiency of EE in elementary science program', 'financial source problems', 'support of authority', 'effect of media' and 'lack of environmental awareness' have all shared the third

ranking for the third barrier for EE (n=6). 'Lack of environmental laws' has been revealed as the fourth priority (n=5) and finally 'lack of environmental sensitivity', 'EE applications' and 'materials for EE' have all been at the fifth ranking.

Responses of the participants for the most significant barriers on the implementation of EE respectively are presented in Table 4.15.

Table 4.15 Perceptions of in-service science teachers' on the most significant three barrier for EE

	Frequency		
Items (Part L)	L1	L2	L3
1. Importance of EE	18	4	9
2. EE in elementary science program	15	6	6
3. Environmental consciousness	14	13	12
4. Environmental Laws	14	12	5
5. Environmental knowledge	14	4	3
6. Behaviour toward environment	13	16	9
7. Financial source problems	12	12	6
8. Support of Authority	12	7	6
9. Priority of Authorities	9	11	3
10. Environmental attitude, consciousness & knowledge of parents	7	10	2
11. Education system	6	2	2
12. Environmental problems	5	1	1
13. Environmental sensitivity	4	3	4
14. School opportunities	4	3	2
15. Physical Facilities	3	5	3
16. EE applications	3	2	4
17. Effect of Media	2	4	6

Table 4.15 (continued)

18. Egocentricity	2	3	2
19. Environmental awareness	1	6	6
20. Environmental attitude	1	5	3
21. Teachers' qualifications	1	3	1
22. Cooperation	1	0	1
23. Materials for EE	0	2	4
24. Lack of Interest	0	3	3
25. Motivation	0	1	1
26. Environmental solutions	0	0	1

Therefore the fourth major result related to needs of EE in elementary schools science program in the words of in-service science teachers is that, they have serious concern related to cooperation with universities, families and school administrtaions to improve EE. The major missing issues in the program in-service teachers mention are related to ESD content, such as consumption patterns and individual responsibilities. The most significant EE need is improving environmental knowledge of the individuals, and the most significant barrier for imlementation of EE is importance given to EE.

4.2.2 Current state of EE in elementary schools science program in the words of pre-service science teachers

The mean scores and standard deviations for the factors involved in the EE SoAQ calculated for the responses of pre-service science teachers of this study are presented in Table 4.16.

The M value calculated for the first factor is 3.13 with standard deviation .80, meaning that most of the pre-service science teachers were undecided about adequacy of EE content in the elementary science program.

For the second factor, self-efficacy, mean score was calculated as 3.90 with standard deviation .58, hence it was interpreted that self-efficacy of the pre-service science teachers were high. The perception of pre-service science teachers on the current practices, as the third factor, indicated that they agree on using student centered teaching methods, daily life examples, as well as integrating EE issues with other disciplines and use of activities given in textbook and other sources (M=4.09, SD=.59).

Responses of the pre-service science teachers for the last factor, the needs for more effective EE, reflect their perception that there is a need for developing EE in the elementary science program.

Table 4.16 Current state of EE in elementary schools science program in the words of pre-service science teachers

Factors	**M**	**SD**
EE in the elementary science program	3.13	.80
Self-efficacy on EE applications	3.90	.58
Current practices in teaching EE	4.09	.59
Needs for more effective EE	4.42	.46

4.2.2.1 Perception of pre-service science teachers on EE in the elementary science program

Stated as the first factor of the EE SoAQ, perception of the pre-service science teachers about the EE in the elementary science program has been evaluated by seven items (Table 4.17).

The mean score calculated for the perceptions of pre-service science teachers on EE content of the elementary science program is 3.13 with standard deviation .80 (Table 4.16). Therefore, it can be interpreted that, pre-service science teachers involved in this study were mainly undecided about the sufficiency of the EE content, however, pre-service science teachers who perceive that EE content in the elementary science program is sufficient were a little bit more than the ones who perceive that it is not sufficient.

Table 4.17 EE content of the elementary science program in the words of pre-service science teachers

	Items (Part E)	Frequency					
		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1.	Environmental issues involved in the science program are sufficient for increasing environmental knowledge of students.	4.7	32.0	20.0	42.0	1.3	
2.	Environmental issues involved in the science program are sufficient for increasing environmental awareness of students.	4.0	33.3	18.0	43.3	1.3	
3.	Environmental issues involved in the science program are sufficient for enhancing the positive behaviors of students towards the environment.	5.3	28.0	24.0	40.0	2.7	
4.	Environmental issues involved in the science program are sufficient for students to understand that environmental problems are part of their life.	6.0	28.7	22.0	38.7	4.7	
5.	Environmental issues and activities involved in science program reflect daily environmental problems.	1.3	20.0	18.0	56.0	4.7	

Table 4.17 (continued)

6.	Environmental issues and activities involved in the science program involve the concept of sustainable development.	2.7	16.0	30.0	46.7	4.7	
7.	The science program sufficiently covers environmental issues and activities.	3.3	34.7	26.7	32.7	1.3	1.3

The frequencies presented in the above table display that;

60.7% of the pre-service science teachers agreed that the environmental issues and activities involved in science program reflects daily environmental problems (Item E.5).

More than half of the pre-service science teachers perceived that the environmental issues and activities involved in the science program includes the term sustainable development (Item E.6).

Almost 45% of the participants perceive that the science program is sufficient for increasing students' environmental awareness (Item E.2), environmental knowledge (Item E.1) and enhancing their positive behaviors (Item E.3), as well as realizing that environmental problems are part of their life (Item E.4), while less than 40% of them perceived as insufficient.

Distribution of the pre-service science teachers responses on disagree option was 37.7% and agree option was 34% for the item related to the sufficiency of content of environmental issues and activities in elementary science program (Item E.7).

The responses of the pre-service science teachers indicated that the percentage for the answer "undecided" ranges between 18 and 30, and the M value is 3.13, meaning that they do not have consensus for majority of the items apart from the

items concerning involvement of daily environmental problems and sustainable development term.

Therefore, the first major outcome related to pre-service science teachers' perceptions on the current state of EE in the elementary school science program is that, although agreed and disagreed percentages of pre-service science teachers involved in this study were mainly close to each other, the responses for EE in the elementary science program is sufficient were a little bit more than the ones who perceive that it is not sufficient.

4.2.2.2 Pre-service science teachers' self-efficacy on EE applications

The 2nd factor of the EE SoAQ, self-efficacy of pre-service science teachers, involved 6 Likert-type items, one of which is reversed (Item F.3).

The mean score calculated for self-efficacy of pre-service science teachers on EE application is 3.90 with standard deviation .58, meaning that pre-service science teachers of the current study have high self-efficacy (Table 4.16).

Table 4.18 Pre-service science teachers' self-efficacy on EE applications

	Percentage (%)					
Items (Part F)	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1. I have adequate knowledge to teach the environmental issues involved in the science program.	.7	4.0	18.7	62.0	14.7	
2. I have the necessary skills to teach the environmental issues involved in the science program.		6.7	10.7	63.3	19.3	

Table 4.18 (continued)

3.	I have difficulty in controlling the students while teaching environmental issues involved in the science program.	4.7	6.7	24.7	49.3	14.7	
4.	I can answer the questions of students about the environmental issues involved in the science program.	.7	4.0	10.0	72.0	12.7	.7
5.	I can teach the environmental issues involved in the science program as well as the other issues involved in the science program.		6.0	13.3	64.0	16.7	
6.	I can use various activities while teaching environmental issues involved in the science program.	.7	2.0	4.7	69.3	23.3	

According to the results presented in Table 4.18, more than 90% of the pre-service science teachers stated that they can use various activities while teaching environmental issues involved in science program (Item F.6)

Almost 85% of the pre-service science teachers agreed that they can answer the questions of students about the environmental issues involved in science program (Item F.4) and they have the necessary skills to teach the environmental issues involved in science program (Item F.2).

More than 75% of the pre-service science teachers stated that they can teach the environmental issues involved in science program as well as the other issues involved in the science program (Item F.5) and they have adequate knowledge to teach the environmental issues involved in the science program (Item F.1).

Almost 65% of the pre-service science teachers mentioned that they will not have difficulty in controlling the students while teaching environmental issues involved in science program (Item F.3).

Therefore, the second result related to pre-service science teachers' self-efficacy on EE applications is that, they have high self-efficacy for most of the cases in teaching EE.

4.2.2.3 Perception of pre-service science teachers on practices for teaching EE in the classroom

Being defined as the 3rd factor of the EE SoAQ, which is the perception of pre-service science teachers on the practices in teaching EE has been evaluated via 3 sub-headings: a. EE implementations that should be used while teaching EE (5 items), b. teaching methods and activities that should be used for EE (14 items), and c. the source of information (1 item).

a. EE implementations that should be used in the classrooms

Mean score for the perception of pre-service science teachers on the current practices of teaching EE was calculated as 4.09 and the standard deviation was .59. (Table 4.16), meaning that pre-service science teachers mainly perceive that practice of teaching EE should involve student centered teaching methods, daily life examples, integration with other disciplines and use of activities involved in textbook and other sources.

Descriptive statistics results of pre-service science teachers for this factor are presented below through the related items (Table 4.19):

Approximately 90% of the pre-service science teachers stated that the environmental issues in the science program should be thought by linking with daily life (Item G.4), using student-centered approach (Item G.5) and by linking with other disciplines (Item G.3). Moreover, activities used for teaching EE should be developed or adapted from other sources by teachers while teaching EE (Item G.2).

66% of the participants perceive that related activities of the science textbooks should be used while teaching the environmental issues in the science program (Item G.1)

Table 4.19 Perception of pre-service science teachers on practices for teaching EE in the classroom

	Items (Part G)	Percentage (%)					
		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1.	The related activities in the science text book should be used while teaching environmental issues in the science program.	1.3	13.3	19.3	58.0	8.0	
2.	The activities that teachers develop or adapt from other sources should be used while teaching the environmental issues in the science program.		4.7	4.0	67.3	24.0	
3.	The environmental issues should be taught by linking them with other disciplines.	.7	2.0	7.3	56.0	34.0	
4.	The environmental issues in the science program should be taught by linking them to daily life.	2.0	2.0	2.0	47.3	46.7	
5.	Student-centered approach should be used while teaching the environmental issues in the science program.	2.7	1.3	4.0	54.0	37.3	.7

b. Teaching methods that should be used for EE in the words of pre-service science teachers

As displayed in Table 4.20, the highest percentage for the teaching methods that pre-service science teachers mentioned as should be usually used is problem-based learning (54.0%; Item H.9). Questioning, discussion and video takes the second rank with 52.7% respondents (Item H.5, H.6 & H.7), which is followed by field trips and case study with response of half percent of the participants (50%; Item H.2 & H.10). The responses of the pre-service science teachers for the other methods ranges 30-50. The least mentioned method that should be usually used for EE, however, is lecturing (Item H.1) with the 9.3% of respondents.

Table 4.20 Perception of pre-service science teachers on teaching methods and activities that should be used for EE

	Percentage (%)					
Items (Part H)	Never	Seldom	Sometimes	Usually	Always	Missing
1. Lecturing	18.7	34.7	34.0	9.3		3.3
2. Field trip		1.3	20.0	50.0	28.0	.7
3. Role playing	.7	10.0	34.0	41.3	12.7	1.3
4. Drama	1.3	8.0	34.0	44.7	10.0	2.0
5. Discussion			14.7	52.7	32.0	.7
6. Questioning	.7	1.3	12.7	52.7	32.0	.7
7. Video		1.3	17.3	52.7	28.7	
8. Experiment	.7	3.3	20.7	48.7	25.3	1.3
9. Problem-based learning		3.3	20.7	54.0	22.0	
10. Case study		6.0	32.7	50.0	9.3	2.0

Table 4.20 (continued)

11. Computer based activity		6.0	36.7	42.7	14.0	.7
12. Presentation	5.3	18.0	34.7	33.3	6.7	2.0
13. Doing research on a certain topic		9.3	27.3	45.3	18.0	
14. Individual or group project	.7	4.7	28.7	43.3	22.0	.7

d. Sources used by pre-service science teachers for EE

Almost half of the pre-service science teachers stated that they mostly use internet as a source for EE, 13% of them stated journals as a source and 9% of declared their source as books. On the other hand, only 1% of the participants stated that they use textbook and video as a source for EE (Figure 4.17).

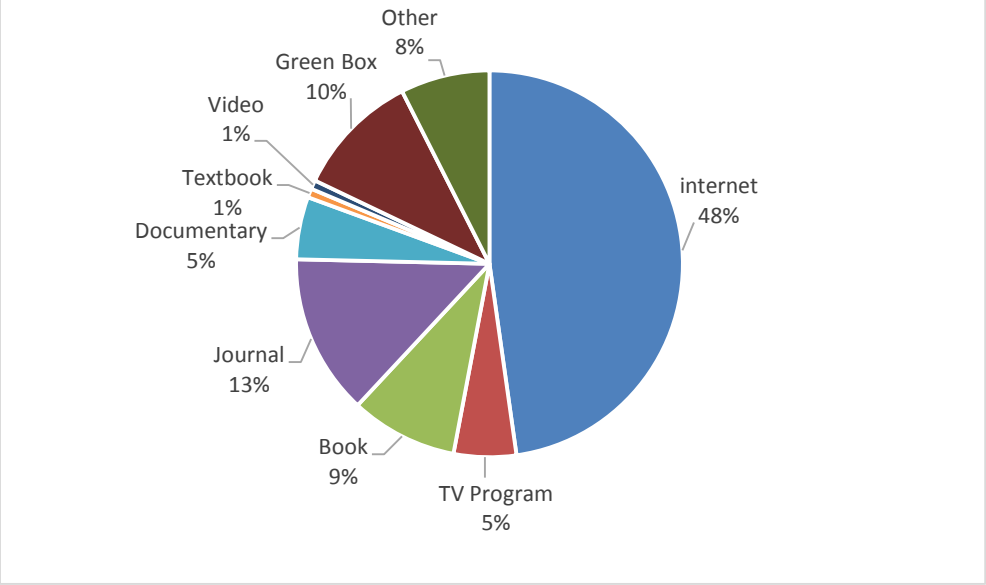

Figure 4.17 Sources of EE used by pre-service science teachers

Therefore the 3rd result concerning the pre-service science teachers' perception on teaching methods and activities that should be used for EE in the classroom is that, EE should be taught by linking with daily life, using student-centered approach and linking with other disciplines in addition to using activities that should be developed or adapted from other sources by teachers for EE. They stated their major source of knowledge however as internet and journal.

4.2.2.4 Perception of pre-service science teachers on the needs for more effective EE in the words of pre-service science teachers

The 4th factor of the EE SoAQ, the perceptions of pre-service sciene teachers on the needs for more effective EE, is examined under four subheadings: a. perception on needs involving 19 Likert-type questions that was ranked from one to five (1=there is not any need, 2=there is no need, 3= there is less need, 4=there is need, 5=there is strong need), b. perception on missing environmental issues involved in elementary science program, c. perception on the most significant three needs, d. perception on the most significant three barriers.

a. Perception on needs for more effective EE

The mean score for perceptions of pre-service science teachers on more effective EE items was calculated as 4.42 with standard deviation .46 (Table 4.16), meaning that pre-service science teachers' perceive that all of the listed items concerning this dimension of the questionnaire should be improved.

Table 4.21 Perceptions of pre-service science teachers' for more effective EE

	Items (Part I)	Percentage (%)					
		there is not any need	there is no need	there is less need	there is need	there is strong need	Missing
1.	Increasing the time spent for EE in elementary schools	1.3	1.3	14.0	40.7	42.7	
2.	Transforming EE issues in science program to sustainable development issues	.7	2.0	12.0	52.0	33.3	
3.	Organizing in-service training for EE	.7	.7	12.7	48.0	38.0	
4.	Improving teachers' knowledge on environmental issues			5.3	42.7	52.0	
5.	Improving teachers' knowledge on teaching methods for EE			6.0	40.7	53.3	
6.	Developing sources and materials for EE		.7	4.0	43.3	52.0	
7.	Providing financial sources for field trips			4.0	32.0	64.0	
8.	Support of the school administration for EE implementations			2.7	35.3	62.0	
9.	Increasing the importance given to EE in schools			4.7	32.0	63.3	
10.	Improving the physical structure (forestation, forming cultivation areas, laboratory, etc.) of schools		.7	4.7	33.3	61.3	
11.	Enhancing the motivation and interest of teachers for EE		.7	6.7	41.3	51.3	
12.	Enhancing the motivation and interest of students for EE			4.7	40.7	54.0	.7
13.	Improving support of parents for EE		1.3	4.7	38.7	55.3	
14.	Enhancing the cooperation with universities in the context of EE		.7	4.7	40.0	54.7	
15.	Establishing student clubs on environment at schools		.7	6.0	57.3	36.0	

Table 4.21 (continued)

16. Integration of EE to other lectures in the school program	.7	8.0	42.0	49.3
17. Motivating students to participate in national/international projects on EE	.7	12.0	45.3	42.0
18. Improving the activities about environmental issues in the science textbook		6.0	43.3	50.7
19. Generating a network for teachers to provide information exchange	1.3	4.7	47.3	46.7

As displayed in Table 4.21, pre-service science teachers perceive that the EE in elementary science education needs to be enhanced in terms of:

- School administration support for EE (97.3%)
- Development of sources and materials related with EE (97.3%).
- Financial sources supply for field trips (96.0%)
- Increasing the importance given to EE in elementary schools (95.3%)
- Enhancing the cooperation with the universities regarding EE (94.7%)
- Motivation and interest of students for EE (94.7%)
- Improving physical structure (forestation, cultivation area, laboratory, etc.) of elementary schools (94.6%)
- Improving the knowledge of the teachers regarding environmental issues (94.0%).

b. Missing environmental issues in the elementary science program in the words of pre-service science teachers

Responses of the participants for the missing environmental issues in the elementary school science program is listed in Table 4.22.

Table 4.22 Missing environmental issues in elementary science program in the words of pre-service science teachers

Items (Part J)	N	%
1. Environmental pollution (air, water, soil pollution)	37	24.7
2. Climate change and global warming	48	32.0
3. Sustainable development	106	70.7
4. Biological diversity	36	24.0
5. Endangered animals and plants	71	47.3
6. Deforestation	63	42.0
7. Erosion	29	19.3
8. Solutions for environmental problems	66	44.0
9. Use of sustainable sources	83	55.3
10. Renewable energy sources	80	53.3
11. Consumption patterns	82	54.7
12. Population growth	40	26.7
13. Transportation	48	32.0
14. Pesticides	64	42.7
15. Recycling	71	47.3
16. Activities for developing individual responsibilities about environmental problems	84	56.0
17. Case study about environmental problems	69	46.0
18. History of environmental problems	74	49.3
19. Approaches in Turkey to environmental problems	80	53.3

According to the results mentioned in Table 4.22 , more than 70% of the pre-service science teachers perceived that the most deficiency for the environmental issues was sustainable development (n=106, 70.7%), which is followed by developing individual responsibilities activities about environmental problems (n=84, 56.0%). 55.3% of the participants (n=63) stated that use of sustainable sources. Moreover, approximately half percent of the participants reported that consumption patterns (n=82; 57.7%), renewable energy sources and environmental problems approach in Turkey (n=80; 53.3) is not sufficient. The items that mentioned frequently were displayed in Figure 4.18.

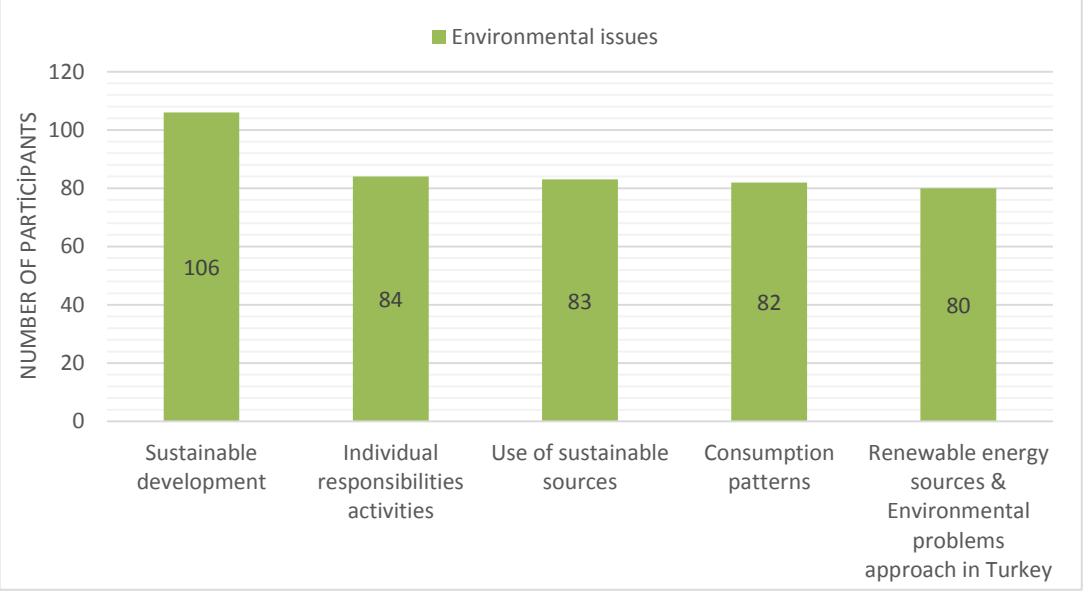

Figure 4.18 Missing environmental issues in the elementary science program in the words of pre-service science teachers

The percentage of the in-service science teachers, who choosed other issues as missing ranges between 25-50. The least stated missing environmental issues in elementary science program were erosion (n=29, 19.3%), biological diversity (n=36, 24.0%) and environmental pollution (air, water, soil pollution) (n=37, 24.7%).

c. Perceptions of pre-service science teachers on the most significant three needs

Pre-service science teachers were asked to mention the most significant three needs on EE in accordance with their importance.

A total number of 147 responses were obtained for the **first need**. Among these responses, 'improving environmental consciousness of the individuals' has been mentioned as the primary first need (n=26). The answer of 'improving environmental knowledge' and 'improving qualifications of the teachers' have shared the second priority ranking of this first need (n=18). As the third ranking, the response of 'EE in elementary science program' has been obtained (n=17). 'Improving positive behavior' and 'EE applications' (n=12) have been at the fourth ranking and finally fifth ranking has been shared by the responses of 'financial sources', 'improving environmental awareness' and 'training for parents' (n=7).

135 out of 250 in-service teachers replied the **second need** and the most primary need among these responses were reported as 'improving environmental consciousness of the individuals' (n=17). 'EE in elementary science program' has been found at the second priority ranking (n=13) and subsequently 'improving positive behavior' has had the third ranking (n=12). After that, 'improving environmental knowledge' and 'improving qualifications of teachers' have shared the fourth ranking all together (n=11). Finally, 'EE applications' has been revealed as the fifth ranking.

For the **third need**, 92 responses have been obtained and 'EE applications' has been mentioned the most (n=12). 'Improving environmental knowledge' has been in the second ranking (n=11) whereas 'training for parents' has been placed at the third ranking (n=9). For the fourth ranking, 'financial sources' has been obtained (n=8) and finally, 'improving environmental consciousness' has been counted as the fifth priority ranking for the needs of EE (n=7).

Responses of the participants for the most significant needs on EE respectively are presented in Table 4.23.

Table 4.23 Perceptions of pre-service science teachers' on the most significant three needs on EE

	Items (Part K)	Frequency		
		K1	K2	K3
1.	Improving environmental consciousness	26	17	7
2.	Improving environmental knowledge	18	11	11
3.	Improving qualifications of teachers	18	11	5
4.	EE in elementary science program	17	13	6
5.	Improving positive behaviour	12	12	4
6.	EE applications	12	8	12
7.	Financial sources	7	7	8
8.	Improving environmental awareness	7	4	1
9.	Trainings for parents	7	1	9
10.	EE in teacher education program	6	3	2
11.	Support of Authority	3	6	6
12.	Importance of EE	3	5	3
13.	Materials for EE	1	7	2

Table 4.23 (continued)

14. Motivation	1	5	1
15. Environmental problems	1	3	1
16. Environmental solutions	1	4	5
17. Information through media	1	3	2
18. Improving environmental attitude	1	3	1
19. Improving environmental sensitivity	1	3	1
20. Priority of Authorities	1	3	1
21. Improving environmental responsibility	1	1	2
22. Physical Facilities	1	1	0
23. Student Interest	1	0	1
24. Environmental Laws	0	3	0
25. Informal education	0	1	0
26. Cooperation	0	0	1

d. Perceptions of pre-service science teachers on the most significant three barriers for EE.

The most significant three barriers for the implementation of EE were asked to pre-service science teachers.

Among 144 responses received for the **first barrier**, 'financial source problems' has been mentioned as the most significant one (n=17). It has followed by the 'support of authority' and 'insufficient EE in elementary science program' as the second ranking of the first barrier (n=14) and 'lack of environmental consciousness' has been placed at the third ranking (n=12). Then, 'lack of environmental knowledge' and 'EE in teacher education program' have all shared the fourth ranking (n=11) and subsequently 'behavior toward environment' has been in the fifth ranking of the first barrier for EE (n=10).

128 responses have been received for detecting the **second barrier**. 'teachers' qualifications to teach EE', 'lack of environmental consciousness of individuals' and 'financial source problems' have all had the first priority ranking of second barrier (n=13). 'Lack of environmental knowledge' has been the second priority ranking (n=12) while 'behavior toward environment' has been at the third ranking (n=9). At the fourth ranking, 'support of authority' and 'environmental attitude' have both revealed (n=8) and 'importance of EE' has been responded as the fifth priority ranking (n=7).

For the **third barrier**, 95 responses were gathered. Among these responses, 'lack of environmental consciousness of the individuals' has been stated as the most significant one (n=8). 'Insufficiency of EE in elementary science program', 'lack of environmental knowledge' and 'deficiency in EE in teacher education program' have been at the same ranking (n=7), whereas 'importance given to EE', 'lack of environmental attitude' and 'lack of environmental sensitivity' have all shared the third ranking for the third barrier for EE (n=6). 'Financial source problems' and 'behavior toward environment' have all shared the fourth priority (n=5) and finally 'support of authority', 'lack of interest', 'teachers' qualifications', 'environmental attitude, consciousness and knowledge of parents, and 'EE applications' have all been at the fifth ranking (n=4).

Responses of the participants for the most significant barriers on the implementation of EE respectively are presented in Table 4.24.

Table 4.24 Perceptions of pre-service science teachers' on the most significant three barrier on EE

	Items (Part L)	Frequency L1	L2	L3
1.	Financial source problems	17	13	5
2.	Support of Authority	14	8	4
3.	EE in elementary science program	14	5	7
4.	Environmental consciousness	12	13	8
5.	Environmental knowledge	11	12	7
6.	EE in teacher education program	11	4	7
7.	Behaviour toward environment	10	9	5
8.	Lack of Interest	9	5	4
9.	Importance of EE	8	7	6
10.	Teachers' qualifications	6	13	4
11.	Environmental attitude	5	8	6
12.	Environmental attitude, consciousness & knowledge of parents	4	2	4
13.	EE applications	3	5	4
14.	Environmental sensitivity	3	4	6
15.	Priority of Authorities	3	4	3
16.	School opportunities	2	3	1
17.	Education system	2	2	2
18.	Environmental awareness	2	2	0
19.	Materials for EE	2	1	2
20.	Effect of Media	2	0	3
21.	Environmental responsibility	2	0	1
22.	Egocentricity	1	2	1
23.	Physical Facilities	1	0	2
24.	Environmental Laws	0	2	1
25.	Environmental solutions	0	2	1

Table 4.24 (continued)

26. Motivation	0	1	1
27. Cooperation	0	1	0
28. Environmental problems	0	1	0

Therefore the major result related to current state of EE in elementary schools science program in the words of pre-service science teachers is that, they have serious concern related to support from school administrtaions, materials and importance given to EE to improve EE. The major missing issues in the program pre-service teachers mention are related to ESD content, such as sustainable development, individual responsibilities and consumption patterns. According to pre-service teachers the most significant need for EE is improving environmental consciousness of the individuals and the mostly pronounced barrier is financial source problems.

4.3 In-service science teachers' versus pre-service science teachers' perceptions on EE: Multivariate Analysis of Variance:

A Multivariate Analysis of Variance (MANOVA) was conducted to compare in-service science teachers' and pre-service science teachers' perceptions on EE in the elementary science program, self-efficacy on EE applications, EE practices and needs for EE implementations. MANOVA was conducted for the independent variable groups; 1. in-service science teachers; 2. pre-service science teachers. The dependent variables were 4 factors of EE SoAQ mentioned above. The assumptions for conducting MANOVA are reported in the next section.

4.3.1 Assumptions for Multivariate Analysis of Variance (MANOVA)

The sample size (n=400) is suitable for conducting MANOVA since there are more cases in each cell than the number of dependent variables.

Skewness and kurtosis values and histograms were examined to check univariate normalities. Skewness and kurtosis values ranged between -.883 and 2.996, meaning that normal distribution was observed since the values are between -3 and 3 (Tabachnick & Fidell, 2007). Moreover, histograms with normal curves were checked in addition to skewness and kurtosis as evidence of normal distribution. Furthermore, Mahalanobis distance was calculated to check multivariate normality. It was found as 37.563 for this study, and comparing this value with the critical value stated by Pallant (2007), the values higher than the critical value was considered as an outlier.

Scatter plots for each pair of dependent variables were used to check linearity assumption and it was found that the linearity assumption was met.

Box's M was checked for homogeneity of covariance matrices. Box's M value calculated as .016 (p>.001) meaning that this assumption was not violated. Levene's test was also conducted for the assumption of equality of variances. This assumption was violated only for one of the factors (perceptions on EE in the elementary science program) (P=.008 < .05), and equal variances were assumed for other factors. Therefore, more conservative alpha level was set for the factor with violated assumption of equality of variances (Tabachnick & Fidell, 2001).

4.3.2 Perceptions of in-service science teachers versus pre-service science teachers on the current state of EE

A one-way between groups MANOVA was performed to examine the differences between the perceptions of in-service science teachers and pre-service science teachers on the current state of EE. Wilk's lambda as one of the most commonly preferred multivariate test statistic (Hair, Black, Babin, Anderson & Tatham, 2006) was considered. Results indicated that there was a statistically significant difference between the in-service science teachers' and pre-service science teachers' perceptions (Wilks' L = 0.953, F = (4, 386) = 4.804, p= 0.001 p < .05, $\eta 2$=.05).

Table 4.25 MANOVA for EE SoAQ by group

		df	F	Sig.	Partial eta squared
Group (in-service science teachers and pre-service science teachers)	Perceptions on EE in the elementary science program	1	2,707	,101	,007
	Self-efficacy on EE applications	1	1,516	,219	,004
	EE practices	1	4,264	,040	,011
	Needs for more effective EE	1	12,876	,000	,032

As seen in the Table 4.25, a follow up analysis were carried out to examine the results of the dependent variables separately. A higher alpha level, which is decided by Bonferroni adjustment, was used to reduce the chance of Type I error. Bonferronni adjustment is the most common method that is calculated by dividing the alpha by the number of comparisons (Pallant, 2007). In this study, alpha level (α=.05) was divided to four, since there were four dependent variables, and the new alpha value was calculated as .0125 for three of the factors. However, since one of the factors was violated the assumption of equality of variances, the alpha level for that factor (α=.4) was divided to four, and calculated as .01. As a result, it was found that there is a significant difference in the perceptions of pre-service science teachers and in-service science teachers on the needs for EE (p=.00 <.0125). Partial eta square value for this factor was .032, implying that 3.2 percent of the variance for the perceptions on EE needs can be explained by group difference.

Moreover, an inspection of the mean scores indicated that pre-service science teachers' perception on needs for more effective EE (M=4.418, SD=.469) was slightly higher than the in-service science teachers' (M=4.236, SD=.495). However, no significant difference was found for the perceptions of pre-service science teachers on EE practices and in-service science teachers' current practices in teaching EE in their classroom, their perceptions on EE in the elementary science program and self-efficacy on EE applications.

Table 4.26 below is presented in order to deepen the significant different found between the perception of pre-service science teachers and in-service science teachers on the needs for more effective EE through MANOVA. Assuming that the M values for the items in the related factor may give a detailed information on how the significant difference occurs, they are presented in the table. Therefore, the items more probably leading to the difference are listed respectively in Table 4.26, below.

Table 4.26 Mean values of the items that probably lead to the significant difference between the perception of in-service and pre-service science teachers on the needs for more effective EE

Items- perception on needs for more effective EE	M (pre-service science teachers)	M (in-service science teachers)
I.4. Improving teachers' knowledge on environmental issues	4.47	3.95
I.5. Improving teachers' knowledge on teaching methods for	4.47	4.00
I.8. Support of the school administration for EE implementations	4.59	4.32

Table 4.26 (continued)

I.6. Developing sources and materials for EE	4.47	4.20
I.15. Establishing student clubs on environment at schools	4.29	4.04
I.18. Improving the activities about environmental issues in the science textbook	4.45	4.20
I.9. Increasing the importance given to EE in schools	4.59	4.36
I.1. Increasing the time spent for EE in elementary schools	4.22	4.00
I.3. Organizing in-service training for EE	4.22	4.01
I.19. Generating a network for teachers to provide information exchange	4.39	4.18
I.11. Enhancing the motivation and interest of teachers for EE	4.43	4.23
I.7. Providing financial sources for field trips	4.60	4.41
I.16. Integration of EE to other lectures in the school program	4.40	4.26
I.12. Enhancing the motivation and interest of students for EE	4.50	4.35
I.2. Transforming EE issues in science program to sustainable development issues	4.15	4.02
I.10. Improving the physical structure (forestation, forming cultivation areas, laboratory, etc.) of schools	4.55	4.42
I.14. Enhancing the cooperation with universities in the context of EE	4.49	4.43
I.17. Motivating students to participate in national/international projects on EE	4.29	4.27
I.13. Improving support of parents for EE	4.48	4.50

As is displayed in Table 4.26, responses of the pre-service science teachers of this study display higher M values for all the items, except item K.13. For example, pre-service science teachers' perceptions related to the need for improving teachers' knowledge on environmental issues (Item K.4) is much higher compared to that in-

service teachers'. Similarly, more in-service science teachers agree with the item that asserts the need for improving teachers' knowledge on the teaching methods for EE, compared to that of in-service science teachers'.

4.4 Relationship between the characteristics of in-service and pre-service teachers and their perception on need for more effective EE

Pearson product-moment correlation coefficient value was calculated to examine the relationship between the characteristics of the two samples and their perception on need for more effective EE, and the results were represented in Table 4.27.

Table 4.27 Correlations between the characteristics of the samples and their perception on need for more effective EE

Groups	Measures	Sig. (p)	Pearson correlation
In-service science teachers	Age	.590	-.034
	Teaching experience	.361	-.058
	EE perception	.000	**.342**
	ESD perception	.592	-.034
Pre-service science teachers	Age	.272	.090
	EE perception	.183	-.109
	ESD perception	.001	**-.270**

Calculated Pearson product-moment correlation coefficients revealed that, there is a positive medium correlation between the EE perceptions of in-service science teachers and their perception on needs for more effective EE [r=.342, p<.05].

Moreover, there was a low negative relationship between the pre-service science teachers' perceptions on ESD and needs for more effective EE [r=-.270, p<.05].

No significant relationship was found between the in-service science teachers' age, teaching experience and ESD perception, and perception on needs for more effective EE; pre-service science teachers' age and EE perception, and perception on needs for more effective.

4.5 The current state of EE in teacher education programs in Turkey in the words of university lecturers

Responses of the university lecturers to the EE-U IP related to current state of EE is evaluated by qualitative analysis and the results are presented in this section corresponding to the schedule represented in Figure 4.19 below.

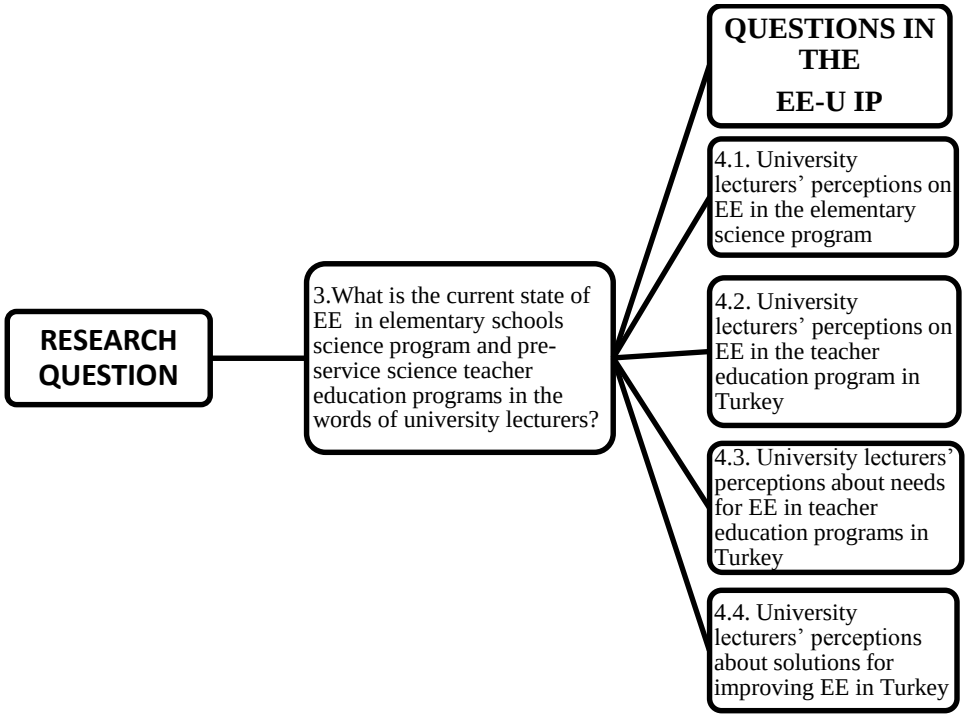

Figure 4.19 The schedule for evaluating qualitative results

4.5.1 Current state of EE in Turkey in the words of University Lecturers

Results of this section display university lecturers' perceptions on current state of EE in Turkey in two circumstances as; for elementary schools science program and for teacher education program. Responses of the participants to the EE-U IP will be evaluated in this section in the sequence of research questions listed in Figure 4.30. Abbreviations as P1, P2, P3 and P4 will be used in order to denote the participants from whom the data was gathered. As represented in Chapter 3, the participants were composed of the university lecturers (3 male; 1 female), who teach environmental education in Faculties of Education in two different public universities in Ankara.

Findings gathered from above mentioned data source are reported under five main categories consisting of a. university lecturers' perceptions on EE in the elementary schools science program, b. EE in the teacher education program, c. Needs for practicing EE in the university campus, d. Needs for EE in Turkey and e. Suggestions for improving EE.

As explained in the method chapter, categories and the sub-categories were determined before the content analysis through the need analysis handled while forming EE-U IP. Thus, the categories displayed in the following tables are similar with the dimensions of EE-U IP, and the codes were derived from the responses of the participants to the questions involved in EE-U IP concerning the perceptions on current state of EE in elementary schools science program and teacher education program. Categories, sub-categories and codes with sample quotations and frequencies regarding the perceptions of university lecturers on related headings mentioned above are presented in Tables correspondingly.

4.5.2 University Lecturers' Perceptions on EE in the elementary schools science program

University lecturers were asked four questions through EE-U IP concerning their perception on EE in the elementary school science program and the codes were determined from their responses. There were three sub-categories in the EE-U IP related to perception on EE in the elementary science education program as, necessity of including environmental issues in the elementary science program, teaching strategies and teaching practice; thus, the codes were determined under these sub-categories.

Necessity of including environmental issues in the elementary science program

University lecturers were asked if it is necessary to include environmental issues in the elementary science program together with their reasons. All of the university lecturers agreed on the idea that it is necessary to include environmental issues in the elementary science program.

One of the university lecturers mentioned that environment is related to our life; that is, environmental issues should be included in the elementary science program in order to help students to recognize that almost all life-supporting systems in our daily life (e.g. nutrition, health, jobs, shelter, etc.) are related with the environment and that the environment is part of our life. Moreover, one of the lecturers emphasized the importance of including environmental issues in the elementary science program to form lifestyles at young ages. Thus, teaching environmental issues at young ages is necessary for elementary school students to develop habits, awareness and behaviors in the favor of environment. One of the lecturers stated to improve environmental consciousness and environmental attitudes of the students as another reason for including environmental issues in elementary schools science program.

University lecturers were also asked how EE should be included in the elementary science program. Two different responses were received, which are necessity of a separate EE course and integration of EE to the other existing courses. One of the lecturers stated that there is a need for a separate EE course, while three lecturers mentioned that EE should be taught as being integrated to the other courses besides elementary science program. Related perceptions of the lecturers on the necessity of including environmental issues in elementary science program are presented in the Table 4.28 in detail.

Table 4.28 University lecturers' perceptions on necessity of including environmental issues in elementary science program

Sub-Category: Necessity of including environmental issues in elementary science program		
Q. Could you please explain why environmental issues should be involved in elementary science program?		
Codes	**f (#of persons)**	**Quotations**
Relatedness to life	1 (P4)	…the students should feel that environment is in our life (P4)
Developing lifestyles at young ages	1 (P2)	…because as it is said "as the twig is bent, so grows the tree". Habits and awareness concerning environment should be gained in elementary schools, even in the early childhood education (P2)
Improvement of environmental attitude and consciousness	1 (P4)	To improve the environmental consciousness and environmental attitudes of the students… (P4)

Table 4.28 (continued)

Q. How do you think that EE should be included in the elementary science program?		
Codes	**F**	**Quotations**
Need for a separate EE course	1 (P4)	I already believe that there is a need for a separate environmental education course (P4)
Integration to other courses	3 (P1, P3, P4)	… Besides, environmental education might be integrated into the other courses. (P4)
		I believe that EE should be taught together with the other courses (P3)
		There exists some points for EE to be integrated in all subjects. The teachers should mention this [EE] in all necessary subjects

Teaching strategies

Responses of the participants for the question about how to design an EE to increase its effectiveness are revealed in this category. One of the university lecturers stated that environmental issues involved in the science program should be provided gradually and increased systematically depending on the background of the students. One of the participants stated that EE should be given focusing on the basic information, while three of them perceive that both theoretical and practical implementations should be involved in EE. Moreover, one of the university lecturers stated that EE should focus on improving positive behaviors of the students, and daily life examples should be used in the lectures to help students making connections with real life. Related perceptions of the university lecturers on teaching strategies for EE are presented in the Table 4.29 in detail.

Table 4.29 University lecturers' perceptions on teaching strategies for EE

Sub-Category: Teaching strategies		
Q. How should EE be designed to increase its effectiveness?		
Codes	**f (# of persons)**	**Quotations**
Involvement of basic information	1 (P2)	Basic EE information should be provided taking the age of the students into consideration (P2)
Theoretical and practical implementation	2 (P2, P4)	It is unlikely to provide only theoretical information…It should be supported by field trips (P2)
		Practice should be involved along with the theory. By means of projects such as eco-schools, students can apply what they learn (P4)
Improvement of positive behavior	1 (P1)	The teaching methods should improve positive behaviors (P1)
Systematic intensification of EE issues	1 (P2)	EE programs should be modified step by step according to age and perceptions of the students as their grade level increases (P2)
Using daily life examples	1 (P1)	To emphasize the importance of plants and their protection during the topic photosynthesis is necessary. In this way, the students can link what they learned to the protection of environment (P1)

Teaching practice

University lecturers were asked to mention the teaching methods that would be useful for EE. One of the lecturers stated that student-centered teaching methods should be used with a teacher who could moderate the lesson well. Two lecturers mentioned outdoor activity (e.g. activities out of classroom, field trips and practices

in nature) as another teaching method to be used for supporting EE. Moreover, one lecturer stated that drama, role-playing, experiments and lecturing should be used for EE. Related perceptions of the university lecturers on teaching methods that should be used for EE are presented in the Table 4.30 in detail.

Table 4.30 University lecturers' perception on teaching methods for EE

Sub-Category: Teaching practice		
Q. Which teaching methods would be useful for EE?		
Codes	**f (# of persons)**	**Quotations**
Student-centered methods with teacher guide	1 (P4)	I think that teaching methods should be student-centered and that the teacher should be an effective moderator. (P4)
Outdoor activities	2 (P2, P3)	…the lecture might be supported by field trips (P2)
		The students can be taken to the school garden or a field trip can be organized and EE can be taught in nature if possible (P3)
Alternative methods (Drama, Role-playing, Experiments)	2 (P3, P2)	You can use drama or role playing in some of the environmental issues, which can be decided according to the topic (P3).
		Experiments can be beneficial… (P2)
Lecturing	1 (P3)	You can use lecturing for some of the topics… (P3)

4.5.3 University Lecturers' Perceptions and Implementations on EE in the teacher education program

University lecturers were asked about how they implement EE in the teacher education program within the framework of Environmental Science course they give. Questions focused on the target, objectives and context of the environmental science course, teaching methods and teaching strategies they use in this course, and their perception about opportunities provided by the university in relation to EE.

There are 5 sub-categories defined in line with the EE-U IP as given in the Table 3.15. Codes from the university lecturers' responses were determined in line with these sub-categories. The set sub-categories and the determined codes are presented below together with the participants' quotations.

Target of Environmental Science Course

University lecturers stated two targets for the course, which are improving environmental knowledge and generating environmental consciousness. Two university lecturers stated that the target of the course is to improve environmental knowledge of the students, while three of them mentioned that their main aim is to improve environmental consciousness of the students. Related perceptions of the lecturers on the mentioned codes are presented in the Table 4.31 in detail.

Table 4.31 University lecturers' perception on target of environmental science course

Sub-Category: Target of Environmental Science Course		
Q. What is the main target of the environmental science course?		
Codes	**Frequency (# of persons)**	**Quotations**
Environmental knowledge	2 (P4, P3)	To teach basic environmental issues to the students (P3)
Environmental consciousness	3 (P4, P3, P1)	To generate environmental consciousness of the students (P3) To raise individuals with environmental consciousness (P1)

Objectives of Environmental Science Course

Two of the university lecturers mentioned that the objectives of the environmental science course intended to enhance positive behaviors. For example, one of the lecturers declared that the students will be able to "Recall information about negative effects of throwing wastes around on the environment" and "Connect his or her daily life behaviors with their effects on earth" after attending this course. Three out of four university lecturers revealed that the objectives of the course focus on improving environmental knowledge of the students. For instance, two of the lecturers stated "Recognize the meanings of the basic ecologic terms" and "Interpret the effects of human behaviors on the environment" as objective to be gained after attending the environmental science course. Moreover, one of the lecturers said that the objectives of the course focus on improving environmental consciousness of the

students, while one of them stated improving environmental attitude as another objective of the course. Other related perceptions of the lecturers about the objectives of environmental science course are presented in the Table 4.32 in detail.

Table 4.32 University lecturers' perception on objectives of environmental science course

Sub-Category: Objectives of Environmental Science Course		
Q. What are the objectives of environmental science course?		
Codes	**Frequency (# of persons)**	**Quotations**
Positive behaviors	2 (P1, P4)	Recall information about negative effects of disposing wastes in the environment (P1)
		Connect his or her daily life behaviors with their effects on earth (P4)
Environmental knowledge	3(P2,P3, P4)	Recognize the meanings of the basic ecologic terms (P3, P4)
		Interpret the effects of human behaviors on the environment (P4, P2)
		Understand the terms sustainable development, global warming and ecological footprint (P3)
		Present their finding about environmental pollution to the class (P3)
Environmental consciousness	1 (P3)	The objectives of the course generally focus on improving environmental consciousness
Environmental attitude	1 (P4)	To improve environmental attitude towards environment

Context of Environmental Science Course

All of the university lecturers stated that they teach basic ecologic terms and environmental pollution in Environmental Science Course. Two of the lecturers mentioned that they explain biodiversity, environmental education and ecological footprint within the scope of this course. Moreover, all of the lecturers stated that pre-service science teachers learn how to teach EE in environmental science course; that is, since various teaching methods applied to pre-service science teachers in the environmental science course, they learn how to implement these methods in their future teaching career. Related perceptions of the university lecturers on topics involved in environmental science course are presented in the Table 4.33 in detail.

Table 4.33 University lecturers' perception on topics involved in environmental science course

Sub-Category: Context of Environmental Science Course	
Q. What are the topics included in the environmental science course?	
Codes	**Frequency (# of persons)**
Environmental pollution	4 (P4, P3, P1, P2)
Basic ecologic terms	4 (P4, P1, P2, P3)
Decomposition of wastes	1 (P1)

Table 4.33 (continued)

Renewable energy sources	1 (P1)	
Endangered species	1 (P1)	
Effect of pesticides	1 (P1)	
Biodiversity	2 (P4, P2)	
Environmental education	2 (P4, P2)	
Sustainable development	1 (P3)	
Global warming	1 (P3)	
Ecologic Footprint	2 (P3, P2)	
Environmental Problems	1 (P2)	
How to teach EE	4 (P1, P2, P3, P4)	The students will reflect the environmental attitudes they gained during environmental science course to their students in the future. (P4) Since the students were taught with various teaching methods during the environmental science course, they will be able to implement these methods in their future teaching career (P3) …the students learn how to teach environmental education during environmental science course (P1)

Teaching methods used in Environmental Science Course

Responses of the participants for the teaching methods they use during environmental science lectures indicated that field trip is used by all of the university lecturers, however its frequency differs. One of the lecturers stated

making use of field trips 3-4 times a year, while the rest of them stated that they use field trip once a year. Group project, lecturing, questioning, presentation, visual aids, and discussion is also declared as a method usually used by all of the lecturers. Problem based learning, case study, computer based activities and experiment were reported to be usually used by three lecturers. Responses related to the teaching methods used by the university lecturers in environmental science course are presented in the Table 4.34 in detail.

Table 4.34 University lecturers' perception on teaching methods used in environmental science course

Sub-Category: Teaching methods used in Environmental Science Course		
Q: Which teaching methods and activities do you use in the environmental science course?		
Codes	**Frequency (# of participants)**	**Quotations**
Group projects	4 (P4, P1, P3, P2)	
Discussion	4 (P4, P1, P2, P3)	
Presentation	4 (P4, P1, P2, P3)	
Visual aids	4 (P4, P2, P3, P1)	
Questioning	4 (P4, P2, P3, P1)	
Lecturing	4 (P4, P2, P3, P1)	
Problem based learning	3 (P2, P3, P1)	
Case study	3 (P3, P1, P4)	
Experiment	3 (P2, P3, P1)	

Table 4.34 (continued)

Computer based activities	3 (P2, P3, P4)	
Role-playing	2 (P3, P1)	
Drama	2 (P3, P1)	
Field trips	4 (P1, P2, P3, P4)	We organize field trips at least once a year (P4) We organize 3-4 field trips (e.g. waste water treatment facility, drinking water treatment facility, etc...) for each environmental science course (P1)

Teaching strategies used in Environmental Science Course

All of the university lecturers stated that they use daily life examples during environmental science course. It is preferred in order to help the pre-service teachers to understand easier and make them put into the practice the things they learned by connecting with their life. Two of the lecturers also mentioned that the course should be designed based on theoretical information that is supported by practical applications. Moreover, one of the lecturers stated using student-centered teaching methods in order to take the attention of the students. Responses related to the teaching strategies used by the university lecturers in environmental science course are presented in the Table 4.35 in detail.

Table 4.35 University lecturers' perception on teaching methods used in environmental science course

Sub-Category: Teaching strategies used in Environmental Science Course		
Q: Do you use daily life examples during environmental science course?		
Codes	**Frequency (# of participants)**	**Quotations**
Daily life examples	4 (P4, P1, P3, P2)	We should link to daily life in order to help students understand better(P3)
Q: What was your consideration while preparing environmental science course?		
Codes	**Frequency (# of participants)**	**Quotations**
Theoretical and practical implementations	2 (P4, P2)	First of all you should provide some information and then support by practice with current examples (P2)
Student-centered methods	1 (P4)	I use student-centered teaching methods while teaching environmental pollution (P4)

Opportunities provided by the University

According to the participants of this study, opportunities provided by the university for EE in the teacher education program were mentioned as transportation, lunch for field trips and classroom equipment. All of the university lecturers stated that

they use university facilities for the transportation of field trips through official permission. However, only one of the lecturers stated that university provides lunch boxes in addition to transportation facilities for the field trips. Two of the lecturers mentioned that there exist necessary equipment in the classroom for presentations or video watching. Related responses of the lecturers concerning university opportunities are presented in the Table 4.36 in detail.

Table 4.36 University lecturers' perception on opportunities of the university for EE in teacher education program

Category: Opportunities provided by the University		
Q. What are the opportunities provided by the university within the scope of the environmental science course?		
Codes	**Frequency (# of participants)**	**Quotations**
Transportation	4	The university provide transportation… (P3) …now the university provides only a bus for transportation… (P1)
Lunch box	1 (P3)	Sandwiches are provided for the field trips (P3)
Classroom equipment	2 (P4, P2)	Computer, internet and projector are mostly available in the classrooms (P4)

4.5.4 University Lecturers' Perceptions on the needs for practicing EE in the university campus

University lecturers were asked about their perceptions concerning the needs on the university campus for supporting EE and the codes were derived from their responses. Moreover, Sustainability Assessment Questionnaire (SAQ) was taken as a reference to compare the categories derived from EE-U IP and those of SAQ (ULSF, 2009). Two sub-categories included in the SAQ, which are "Practice" and "Student opportunities", were adopted to be used under needs for practicing EE in the university campus category. As a result two sub-categories were derived as needs for EE practices in the university campus and needs for the supporting opportunities for EE in the campus.

Needs for EE practices in the university campus

According to one of the lecturers of this study, practicing recycling would be a good opportunity for practicing and supporting EE on the university campus; however, they stated that the recycling system in the university is not developed well, and wastes are not collected separately. Besides, one of the lecturers stated energy conservation (lightening, heating, windows and doors) as another need to be considered. Related perceptions of the lecturers about the needs for practice in the universities are presented in the Table 4.37 in detail.

Table 4.37 University lecturers' perception on needs for practice in the universities

Sub-Category: Needs for the EE practices in the university campus		
Q. What type of EE needs do you think exists in your university?		
Codes	**Frequency (# of participants)**	**Quotations**
Recycling of solid wastes	1 (P1)	Wastes are not collected separately in the university (P1)
Energy conservation	1 (P1)	The lights in the classes stay on (P1) Windows or doors of the classes/rooms stay open while the heating is turned on (P1)

Needs for the supporting opportunities for EE in the campus

Among six university lecturers, three of them underlined the significance of physical facilities of a university (laboratories, laboratory equipment and crowded classes) in supporting EE in the campus. One of the lecturers on the other hand, stated that there is need for a separate EE course, while another two lecturers mentioned the need for including EE course for the students in other departments. Moreover, one of the lecturers mentioned that duration of the existing environmental science course should be increased as to be thought two semesters, and EE should be also provided as being integrated to other courses in addition to environmental science course. To further illustrate, related perceptions of the lecturers about the needs for opportunities of the universities are presented in the Table 4.38 in detail.

Table 4.38 University lecturers' perception on needs for opportunities of the universities

Sub-Category: Needs for the supporting opportunities for EE in the campus		
Q. What type of EE needs do you think exists in your university?		
Codes	**Frequency (# of participants)**	**Quotations**
Physical facilities	3 (P2, P3, P4)	Laboratories should be built (P2) Science museum or botanic garden should be built (P3) Having crowded classes is a big disadvantage (P4)
Need for a separate EE course	1 (P4)	There should be a separate course about environmental education (P4)
Duration of Environmental Science lecture	1 (P3)	I think the environmental science course included in the teacher education program should be taught in two semesters (P3)
Needs for EE course in other departments	2 (P1, P3)	This opportunity [EE course] should be provided to the students from different departments such as early childhood education, biology, physics, chemistry… (P3)
Integration of EE into other courses	1 (P3)	EE should not be only provided in environmental science course, but also be provided as integrated to other courses (P3)

4.5.5 University Lecturers' Perceptions on the needs for EE in Turkey

University lecturers were asked to priorities the most significant three needs about EE in Turkey. Therefore, their responses were mentioned as first, second and third needs respectively in order to figure out perceptions of the lecturers on EE needs.

Responses of the university lecturers for the most important EE needs included increasing environmental consciousness of the authorities, valid environmental laws, lack of qualified teachers concerning EE, in-service training programs, and improving environmental attitude of the individuals by one lecturer. Regarding the second important EE needs, one of the lecturers stated that academicians should be conscious about protecting the environment as a priority, awareness for EE should be increased and EE should be practicable. Integration of EE to other courses in the teacher education program were the needs stated as the third important need by one lecturer. Related perceptions of the lecturers about the perception on needs for EE are presented in the Table 4.39 in detail.

Table 4.39 University lecturers' perception on the most significant EE needs in Turkey

Category: The most significant EE needs in Turkey		
Q. What are the most significant three needs regarding EE in Turkey?		
Codes	**Frequency (# of participants)**	**Quotations**
Environmental consciousness	1 (P1)	The authorities should have environmental consciousness (P1)

Table 4.39 (continued)

Environmental attitude	1 (P4)	Improving environmental attitudes of the individuals (P4)
Environmental awareness	2 (P1, P2)	Increasing an awareness for the necessity of environmental education (P2)
		Academicians should become aware that protecting the environment is a social responsibility and they should consider it as a priority (P1)
Environmental knowledge	1 (P3)	In-service training should be provided to the teachers (P3)
Curriculum	1 (P3)	Environmental education should not only be involved in the environmental science course but also integrated in other courses in the teacher education program (P3)
Physical facilities	1 (P2)	Comprehensive laboratories should be set up in Universities (P2)
EE applications	1 (P3)	Environmental education should be practicable. The students should learn directly by practicing (P3)

4.5.6 University Lecturers' Perceptions on suggestions for improving EE

University lecturers were asked about the suggestions to improve environmental education on the basis of individuals, local authorities, universities and NGOs including the cooperation examples between them. Codes derived from the responses of the university lecturers were handled under three sub-categories which are suggestions for individuals, suggestions for authorities and suggestions for cooperation between local authority, NGOs and universities.

Suggestions for individuals to improve EE

Two of the university lecturers emphasized developing environmentally responsible behaviors of individuals; thus, people should give attention to energy conservation, collecting waste oil and batteries, and recycling of solid wastes. One of the university lecturers stated that environment should be clean in university campuses, environmental knowledge of the individuals should be improved, and the politicians should be demanded to act environmental friendly. Related perceptions of the lecturers about the perception on suggestions for individuals to improve EE are presented in the Table 4.40 in detail.

Table 4.40 University lecturers' perception on suggestions for individuals to improve EE

Sub-Category: Suggestions for individuals to improve EE		
Q. What should individuals, local authority, universities, NGOs do to improve EE?		
Codes	**Frequency (# of participants)**	**Quotations**
Clean environment	1 (P1)	Environment should be clean in the places where involve enlightened people [universities]
Developing environmentally responsible behavior	2 (P3, P1)	…I turn off the heating since it is warm enough, but the doors and windows in the classrooms and in most of my colleagues' rooms stays open when the heating is turned on… (P1) We can collect waste oil, waste batteries and solid wastes separately (P3)

Table 4.40 (continued)

Developing environmental knowledge	1 (P4)	Teachers should be qualified about EE and how to teach EE; they should also know the common environmental problems in the country (P4)
Desire environmentally friendly political action	1 (P1)	… municipality president candidate asked people their desires in one of his visits to society…one of my friends asked him what he thinks about the environment and what he will do to protect environment. The candidate answered as no body offered this before… (P1)

Suggestions for authorities to improve EE

Three of the university lecturers stated that priorities of the authorities should be changed in the favor of the environment. Thus, authorities should give more importance to EE rather than considering economic concerns and they should make EE remain on the agenda. One of the lecturers mentioned that environmental consciousness of the authorities should be increased and qualified experts concerning EE should work in related areas. Related perceptions of the lecturers about the perception on suggestions for authorities to improve EE are presented in the Table 4.41 in detail.

Table 4.41 University lecturers' perception on suggestions for authorities to improve EE

Sub-Category: Suggestions for authorities to improve EE		
Q. What should individuals, local authority, universities, NGOs do to improve EE?		
Codes	**Frequency (# of participants)**	**Quotations**
Priority of authorities	2 (P1, P2, P3)	Whatever needed to protect the environment should be done, however it can not be with an administration having economic concern (P1) Local authorities should give more importance to EE (P2) EE should be included in the school curriculum and textbooks adequately (P3)
Increasing environmental consciousness	1 (P1)	Authorities do not pay attention to this [energy conservation]. Universities should also focus on this issue.
Qualified experts on environmental issues	1 (P1)	People do not work in the field (e.g. environment, engineering, administration, education, etc.) they qualified.

Suggestions for cooperation between local authority, NGOs and universities authorities to improve EE

All of the university lecturers agreed that there should be cooperation between the local authority, NGOs and Universities. Two of the lecturers remarked on activities, such as planting trees, organizing seminars or symposiums, training for farmers, etc., as various contributions to this cooperation in order to increase environmental awareness, environmental consciousness and environmental knowledge of

individuals. Moreover, three of the lecturers stated that activities to improve positive behavior of the individuals should be handled, while one of them said that they should improve environmental attitudes of people. One of the lecturers mentioned that in-service training for teachers should be organized and various environmental education applications like eco-schools should be conducted in schools. One of the lecturers stated graduate courses for teachers' needs as another cooperation example, since most of the students in master program of elementary science education department are also science teachers, and this courses will enhance them to perform applications in their teaching career. Related perceptions of the lecturers about the perception on suggestions for cooperation to improve EE are presented in the Table 4.42 in detail.

Table 4.42 University lecturers' perception on suggestions for cooperation between local authority, NGOs and universities authorities to improve EE

Sub-Category: Suggestions for cooperation between local authority, NGOs and universities authorities to improve EE		
Q. What should individuals, local authority, universities, NGOs do to improve EE?		
Codes	**Frequency (# of participants)**	**Quotations**
Increasing environmental awareness	1 (P3)	Environmental awareness should be increased (P3)
Increasing environmental consciousness	2 (P2, P3)	Various activities such as planting trees, organizing seminars or symposiums can be handled with the cooperation of municipalities, NGOs and universities in order to increase environmental consciousness of people (P2) Environmental consciousness should be developed in all humans (P3)

Table 4.42 (continued)

Increasing environmental knowledge	1 (P3)	Local authority, universities and NGOs should cooperate…For example, local authorities can organize trainings for farmers with the help of related persons from universities and NGOs (P3) People should be informed about recycling, collection of waste oil and batteries (P3).
Increasing environmental attitude	1 (P2)	…its aim is to increase environmental attitudes of the people [by handling activities in cooperation]
In-service training	1 (P4)	In-service training about EE is necessary for teachers since they skip teaching EE when they do not feel qualified about EE (P4)
Graduate courses for teachers needs	1 (P4)	Most of the master students in here [elementary education science program] are teachers. I try to provide courses to enhance them perform applications in their teaching career. I believe that they will teach more focusing on practicable applications if they feel qualified in that subject, and I motivate them in this sense.
Improving positive behaviors	3 (P5, P3, P2)	Projects about recycling of the solid wastes can be piloted in cooperation with a municipality and university by randomly selecting one university (P5) …Municipality should direct people to dispose their wastes separately to the recycling bins…. (P3)
Environmental applications in schools	1 (P4)	It would be beneficial if universities, NGOs and local authority work in a cooperation…Eco-schools is an example of cooperation between NGOs, local authority and elementary schools (P4)

Summary of the university lecturers' perceptions on EE in the elementary schools science program, EE in the teacher education program, needs for practicing EE in the university campus, needs for EE in Turkey and suggestions for improving EE are listed in Table 4.43 below, together with corresponding sub-categories. Codes derived from the responses of the university lecturers were named as perception in this table in order to figure out the whole picture concerning the above mentioned categories.

Findings of the EE-U IP concerning perceptions of university lecturers on EE in elementary schools science program revealed that environmental issues should be included in the elementary science program since environment is directly related with our life, and it will help students to adopt a lifestyle in favor of the environment starting from young ages, even from the early childhood education. Moreover, environmental issues at elementary level should be taught by both theoretical and practical applications which are composed of basic information and supported by outdoor activities.

As for the responses of the university lecturers concerning EE in the teacher education program through Environmental Science Course they give, they indicate that the main target of the course is to improve environmental knowledge and environmental consciousness of the students, and that the objectives of the course focus on enhancing positive behaviors and improving environmental knowledge. The course gives both theoretical information (e.g. basic ecologic terms, environmental pollution, biodiversity, environmental education, ecological footprint, etc.) and practical applications (e.g. field trips, group projects, etc.) which include transportation for field trips provided by the university. On the other hand, university lecturers stated that universities do not pay attention to recycling of the wastes and energy conservation; that is, the wastes are not collected separately and lights left turned on unnecessarily and doors or windows left open when the heating is turned on.

The most important EE needs stated by the university lecturers includes lack of authorities with environmental consciousness, environmental laws, qualified teachers to teach EE and individuals having an environmental attitude. Therefore, suggestions of the participants for improving EE focuses on improving cooperation between the local authority, NGOs and Universities, increasing environmental knowledge and environmental awareness of the individuals, and enhancing positive behaviors of the administration.

Table 4.43 Summary of categories, sub-categories and perceptions of the university lecturers

Category: Perception on EE in the elementary schools science program (Tables 4.28; 4.29; 4.30)	
Sub-Categories	**Perceptions**
1. Necessity of EE in science education program	a. Developing life styles at young ages
	b. Relatedness to life
	c. Improvement of environmental attitude and consciousness
	d. Need for a separate EE course
	e. Integration to other courses
2. Teaching strategies	a. Involvement of basic information on EE
	b. Theoretical and practical implementation
	c. Improvement of positive behavior
	d. Improvement of motivation
	e. Systematic intensification of the EE issues
	f. Using daily life examples
	g. Integration to all subjects

Table 4.43 (continued)

3. Teaching practice	a. Student-centered methods with teacher guide b. Outdoor activities c. Visual aids d. Alternative methods (Drama, Role-playing, Experiments etc..) e. Lecturing
Category: Perceptions and Implementations on EE in the teacher education program (Tables 4.31; 4.32; 4.33; 4.34; 4.35; 4.36)	
Sub-Categories	**Perceptions**
1. Target of Environmental Science Course	a. Environmental knowledge b. Environmental consciousness
2. Objectives of Environmental Science Course	a. Positive behaviors b. Environmental knowledge c. Environmental consciousness d. Environmental attitude
3. Context of Environmental Science Course	a. Environmental pollution b. Basic ecologic terms c. Decomposition of wastes d. Sustainable use of natural resources e. Renewable energy sources f. Endangered species g. Effect of pesticides h. Biodiversity i. Environmental education j. Sustainable development k. Global warming l. Ecologic Footprint m. Environmental Problems n. How to teach EE

Table 4.43 (continued)

4. Teaching methods used in Environmental Science Course	a. Group projects b. Discussion c. Presentation d. Visual aids e. Questioning f. Lecturing g. Problem based learning h. Case study i. Experiment j. Computer based activities k. Role-playing l. Drama m. Field trips
5. Opportunities provided by the University	a. Transportation b. Lunch box c. Classroom equipment
6. Teaching strategies used in Environmental Science Course	a. Daily life examples b. Theoretical and practical implementations c. Student-centered methods
Category: Perception on the needs for practicing EE in the university campus (Tables 4.37; 4.38)	
Sub-Categories	**Perceptions**
1. Needs for practicing EE in the university campus	a. Recycling of solid wastes b. Energy conservation

Table 4.43 (continued)

2. Needs for the supporting opportunities for EE in the campus	a. Physical facilities b. Need for a separate EE course c. Duration of Environmental Science lecture d. Need for EE course in other departments e. Integration of EE into other courses
Category: Perception on the needs for EE in Turkey (Table 4.39)	
Sub-categories	**Perceptions**
-	a. Environmental consciousness b. Environmental perception c. Environmental attitude d. Environmental awareness e. Environmental knowledge f. Curriculum g. Physical facilities h. EE applications
Category: Suggestions for improving EE (Tables 4.40; 4.41; 4.42)	
Sub-categories	**Perception**
1. Suggestions for individuals	a. Clean environment b. Energy conservation c. Developing environmentally responsible behavior d. Developing perceptions in the favor of environment e. Desire environmentally friendly political action f. Developing environmental consciousness g. Developing environmental knowledge

Table 4.43 (continued)

2.	Suggestions for authority	a. Priority of authorities b. Increasing environmental consciousness
3.	Suggestions for cooperation between local authority, NGOs and Universities	a. Increasing environmental awareness b. Increasing environmental consciousness c. Increasing environmental attitude d. In-service training e. Graduate courses for teachers needs f. Improving positive behaviors g. Environmental applications in schools

4.6 Evaluation of the results in line with AS-IS & TO-BE approach.

Over the past three decades, researchers have increasingly recognized that including multiple methods into a single evaluation often results in a stronger, more complete evaluation than conventional evaluation approaches relying on only one method. This trend has led to a rapidly growing interest in mixed-method evaluations among both practitioners and evaluators. As reported in the USAID's Evaluation Policy (2013), "Given the nature of development activities, both qualitative and quantitative methods yield valuable findings, and a combination of both often is optimal." (p. 4) However, evaluating the data collected from multi-layered mixed methods is often more complicated than analyzing the data derived from one method and/or single layer methods since the evaluator must integrate multiple data analysis methods in order to determine and understand key findings. Therefore, for

most of the cases, evaluations for multi-layered mixed method is subject specific and the choice of technique depends on the purpose of the evaluation and the type of data involved as well as time and resources available (USAID, 2013). Accordingly, depending on the purpose, research questions and the nature of the data, As-Is & To-Be approach was used in this study for presenting the results in a more structured way. As-Is & To-Be Analysis is the term given to producing flowcharts and process maps that depict the current situation and then go on to develop the future presentation. The As-Is corresponds to detailed presentation of the process, which presents data and highlights opportunities for improvement, as it is performed today. The To-Be can either be a required process addressing the problems from the As-Is analysis or a completely new process design that takes into account information from the As-Is analysis. Therefore, As-Is & To-Be approach is adapted to the results of this thesis in order to better represent the similarities and discrepancies among perceptions of participants gathered to answer the research question: How does EE in the science teacher education program meet the needs as reported by pre-service and in-service science teachers?

4.6.1 As-Is & To-Be Model for EE in the Elementary Science Program

As mentioned in Chapter 2, environmental education in elementary schools is included only as a chapter in the science course. However, the perceptions of university lecturers concerning how EE should be included in the elementary science program indicated the necessity of a separate EE course and integration of EE to the other existing courses. Majority of in-service science teachers and pre-service science teachers also agreed that EE should be integrated to all courses in elementary education.

The responses of the university lecturers for the EE-U IP indicated that environmental issues should be included in the elementary science program for improving environmental consciousness and environmental attitudes of the students, enhancing them to realize that our life is related to the environment, and

that the environment is part of our life. By contrast, the responses of the in-service science teachers indicated that the environmental issues included in the science program are not adequate to equip students with environmental awareness (45%) while pre-service science teachers stated that they are adequate for making students improve environmental awareness (45%). Furthermore, pre-service science teachers perceived that environmental issues included in elementary science program is adequate for students to understand that environmental problems are part of their life (45%), and involve the concept of sustainable development (51%). However, no consensus on the responses of in-service science teachers were found on the adequacy of the science program to reflect the idea that environmental problems are part of our lives and inclusion of the concept of sustainable development. Moreover, 79% of the in-service science teachers and 85% of the pre-service science teachers stated the need for transforming EE issues in science program to sustainable development issues.

Looking at the current situation of EE in the teacher education program, the objectives of the environmental science course mentioned by the university lecturers include improving positive behaviour and environmental knowledge, which is also stated as necessary for EE. However, in-service science teachers stated that the elementary science program is not adequate for enhancing the positive behaviors of students towards environment and improving environmental knowledge (45%) while pre-service science teachers stated its adequacy (43%).

As mentioned in the quantitative result section, a significant difference was found between the pre-service science teachers and in-service science teachers perception on EE needs through MANOVA (Table 4.25) Also, comparing their mean scores indicated that pre-service science teachers perceptions on EE needs are slightly higher than in-service science teachers. Relating their responses to the university lecturers' answers specified some similarities on the EE needs perceptions. For example, as also displayed in Figure 4.20, university lecturers stated that priority of

authorities should be changed, and EE should be included in the school curriculum and textbooks adequately. Moreover, 87% of the in-service science teachers and 97% of the pre-service science teachers mentioned that the support of the school administration for EE implementations should be improved, 75% of the in-service science teachers and 83% of the pre-service science teachers stated that the time spent for EE in elementary schools should be increased. 95% of pre-service science teachers and 90% of in-service science teachers stated that more importance should be given to EE in elementary schools.

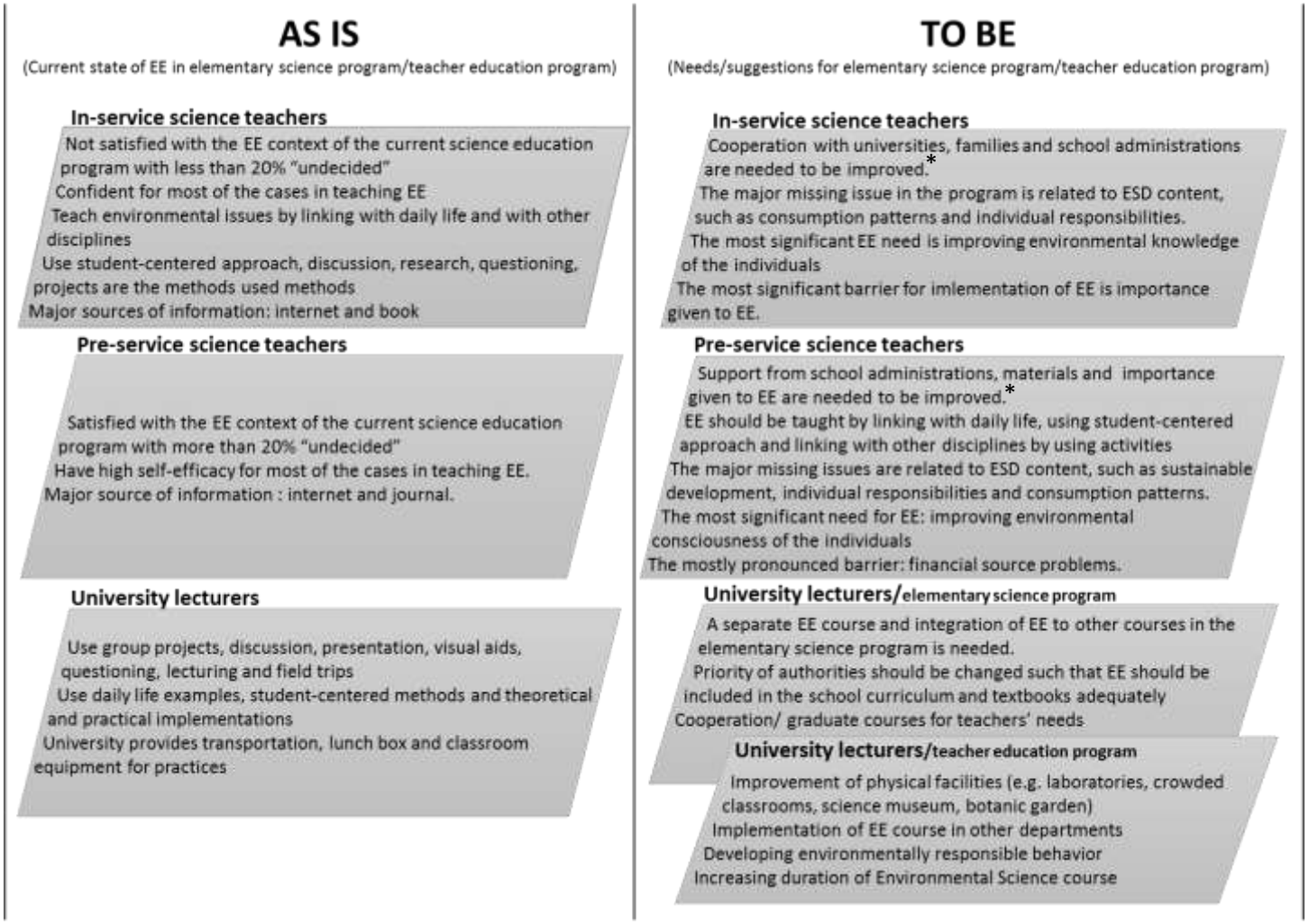

Figure 4.20 As-is To-be: Current state of EE & needs/suggestions in elementary science program/teacher education program

* The result of the MANOVA indicated that there is a significant difference in the perceptions of pre-service science teachers and in-service science teachers on the needs for more effective EE ($p=.00 < .0125$).

To sum up, as-is to-be model was used to better figure out the findings of this study. The responses of the participants for EE SoAQ and EE-U IP indicated that, university lecturers, pre-service teachers and in-service teachers perceive that environmental issues should be included in the elementary science program as well as being integrated to other courses in the elementary education. Moreover, university lecturers believe that EE should include daily life examples while the majority of the in-service science teachers stated that they use daily life examples when they teach the environmental issues in the science program, and most of the pre-service science teachers mentioned that daily life examples should be used. While considering the usage of outdoor activities, university lecturers mentioned its importance for supporting EE, and half of the pre-service teachers' perceived that it should be used, but only a small minority of the in-service science teachers stated that they use outdoor activities for EE. Perception of university lecturers, pre-service teachers and in-service teachers for EE needs were mainly similar in terms of providing in-service training, support of the authorities and developing cooperation, except that pre-service teachers perceive higher needs than the in-service teachers concerning these needs on EE.

4.7 Summary of the Results

The purpose of this study is to examine the current state of implementations and the needs concerning EE in elementary school program and teacher education program in Turkey in the words of three levels of people who engaged in education. The data collected through EE SoAQ conducted with in-service science teachers and pre-service science teachers and EE-U IP implemented to university lecturers were used in order to explore the current state of EE and the needs concerning EE in elementary school science program and teacher education programs in Turkey.

The analysis of the EE SoAQ revealed that pre-service science teachers have a tendency that EE in the elementary science program is not adequate in many aspects

such as increasing environmental knowledge, awareness and behavior, whereas in-service science teachers have a tendency that EE in elementary science program is adequate in those aspects.

Both in-service science teachers and pre-service science teachers found to have a high self-efficacy for most of the items such as having adequate knowledge and necessary skills to teach the environmental issues involved in the science program, being able to use various activities while teaching and answer students' questions.

Current practices of in-service science teachers in teaching EE in their classroom contains usage of student-centered approach, linkage with daily life and with other disciplines and the teaching methods majorly used by them included discussion, research on a certain topic, questioning, individual or group projects. Similarly, pre-service science teachers' perceptions indicated that EE should be taught by using student-centered approach, linking with daily life and other disciplines and the teaching methods for EE should include problem-based learning, questioning, discussion, video, field trips and case study.

For the needs about more effective EE, in-service teachers have serious concerns related to the cooperation with universities, support of families and school administrations, whereas pre-service teachers indicated serious concerns related to the support of school administrations, sources and materials related to EE and financial sources for field trips.

Moreover, MANOVA was conducted to compare the perceptions of in-service science teachers and pre-service science teachers and a significant difference was found for their perceptions on the needs for more effective EE.

The analysis of the EE-U IP revealed that university lecturers perceive that environmental issues should be included into the elementary science program since the environment is a part of our life and the students should recognize that our lives

are related with the environment. Moreover, university lecturers stated that EE should include daily life examples, theoretical and practical implementations and be integrated to all subjects in order to increase its effectiveness, in addition to the usage of student-centered methods (e.g. field trips, drama, role-playing, experiments, etc.), lecturing and visual aids.

Perceptions of university lecturers on the needs concerning EE in the teacher education programs included not having well developed recycling systems and not paying attention to the energy conservation (lightening, heating, windows and doors). Improving the cooperation between the local authority, NGOs and universities in order to increase environmental awareness, consciousness and knowledge of individuals and enhancing their environmentally responsible behaviors was the major solution suggested by the university lecturers.

CHAPTER 5

DISCUSSION, CONCLUSION and IMPLICATIONS

This chapter is presents the discussion of the results achieved in this study. The results was discussed with respect to their consistency with the international and national studies.

5.1 Discussion of the Results

In this section, the key findings from the questionnaire and the interviews of the study related with the perceptions of in-service science teachers, pre-service science teachers and university lecturers on current state of EE and the needs for more effective EE are presented.

5.1.1 Current state of EE in elementary science program and teacher education program

The present study has shown a balanced distribution in the perceptions of in-service science teachers in terms of agreement on the adequacy of EE in elementary science program in many aspects. No consensus has been revealed concerning not only the inclusion of the sustainable development concept into the science program but also the adequacy of the science program for making students be aware of that environmental problems are a part of their lives. This might be due to the barrier "lack of necessary expertise on sustainable development" as mentioned by Borg et al. (2012). By contrast, Cavas et al. (2014) stated that sustainable development mainly does not integrated to the lectures in the schools of education in Turkey. The tendency of the perceptions on the sufficiency of the program included reflection

of the daily environmental problems (50%), whereas the tendency of the perceptions on the insufficiency of the program included equipping the students with environmental knowledge, awareness and behavior (45%). Pre-service science teachers' perceptions on the current state of EE in the elementary school science program have also represented equal distribution in many aspects. However, their tendency in relation to the sufficiency of EE in the elementary science program included increasing environmental knowledge, awareness and behavior of the students as well as recognizing that environment is a part of their lives (45%). Moreover, pre-service teachers perceive that the environmental issues and activities involved in science program reflect daily environmental problems (60%) and include the concept of sustainable development (52%). Thus, using multi-level mixed mixed method design indicated that the perceptions on the sufficiency of the EE in the elementary science programs varies in the different levels of participants, which emphasize the complexity of the current situation of EE looking from the different perspectives and necessity for conducting more multi-level design studies.

Qualitative data collected through EE-U IP from university lecturers also confirm the inclusion of the environmental issues into the elementary science program since the environment is a part of our life and the students, starting from young ages, should realize that our lives are in close relation with the environment. Therefore, as stated by the university lecturers, EE should aim to increase environmental attitude and consciousness of the students and to guide them to behave towards the environment in a positive manner. Furthermore, Günay et al. (2015) found that pre-service science teachers believe that the major goal of EE should be the improvement of the positive behavior.

Both in-service science teachers and pre-service science teachers are confident for most of the cases while teaching EE such that they have adequate knowledge and necessary skills to teach the environmental issues involved in the science program, they can use various activities while teaching and can answer students' questions.

Ko & Lee (2003) also found that secondary school science teachers in Hong Kong have moderate self-efficacy. However, Sia (1992) and Gardner (2009) found that pre-service teachers have negative self-efficacy in terms of having adequate knowledge and having necessary skills to teach EE and they could not answer students' EE questions. Finding that the pre-service teachers in this current study have a high self-efficacy could be because of their professional maturity and being excited about their career (Moseley, Reinke & Bookout, 2003).

Current practices of in-service science teachers in teaching EE in their classroom include the instruction by linking with daily life and with other disciplines, the usage of student-centered approach through the activities in the science textbooks they develop or the adaption from other sources. Pre-service science teachers were also agreed on the idea that EE should be taught by linking with daily life, using student-centered approach and linking with other disciplines in addition to using activities that should be developed or adapted from other sources by teachers for EE. University lecturers of the current study also stated that EE should include daily life examples, theoretical and practical implementations and be integrated to all subjects in order to increase its effectiveness. Concerning the teaching methods, more than half of the in-service science teachers usually perform discussion (55.2%), research (54.8%), questioning (51.2%), individual or group projects (50.8%), whereas pre-service teachers suggested problem-based learning (54.0%), questioning, discussion and video (52.7%), field trips and case study (50%) to be used generally for EE. Field trip was also suggested for the teaching methods in EE by both researchers in the literature (Kennedy et al., 1986; Sydow, 2012) and the university lecturers of this current study. Moreover, Monroe et al. (2002) mentioned that teachers in Florida use any type of lesson performed outdoors. On the contrary, Ko & Lee (2003) found that science teachers in Hong Kong prefer traditional methods such as lecturing that require less preparation time. Only 27.2% of the science teachers in Hong Kong stated that they used field trips, which is similar to the responses of the in-service science teachers involved in this current study

(15.2%). In another study, Borg et al. (2012) revealed that teachers in Swedish upper secondary schools mostly use discussions (38%), interactive lectures (32%) and group projects (27%). As also mentioned by the university lecturers included in this study, student-centered methods should be preferred by the teachers, in addition to the lecturing, visual aids and alternative methods (e.g. drama, role-playing, experiments, etc.).

Looking at the EE in teacher education program, the environmental issues in the environmental science course, as mentioned by the university lecturers of his study, mainly included basic ecologic terms, environmental pollution, biodiversity, environmental education and ecological footprint. Andrades (2015) on the other hand, stated that the main topics of such courses in the Spanish Universities are environmental controlling, sustainable tourism, environmental economy or environmental influence. Furthermore, as a part of the environmental science course, university lecturers do not train pre-service teachers on how to teach EE since they believe that pre-service teachers attending this courses could learn the teaching strategies and techniques of EE and implement in their future teaching careers by just attending their course. Similarly, Lane (1994) found that the teachers in Wisconsin do not give training on how to use teaching strategies of EE with the reasons of not having sufficient time. Teaching methods used by university lecturers of the current study for the environmental science course are mainly stated as field trips, group projects, lecturing, questioning, presentation, visual aids, and discussion. Likewise, Christie et al. (2013) found that academicians in Australian Universities use lectures, tutorials, critical thinking and discussions in their teaching.

5.1.2 Needs for more effective EE

The findings of the EE SoAQ indicated that in-service teachers have serious concerns related to the cooperation with universities (94.4%), support of families (91.6%) and school administrations (87.2%) to improve EE. Moreover, they

perceive that physical structure of schools should be improved (90.4%), importance given to EE (90.4 %) and financial sources provided for field trips (89.6%) should be increased. Pre-service teachers also stated similar needs but at different priority levels. Responses of pre-service teachers indicated serious concerns related to the support of school administrations (97.3%), sources and materials related to EE (97.3%) and financial sources for field trips (96.0%). Moreover, they perceive that importance given to EE in elementary schools (95.3%), cooperation with universities (94.7%) and motivation and interest of students for EE (94.7%) should be increased. Similar findings were found in the literature. Meichtry and Harrell (2002) stated field trip opportunities (83%), curriculum resources (74%) and lesson plan and curriculum ideas (70%) as some of the significant needs for EE implementations. Yangın & Filik İşçen (2013) also mentioned inadequate educational materials, lack of classroom equipments (e.g. overhead projector, datashow, etc.), insufficiant sources about EE in the library and crowded classes as the major needs in the teacher education programs. University lecturers in this current study also mentioned the lack of qualified teachers for EE as one of the significant needs while majority of the pre-service science teachers and almost 80% of the in-service science teachers stated the need for improving the knowledge of the teachers regarding environmental issues and teaching methods that can be used for EE. Necessity of organizing in-service training concerning EE was also mentioned by both university lecturers, pre-service science teachers (86%) and in-service science teachers (77%) as another important need. Moreover, in his study Lane (1994) found that although the teachers have positive attitudes toward environment they spend less than half an hour per week for environmental issues. The major reason for not including environmental issues into their instruction is the lack of training in EE.

The major needs about the inadequate environmental issues included in the elementary science program as mentioned by the in-service science teachers were consumption patterns, sustainable development, developing individual

responsibilities activities about environmental problems, deforestation and approaches in Turkey to environmental problems. Similar responses with different ranking were given by the pre-service teachers sequentially as sustainable development, developing individual responsibilities activities about environmental problems, use of sustainable sources, consumption patterns, renewable energy sources and environmental problems approach in Turkey. However, with the new national science education program that was started to be implemented gradually in 5th grades in 2013-2014 education year, some of these mentioned issues (e.g. sustainable development, sustainable use of resources, individual responsibilities) were improved in different grades (Table 5.1). Therefore, the implementation of these issues should be observed with conducting more research in order to recognize their influence on the students' environmental knowledge, attitudes, awareness and behaviors.

Table 5.1 Comparison of perceptions of in-service teachers and pre-service teachers on the environmental issues needed to be improved in the elementary science program with the new science program

Environmental issues needed to be improved	**In-service teachers (%)**	**Pre-service teachers (%)**	**Sample objectives in the new science curriculum**
Consumption patterns	61.6	54.7	-
Sustainable development	60.4	70.7	8th Grade
Use of sustainable sources	42.8	55.3	8.5.3.1. Designs and plans projects for economic usage of natural resources
Renewable energy sources	36	53.3	8.5.3.2. Investigates the significance of disposing solid wastes and its economic contribution, and suggests solutions related to this.

Table 5.1 (continued)

Developing individual responsibilities activities about environmental problems	59.2	56	7th Grade 7.3.5.3. Examines the recycling in terms of effective usage of sources. 7.3.5.4. Develops sense of responsibility on the local waste disposal.
Deforestation	58.8	42	5th Grade 5.5.2.1. Investigates the environmental problems that arise through the human actions and suggests solutions for reducing these problems.
Approaches in Turkey to environmental problems.	58.4	53.3	-

Needs concerning EE in the teacher education programs, as stated by university lecturers of this study related with the practices in university campus included not having well developed recycling systems and not paying attention to the energy conservation (lightening, heating, windows and doors). Similarly, Cavas et al. (2014) found a low frequency in sustainable campus facilities supplied for the students (e.g. sustainable use of energy and water).

There exists certain reasons that may arise an unwillingness among the instructors in the utilization of community resources while fulfilling their environmental education instruction purposes. These probable barriers causing such reluctance can be the involved time commitment, additional costs, safety issues, inexperience in using community resources and the lack of support (Ciffone, Morelock, Turner,

Sivek & Daudi, 2002). Further through, lack of time for preparation and implementation of EE as well as the budget have been mentioned as the most common barrier by several researchers (Monroe et al., 2002; Ko & Lee, 2003; Ardoin and Sivek, 2002; Borg et al., 2012). Financial source problems and not providing adequate time for EE in the elementary science program and teacher education program were also stated by both in-service science teachers and pre-service science teachers of this current study.

The most common barriers stated by in-service science teachers included giving sufficient importance to EE (n=18); lack of environmental laws, environmental consciousness and knowledge (n=14); negative behavior toward environment (n=13); lack of support of authority (n=12). Similar barriers with different rankings were mentioned by the pre-service science teachers. The major obstacles they mentioned included lack of support of authority; lack of environmental consciousness (n=12); lack of environmental knowledge and EE in teacher education program (n=11); negative behavior toward environment (n=10). Lack of support from the school management (Borg et al., 2012) as well as the insufficient EE programs, lack of materials and lack of training for teachers (Ko and Lee, 2003; Powers, 2004; Ardoin and Sivek, 2002; Littledyke, 1997) were also mentioned as some of the significant barriers. Not providing inspiring examples of how to include ESD in their instructions, not having necessary expertise (Borg et al., 2012), limited policy development, lack of coordinator, limited interest of teachers for EE and limited understanding of the nature of science (Littledyke, 1997) could be other obstacles for EE implementations.

5.1.3 Suggestions to improve EE

There might be some possible remedies for the barriers causing educators to be unwilling in the implementation of the environmental education (Ciffone et al., 2002). As the qualitative part of this study, university lecturers were asked to suggest solutions for the improvement of EE. The major solution suggested by all

of the university lecturers was improving the cooperation between the local authority, NGOs and universities in order to increase environmental awareness, consciousness and knowledge of individuals, as well as amending environmentally responsible behaviors of the individuals (e.g. energy conservation, collecting waste oil and batteries, and recycling of solid wastes). As one of the ways of increasing environmental knowledge, Lane (1994) suggested that in-service courses should be given to the teachers to further their competencies. Similarly, Njera (2010) stated that ESD program for enhancing the practical skills, sufficient prominence should be given to the ESD fulfilling program among teachers and students both in and out of the classrooms. Green & Somerville (2014) also revealed that detecting how teachers practice the integration of sustainability education into their teaching could provide solutions to overcome the problems of lacking confidence, skills and knowledge to implement ESD. Quality in-service programs should be comprised of EE content, processes and necessary skills to develop EE lessons and materials (Holtz, 1993). Adding to that, Bertschy, Künzli & Lehmann (2013) emphasized the importance of defining fundamentally various in-service training courses for teachers to focus on competencies concerning ESD.

Priorities of the authorities are the other solutions that were suggested by university lecturers to be changed in the favor of the environment such that more importance should be given to EE rather just considering economic concerns. Njera (2010) also states that introducing ESD, assisting and persuading the participation of students into additional activities related to curriculum, putting emphasis on the organization of lectures and seminars having more environmental relevance and also supplying extra funding and support from the Government and Development associates could all be utilized during the process of training of EE in schools as a notable requirement. Furthermore, Ciffone et al. (2002) revealed that cost barriers can be solved by finding organizations that provide free materials and also the usage of volunteers might be taken into consideration and safety issues might be resolved by preparation of well-defined certain guidelines and prospects prior to the event.

5.1.4 Use of Multi-Layered Mixed Method Design in EE Research

Multi-level mixed method design requires the qualitative and quantitative data collection and a strategy to analyze and merge the collected data (Creswell, Reed & Young 2013). The majority of the mixed method studies about the perceptions and needs on EE in the literature, however, are conducted mainly based on the one level of participants [(e.g., teachers, students, academicians, etc.), Lane, 1994; Ko and Lee, 2003; McMillan, 2003; Uzun & Sağlam, 2007; Dobrinski, 2008; Hoeg, 2010; Frederick, 2012; Evans et al., 2012; Yangın & Filik İşçen, 2013 Günay et al., 2015]. Since the evaluation of the data collected by multi-level mixed methods is more complicating compared to the single level studies, generally it is not preferred by the researchers.

On the other hand, multi-level mixed method design that is used in this study has shown the advantage of identifying the current state and implementation needs of EE in a more suitable way when it is compared to the limited quantitative or qualitative approaches. With the help of multi-level mixed method design, the present study points out the current state of EE and the corresponding needs for EE at three levels of participants who have engaged in the education process: the in-service science teachers, pre-service science teachers and the university lecturers.

5.1.5 Use of As-Is & To-Be Approach in Education Research

As-Is & To-Be model can be considered as a prominent tool for business process management (BPM) which are utilized not only to create flowcharts and process maps that are the indications of the current situation but also to advance in the future presentation. In other words, As-Is & To-Be Model provides certain facilitations to identify the needs/gaps concerning a process by means of pointing out the current situation through As-Is and utilizing To-Be in order to address the problems associated to As-Is or to present a new design that allows to evaluate the data coming from As-Is.

In this study, the evaluation of the results is revealed by means of the adopted As-Is & To-Be analysis which might generate a new perspective that is suggested for presenting the collected data obtained from the participants at three levels. However, being an interdisciplinary approach, As-Is & To-Be model could be used to assess the current education system in order to improve their processes, as also examined by the responses of the participants in this current study concerning the needs and the current situation of EE.

5.2 Conclusion and Implications

This study provides several implications for universities, elementary schools teachers and teacher educators. The perceptions of in-service science teachers, pre-service science teachers and university lecturers on the current state of implementations and the needs regarding EE in elementary school program and teacher education program in Turkey were explored in this current study.

According to the results of this study, both in-service teachers and pre-service teachers do not have a consensus on the adequacy of environmental issues in the elementary science program. However, pre-service science teachers tended to perceive that the program is adequate, whereas in-service science teachers tended to perceive that the program is not adequate in many aspects such as improving environmental awareness, knowledge and behavior.

Altough in-service science teachers and pre-service science teachers do not share much in common on the adequacy of the EE in elementary science program, the existing needs that were mentioned by the participants imply the necessity of improving EE in elementary science schools in many aspects.

The major needs stated by in-service science teachers were the cooperation with the universities, the lack of support from families and also the lack of support from school administrations. Therefore, EE in the elementary science program and

environmental knowledge of the in-service teachers should be enhanced by the support of the professionalist academiciens in the field of EE. Moreover, the awareness of the parents and school administrations should be raised to minimize the obstacles (e.g. permission of parents for outdoor activities, opportunities provided for field trips, etc.) for EE implementations in elementary schools. Pre-service science teachers were also mentioned the lack of school administrations as the major significant need concerning EE in elementary school. Another need which was remarked by the pre-service science teachers was inadequate sources and materials related to EE.

The majority of the in-service science teachers and pre-service science teachers specified their concerns on financial sources that are provided for field trips and physical structure of the schools, which may hinder the effectiveness of the EE applications.

Pre-service science teachers and university lecturers mainly stated that EE knowledge and teaching skills of the in-service science teachers should be improved. Relatively small number of in-service teachers were also agreed on the necessity of enhancing the qualifications of teachers. In relation to this, organizing in-service training concerning EE was also mentioned by university lecturers, pre-service science teachers and in-service science teachers as another crucial need.

The needs for increasing the duration of EE, incorporating EE into all subjects or having a separate EE course in both elementary science program and teacher education programs are mentioned by in-service science teachers, pre-service science teachers and university lecturers. Hence, environmental issues included in these programs should be developed by providing more time for a broaden curriculum.

In order to further enhance the environmental education, it is essentially required to expand the cooperation between local authorities, NGOs and universities to

improve environmental awareness, consciousness and knowledge of individuals, and priority of authorities should be changed in a way of adequate inclusion of EE in the school curriculum and textbooks, as also suggested by university lecturers of the present study. Thus, environmental education in both elementary school programs and teacher education programs should be revised and improved in accordance with the needs and suggestions mentioned above.

5.3 Recommendations for Further Researches

The main contribution of this study to the literature is emphasizing the perceptions of in-service science teachers, pre-service science teachers and university lecturers on the current state of EE and the needs concerning EE. Moreover, by utilizing multi-level mixed method design, literature is enhanced with quantitative and qualitative findings provided in this study.

A different approach, As-Is & To-Be Model, was used in this study as a new perspective suggested for representing the attained perceptions of participants on the current state of EE and the needs in elementary school program and teacher education programs, which might lead the researchers to have different perspectives for the future studies.

The present study was conducted with in-service science teachers, pre-service science teachers and university lecturers in elementary science departments. Since environmental education is interdisciplinary, more studies should be performed with the participants from other fields in order to reveal the current situation and the needs of EE with respect to those fields.

This study focused on the perceptions of in-service science teachers, pre-service science teachers and university lecturers. In addition to these participants, school administrators, elementary school students and parents might be included in the further studies in order to comprehend their perceptions.

In this study, questionnaire was conducted to evaluate the perceptions of in-service science teachers and pre-service science teachers about the current state and the needs of EE. Alternatively, the researchers may also collect qualitative data by interviews and by observing the lectures in order to examine their perception thoroughly.

In 2013-2014 education year, new science program has been started to be implemented gradually starting from 5^{th} grade. The current study should be repeated after the implementation of new science program in all grades of elementary schools.

More mixed method studies can be performed in the field of environmental education aiming to identify the needs and barriers on EE and to point out the suggestions to improve the effectiveness of EE.

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APPENDICES

APPENDIX A. PERMISSION FOR IMPLEMENTATION

T.C.
ANKARA VALİLİĞİ
Milli Eğitim Müdürlüğü

ÖĞRENCİ İŞLERİ
DAİRESİ BAŞKANLIĞI
Arş. Md. Saat :

Sayı : 14588481/605.99/3994780
Konu: Araştırma izni

25/12/2013

ORTA DOĞU TEKNİK ÜNİVERSİTESİNE
(Öğrenci İşleri Daire Başkanlığı)

İlgi: a) MEB Yenilik ve Eğitim Teknolojileri Genel Müdürlüğünün 2012/13 nolu Genelgesi.
b) 04/12/2013 tarih ve 13273 sayılı yazınız.

Üniversiteniz İlköğretim Bölümü Doktora Öğrencisi Nuray YILDIRIM' ın **"Türkiye'de çevre eğitimi ve sürdürülebilir kalkınma için eğitim durum değerlendirmesi"** konulu tezi kapsamında çalışma yapma talebi Müdürlüğümüzce uygun görülmüş ve araştırmanın yapılacağı İlçe Milli Eğitim Müdürlüğüne bilgi verilmiştir.

Uygulama formlarının (10 sayfa) araştırmacı tarafından uygulama yapılacak sayıda çoğaltılması ve çalışmanın bitiminde iki örneğinin (cd ortamında) Müdürlüğümüz Strateji Geliştirme Bölümüne gönderilmesini arz ederim.

Müberra OĞUZ
Müdür a.
Şube Müdürü

Güvenli Elektronik İmzalı
Asli İle Aynıdır.
26/12/2013

SUNAY
Esf
30.12.2013 - 19139

Bu belge, 5070 sayılı Elektronik İmza Kanununun 5 inci maddesi gereğince güvenli elektronik imza ile imzalanmıştır
Evrak teyidi http://evraksorgu.meb.gov.tr adresinden 3b53-6873-3673-a5a5-f722 kodu ile yapılabilir.

Konya yolu Başkent Öğretmen Evi arkası Beşevler ANKARA
e-posta: istatistik06@meb.gov.tr

Ayrıntılı bilgi için: Emine KONUK
Tel: (0 312) 221 02 17/135

APPENDIX B. ENVIRONMENTAL EDUCATION STATE OF ART QUESTIONNAIRE

Değerli Öğretmenler,

Bu anket Temel Eğitim Fen Bilgisi Programında yer alan çevre konuları ile ilgili eksiklikleri anlamak ve Türkiye'de çevre eğitiminin durumunu ortaya koymak amacı ile hazırlanmıştır. Aşağıdaki maddelere vereceğiniz yanıtlar araştırma amacı ile kullanılacak ve gizli tutulacaktır. Yanıtlarınız Türkiye'de uygulanacak çevre eğitimi ders programlarının geliştirilmesine önemli katkılarda bulunacaktır. Sizlerin görüşleri bizim için çok önemlidir.

Yardımlarınız için teşekkür ederiz.

ODTÜ Eğitim Fakültesi, İlköğretim Bölümü

Okulunuzun adı:.....

Okulunuzun bulunduğu İl/İlçe: .....

Kişisel Bilgiler

1. Kaç yıldır öğretmenlik yapıyorsunuz? ..... yıl
2. Kaç yaşındasınız ? .....
3. Cinsiyetiniz : ☐ Kadın ☐ Erkek
4. Eğitim düzeyiniz: ☐ Ön lisans
   ☐ Lisans/ Fen Bilgisi Öğretmenliği
   ☐ Lisans/ Sınıf Öğretmeni
   ☐ Lisans / Eğitim Fakültesi Dışındaki Bir Bölüm
   ☐ Yüksek Lisans
   ☐ Doktora
5. Çalıştığınız kurum: ☐ Kamu ☐ Özel
6. Hangi sınıf/sınıfların öğretmenisiniz? : ☐ 4. sınıf ☐ 5. sınıf ☐ 6. sınıf ☐ 7. sınıf ☐ 8. sınıf

7. Okulda öğretmenlik yaptığınız alan: ☐ Fen ve Teknoloji Öğretmeni
   ☐ Sınıf Öğretmeni
8. Milli Eğitim Bakanlığı tarafından düzenlenen çevre eğitimi ile ilgili hizmet içi eğitim aldınız mı? ☐ Evet ☐ Hayır

A. Aşağıda belirtilen çevre eğitimi ile ilgili düşüncelerden hangisi sizin görüşünüze uygundur?

☐ Çevre eğitimi gereksizdir
☐ Çevre eğitimi gereklidir, örgün ve yaygın eğitim kurumlarında verilmelidir.
☐ Çevre eğitimi gereklidir, ancak okullarda verilmesi şart değildir
☐ Kararsızım

B. Aşağıda belirtilen sürdürülebilir kalkınma ile ilgili düşüncelerden hangisi sizin görüşünüze uygundur?

☐ Sürdürülebilir kalkınma için eğitim gereksizdir.
☐ Sürdürülebilir kalkınma için eğitim gereklidir, örgün ve yaygın eğitim kurumlarında verilmelidir.
☐ Sürdürülebilir kalkınma için eğitim gereklidir, ancak okullarda verilmesi şart değildir.
☐ Kararsızım.

C. Aşağıda çevre eğitimi ile ilgili ifadeler bulunmaktadır. Bu ifadelerden hangilerine katıldığınızı kutucuklara işaret koyarak belirtiniz <u>(Birden fazla madde işaretleyebilirsiniz).</u>

☐ Örgün eğitim kurumlarında verilen çevre eğitimi yeterlidir.
☐ Çevre eğitimi sadece fen bilgisi dersi kapsamında verilmelidir.
☐ Çevre eğitimi tüm derslere entegre edilmelidir.
☐ Öğretmen adaylarına eğitimleri sırasında zorunlu çevre eğitimi dersi verilmelidir.
☐ Türkiye'de çevre eğitimi ile ilgili yeterli kaynak (kitap, makale,dergi, internet, video, vb.) bulunmaktadır.
☐ Türkiye'de çevre eğitimi ile ilgili kaynaklara (kitap, makale,dergi, internet, video, vb.) kolaylıkla ulaşabiliyorum.
☐ Üniversitede aldığım eğitim, fen bilgisi dersinde yer alan çevre ile ilgili konular için teorik ve uygulama açısından yeterlidir.

D. Çevre eğitimi konusunda en çok başvurduğunuz kaynaklardan (kitap, dergi, TV programı, web sitesi, vb.) 3 tanesinin adını yazınız:

1. .....
   .....
2. .....
   .....
3. .....
   .....

E. Aşağıda fen bilgisi programının çevre eğitimi çerçevesinde değerlendirilmesine yönelik görüşler yer almaktadır. Bu görüşlere katıldığınızı ya da katılmadığınızı ilgili seçeneği işaretleyerek belirtiniz.

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
1. Programda bulunan çevre ile ilgili konular **öğrencilerin çevreye yönelik bilgilerini** arttırmak için yeterlidir.					
2. Programda bulunan çevre ile ilgili konular **öğrencilerin çevresel farkındalığını** arttırmak için yeterlidir.					
3. Programda bulunan çevre ile ilgili konular **öğrencilerin çevreye yönelik olumlu davranış geliştirmelerini** sağlamak için yeterlidir.					
4. Programda bulunan çevre ile ilgili konular, **öğrencilerin çevre sorunlarının kendi yaşamlarının bir parçası olduğunu anlamaları için** yeterlidir.					
5. Programda bulunan çevre ile ilgili konular ve etkinlikler **güncel çevre sorunlarını** yansıtmaktadır.					
6. Programda bulunan çevre ile ilgili konular ve etkinlikler **sürdürülebilir kalkınma kavramını** içermektedir.					
7. Programda çevre ile ilgili konular ve etkinlikler yeterince yer almaktadır.					

F. Aşağıda fen bilgisi programı kapsamındaki çevre eğitimi uygulamalarına ilişkin öz-yeterlilik maddeleri yer almaktadır. Bu maddelere katıldığınızı ya da katılmadığınızı ilgili seçeneği işaretleyerek belirtiniz.

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
1. Fen bilgisi dersinde yer alan çevre ile ilgili konuları, etkili bir şekilde öğretecek kadar iyi biliyorum.					
2. Fen bilgisi dersinde yer alan çevre ile ilgili konuları öğretmek için gerekli becerilere sahibim.					
3. Fen bilgisi dersinde yer alan çevre ile ilgili konuların anlatırken sınıf kontrolünde sorun yaşıyorum.					
4. Fen bilgisi dersinde yer alan çevre ile ilgili konular hakkında öğrencilerin sorularını cevaplayabilirim.					
5. Fen bilgisi dersinde yer alan çevre ile ilgili konuları programında bulunan diğer konular kadar iyi öğretebilirim.					
6. Fen bilgisi dersinde yer alan çevre ile ilgili konuları öğretirken çeşitli etkinlikler kullanabilirim.					

G. Aşağıda fen bilgisi programı kapsamındaki çevre eğitimi uygulamalarına ilişkin görüşler yer almaktadır. Bu görüşlere katıldığınızı ya da katılmadığınızı ilgili seçeneği işaretleyerek belirtiniz.

	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
1. Fen bilgisi ders programında yer alan çevre ile ilgili konuları anlatırken ders kitabındaki etkinlikleri kullanıyorum.					
2. Fen bilgisi dersi programında yer alan çevre ile ilgili konuları anlatırken kendi oluşturduğum ya da diğer kaynaklardan bulduğum etkinlikleri kullanıyorum.					
3. Çevre konularını diğer disiplinlerle ilişkilendirerek anlatıyorum.					
4. Fen bilgisi dersi programında yer alan çevre ile ilgili konuları günlük hayatla ilişkilendirerek anlatıyorum.					
5. Fen bilgisi dersi programında yer alan çevre ile ilgili konuları anlatırken öğrenci-merkezli yaklaşımlar kullanıyorum.					

H. Fen dersi programı kapsamındaki çevre eğitimi konularını anlatırken, aşağıda belirtilen öğretim yöntemleri ve etkinliklerinden hangilerini ne sıklıkla kullandığınızı ilgili seçeneği işaretleyerek belirtiniz.

	Hiçbir zaman	Nadiren	Bazen	Çoğu zaman	Her zaman
1. Düz anlatım					
2. Alan gezileri / sınıf dışı etkinlikler (çevre gezileri, müze ziyaretleri, vb...)					
3. Rol oynama					
4. Drama					
5. Tartışma					
6. Soru-cevap					
7. Video gösterimi					
8. Deneyler					
9. Probleme dayalı öğrenme					
10. Durum çalışması					
11. Bilgisayar destekli etkinlikler					
12. Sunum					
13. Araştırma ödevleri					
14. Bireysel veya grup projeleri					

İ. Çevre eğitimi ile ilgili bazı ihtiyaçlar aşağıda sıralanmıştır. Lütfen aşağıda bulunan maddelerin geliştirilmesi için Türkiye'de ne kadar ihtiyaç duyulduğunu aşağıdaki ölçeğe göre belirtiniz. (Birden beşe kadar numaralanmış ölçeği kullanarak, hangi gerekçenin sizin gerekçenize karşılık geldiğini, maddenin sağ tarafında yer alan uygun numarayı seçerek belirtiniz.)

	İhtiyaç yoktur		Az ihtiyaç vardır		Çok ihtiyaç vardır
1. Okullarda çevre eğitimi için ayrılan zamanın arttırılmasına	1☐	2☐	3☐	4☐	5☐
2. Programda bulunan çevre eğitimi ile ilgili konuların sürdürülebilir kalkınma eğitimi içeriğine dönüştürülmesine	1☐	2☐	3☐	4☐	5☐
3. Çevre eğitimi ile ilgili hizmet içi eğitim programları düzenlenmesine	1☐	2☐	3☐	4☐	5☐
4. Öğretmenlerin çevre ile ilgili konular hakkında bilgilerinin arttırılmasına	1☐	2☐	3☐	4☐	5☐
5. Öğretmenlerin çevre eğitimi için kullanılabilecek öğretim teknikleri hakkında bilgilerinin arttırılmasına	1☐	2☐	3☐	4☐	5☐
6. Çevre eğitimi ile ilgili kaynak ve materyal geliştirilmesine	1☐	2☐	3☐	4☐	5☐
7. Alan gezileri yapılması için maddi olanak sağlanmasına	1☐	2☐	3☐	4☐	5☐
8. Okul yönetiminin çevre eğitimine destek vermesine	1☐	2☐	3☐	4☐	5☐
9. Okullarda çevre eğitimine verilen önemin artırılmasına	1☐	2☐	3☐	4☐	5☐
10. Çevre eğitimi için okulların fiziksel yapısının (bahçe ağaçlandırması, ekim dikim alanı oluşturma, laboratuvar vb.) geliştirilmesine	1☐	2☐	3☐	4☐	5☐
11. Öğretmenlerin çevre eğitimi konularına olan ilgi ve motivasyonunun arttırılmasına	1☐	2☐	3☐	4☐	5☐
12. Öğrencilerin çevre eğitimi konularına olan ilgi ve motivasyonunun arttırılmasına	1☐	2☐	3☐	4☐	5☐
13. Ailelerin çevre eğitimine verdiği desteğin arttırılmasına	1☐	2☐	3☐	4☐	5☐
14. Çevre eğitimi ile ilgili konularda üniversitelerle işbirliğinin geliştirilmesine	1☐	2☐	3☐	4☐	5☐
15. Okullarda çevre eğitimi ile ilgili öğrenci kulüplerinin oluşturulmasına	1☐	2☐	3☐	4☐	5☐
16. Çevre eğitiminin programdaki diğer derslere de entegre edilmesine	1☐	2☐	3☐	4☐	5☐

17. Öğrencilerin çevre eğitimi ile ilgili yurtiçi/yurtdışı projelere dahil olmasına	1☐	2☐	3☐	4☐	5☐
18. Fen bilgisi dersi kitabında yer alan çevre ile ilgili etkinliklerin geliştirilmesine	1☐	2☐	3☐	4☐	5☐
19. Çevre eğitimi konusunda bilgi alışverişi sağlanması için öğretmen ağı oluşturulması	1☐	2☐	3☐	4☐	5☐

J. Fen Bilgisi dersi programında aşağıda belirtilen çevre ile ilgili konulardan hangilerinin eksik kaldığını düşünüyorsunuz? Lütfen ilgili maddelerin yanındaki kutucuklara işaret koyarak belirtiniz.

- ☐ Çevre kirliliği (hava, su, toprak kirliliği)
- ☐ İklim değişikliği ve küresel ısınma
- ☐ Sürdürülebilir kalkınma
- ☐ Biyolojik çeşitlilik
- ☐ Nesli tükenmekte olan bitki ve hayvanlar
- ☐ Ormansızlaşma
- ☐ Erozyon
- ☐ Çevre sorunları için çözüm yolları
- ☐ Sürdürülebilir kaynak kullanımı
- ☐ Yenilenebilir enerji kaynakları
- ☐ Tüketim alışkanlıkları
- ☐ Nüfus artışı
- ☐ Ulaşım
- ☐ Tarım ilaçları
- ☐ Geri dönüşüm
- ☐ Çevre sorunları ile ilgili kişisel sorumluluklar pekiştirecek etkinlikler
- ☐ Çevre sorunları ile ilgili gerçek durum örnekleri
- ☐ Çevre sorunları tarihçesi
- ☐ Türkiye'de çevre sorunlarına yaklaşım
- ☐ Eklemek istediğiniz konular varsa lütfen belirtiniz: .....

K. Size göre Türkiye'de çevre eğitimi ile ile ilgili en önemli 3 ihtiyaç nedir? Lütfen önem sırasına göre yazınız.

1. .....
   .....
2. .....
   .....
3. .....
   .....

L. Size göre Türkiye'de çevre eğitimi uygulamalarını engelleyici en önemli 3 bariyer nedir? Lütfen önem sırasına göre yazınız.

1. .....
   .....
2. .....
   .....
3. .....
   .....

Katkılarınız için teşekkür ederiz ☺

APPENDIX C. ENVIRONMENTAL EDUCATION IN UNIVERSITIES INTERVIEW PROTOCOL

Değerli Öğretim Üyeleri,

Ben Nuray Yıldırım. Orta Doğu Teknik Üniversitesi İlköğretim Fen Bilgisi Bölümünde doktora öğrencisiyim. Türkiye'de çevre eğitiminin durumu üzerine bir araştırma yapıyorum ve sizinle ilkokullarda ve üniversitelerdeki çevre eğitiminin durumu ve fen bilgisi öğretmenliği bölümünde zorunlu olarak eklenen "Çevre Bilimi" dersi hakkında konuşmak istiyorum. Bu görüşmede amacım çevre eğitimi konusunda uzman olan öğretim üyelerinin Türkiye'deki çevre eğitiminin üniversite ve ilkokul bazında durumu konusunda düşüncelerini ortaya çıkarmaktır. Bu araştırmada ortaya çıkacak sonuçların Türkiye'de çevre eğitimi uygulamalarının geliştirilmesine katkı sağlayacağını ümit ediyorum.

Bu çalışmaya katılmanızın sizler için zararı veya faydası bulunmamaktadır. Verdiğiniz bütün cevaplar gizli tutulacak ve çalışma yayınlandığında isminiz kesinlikle belirtilmeyecektir. Görüşme yaklaşık yarım saat sürecektir. Verdiğiniz cevapları unutmamam ve çalışmama eksiksiz olarak ekleyebilmem için görüşmemizi kaydetmem gerekiyor, bu konuda anlayış gösterdiğiniz ve kaydetmeme izin verdiğiniz için teşekkür ederim.

Görüşme sırasında bir rahatsızlık hissederseniz veya devam etmek istemezseniz bırakmak istediğinizi bildirebilirsiniz.

Bana sormak istediğiniz bir soru var mı? Görüşmeye başlayabilir miyiz?

Yardımlarınız ve katkınız için çok teşekkür ederim.

1. Çevre ile ilgili konuların ilkokul fen bilgisi dersi programında yer alması gerektiğini düşünüyor musunuz? Sebebini açıklar mısınız?
    a. Çevre eğitimi programda nasıl/ne düzeyde yer almalı?

b. Çevre eğitimi tüm yöntemlerde faydalı olur mu?
c. Çevre eğitimi nasıl dizayn edilirse daha faydalı olur?
d. Çevre eğitiminin etkinliğini arttırmak için ne yapmak gerekir?

2. Lisans eğitimi kapsamında çevre ile ilgili ders olması gerektiğini düşünüyor musunuz?
    a. Nasıl bir ders olmalı?
    b. Sizce zorunlu ders mi olmalı yoksa seçmeli ders mi?
3. Çevre Bilimi dersinizin amaç ve içeriği hakkındaki görüşlerinizle ilgili konuşalım.
    a. Dersin temel amacı nedir?
    b. Dersin kazanımları nelerdir?
    c. Bu ders kapsamında yer alan konular nelerdir?
    d. Bu ders anlatılırken hangi öğretim teknikleri ve etkinlikleri kullanıyorsunuz?
    e. Hazırladığınız ders içeriğinde öğrencilerinize çevresel konuları nasıl öğretecekleri ile ilgili bölüm var mı? Bu kısım neleri içeriyor?
    f. Dersi anlatırken günlük yaşamla bağlantı kuruyor musunuz? Örneklerle açıklar mısınız?
    g. Çevre ile ilgili zorunlu olarak sadece bu dersin olması yeterli mi?
4. Bu ders kapsamında yaptığınız alan gezisi, açık hava etkinlikleri, video gösterimi, vb. etkinlikler için Üniversite imkan sağlıyor mu?
    a. Ne gibi imkanlar sağlanıyor? Örnek verir misiniz?
5. Üniversite'de sağlanan çevre eğitimi ile ilgili ne gibi ihtiyaçlar/eksiklikler olduğunu düşünüyor sunuz?
6. Size göre Türkiye'de çevre eğitimi ile ile ilgili en önemli 3 ihtiyaç nedir?
7. Çevre eğitiminin geliştirilmesi için ne gibi adımlar atılmasi gerektiğini düşünüyorsunuz?
    a. Yerel Yönetim, Üniversite, STK, bireysel bazda neler yapılmalı?
    b. Bunlar arasında ortak çalışma geliştirilmeli mi?
        i. Nasıl çalışmalar yapılabilir?

APPENDIX D. RESULTS OF IN-SERVICE SCIENCE TEACHERS FOR EE SoAQ

Table D.1. General perceptions of in-service science teachers

Items	N	%
Perception on EE		
A.1 EE is not necessary	1	.4
A.2 EE is necessary and should be provided by formal and non-formal education	240	96.0
A.3 EE is necessary but providing it at school is not necessarily	8	3.2
A.4 Undiceded	1	.4
Perception on ESD	**N**	**%**
B.1 ESD is not necessary	1	.4
B.2 ESD is necessary and should be provided by formal and non-formal education	228	91.2
B.3 ESD is necessary but providing it at school is not necessarily	18	7.2
B.4 Undiceded	2	.8
Missing	1	.4
General statements about EE	**N**	**%**
C.1 EE provided by formal education institutions is sufficient.	5	2.0
C.2 EE should be given only in science program	60	24.0
C.3 EE should be integrated to all courses in elementary education.	186	74.4
C.4 Theoretical and practical knowledge I gathered during the university education is adequate for teaching environmental issues	115	46.0
C.5 Compulsory EE lecture should be provided to pre-service teachers during their license education.	100	40.0
C.6 There are sufficient sources (book, article, journal, internet, video, etc.) about EE in Turkey	55	22.0
C.7 I can easily reach the sources about EE in Turkey	71	28.4

Table D.2. Perceptions of the in-service science teacher on EE in the elementary science program

	Items (Part E)	Frequency and Percentage (%)					
		Stongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1.	Environmental issues involved in science program is sufficient for increasing environmental knowledge of students.	10 4.0	104 41.6	31 12.4	97 38.8	5 2.0	3 1.2
2.	Environmental issues involved in science program is sufficient for increasing environmental awareness of students.	13 5.2	99 39.6	37 14.8	92 36.8	8 3.2	1 .4
3.	Environmental issues involved in science program is sufficient for enhancing the positive behaviors of students towards environment.	13 5.2	98 39.2	38 15.2	88 35.2	12 4.8	1 .4
4.	Environmental issues involved in science program is sufficient for students to understand that environmental problems are part of their life.	14 5.6	86 34.4	51 20.4	80 32.0	18 7.2	1 .4
5.	Environmental issues and activities involved in science program reflects daily environmental problems.	12 4.8	64 25.6	48 19.2	109 43.6	17 6.8	
6.	Environmental issues and activities involved in science program involves the terms sustainable development.	20 8.0	79 31.6	49 19.6	85 34.0	14 5.6	3 1.2
7.	Environmental issues and activities take part in science program are adequate.	18 7.2	86 34.4	48 19.2	83 33.2	14 5.6	1 .4

Table D.3. In-service science teachers' self-efficacy on EE applications

Items (Part F)	Frequency and Percentage (%)					
	Stongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1. I have adequate knowledge to teach the environmental issues involved in the science program.	1	27	30	151	41	
	.4	10.8	12.0	60.4	16.4	
2. I have the necessary skills to teach the environmental issues involved in the science program.	2	12	38	147	50	1
	.8	4.8	15.2	58.8	20.0	.4
3. I have difficulty in controlling the students while teaching environmental issues involved in the science program.	25	58	13	112	41	1
	10.0	23.2	5.2	44.8	16.4	.4
4. I can answer the questions of students about the environmental issues involved in the science program.	1	9	17	170	50	3
	.4	3.6	6.8	68.0	20.0	1.2
5. I can teach the environmental issues involved in the science program as well as the other issues involved in the science program.	2	14	21	154	59	
	.8	5.6	8.4	61.6	23.6	
6. I can use various activities while teaching environmental issues involved in the science program.	2	16	24	156	51	1
	.8	6.4	9.6	62.4	20.4	1.4

Table D.4. EE implementations in the classroom: in the words of in-service science teachers

	Items (Part G)	Frequency and Percentage (%)					
		Stongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1.	I use the related activities in the science text book while teaching environmental issues in the science program.	4 1.6	24 9.6	14 5.6	176 70.4	31 12.5	1 .4
2.	I use the activities that I develop or adapt from other sources while teaching the environmental issues in the science program.	4 1.6	15 6.0	26 10.4	164 65.6	41 16.4	
3.	I teach environmental issues by linking them with other disciplines.	3 1.2	8 3.2	26 10.4	160 64.0	52 20.8	1 .4
4.	I teach the environmental issues in the science program by linking them to daily life.	3 1.2	4 1.6	4 1.6	157 62.8	82 32.8	
5.	I use student-centered approaches while teaching the environmental issues in the science program.	5 2.0	9 3.6	19 7.6	149 59.6	64 25.6	4 1.6

Table D.5. Teaching methods used by in-service science teachers for EE

Items (Part H)	Frequency and Percentage (%)					
	Never	Seldom	Sometimes	Usually	Always	Missing
1. Lecturing	3	48	97	76	18	8
	1.2	19.2	38.8	30.4	7.2	3.2
2. Field trip	10	82	94	38	7	9
	8.0	32.8	37.6	15.2	2.8	3.6
3. Role playing	14	48	99	62	20	7
	5.6	19.2	39.6	24.8	8	2.8
4. Drama	21	49	91	59	22	8
	8.4	19.6	36.4	23.6	8.8	3.2
5. Discussion		8	50	138	47	7
		3.2	20.0	55.2	18.8	2.8
6. Questioning		12	40	128	65	5
		4.8	16.0	51.2	26.0	2.0
7. Video	3	24	77	94	47	5
	1.2	9.6	30.8	37.6	18.8	2.0
8. Experiment	3	19	92	103	27	6
	1.2	7.6	36.8	41.2	10.8	2.4
9. Problem-based learning	6	21	88	97	28	10
	2.4	8.4	35.2	38.8	11.2	4.0
10. Case study	5	24	113	68	25	15
	2.0	9.6	45.2	27.2	10.0	6.0
11. Computer based activity	4	30	73	87	49	7
	1.6	12.0	29.2	34.8	19.6	2.8

Table D.5 (continued)

12. Presentation	1	15	75	107	46	6
	.4	6.0	30.0	42.8	18.4	2.4
13. Doing research on a certain topic		4	46	137	60	3
		1.6	18.4	54.8	24.0	1.2
14. Individual or group project		13	56	127	49	5
		5.2	22.4	50.8	19.6	2.0

Table D.6. Perceptions of in-service science teachers' for more effective EE

Items (Part I)	Frequency and Percentage (%)					
	there is not any need	there is no need	there is less need	there is need	there is strong need	Missing
1. Increasing the time spent for EE in elementary schools	4	7	50	112	77	
	1.6	2.8	20.0	44.8	30.8	
2. Transforming EE issues in science program to sustainable development issues	1	7	45	131	66	
	.4	2.8	18.0	52.4	26.4	
3. Organizing in-service training for EE	6	11	41	109	83	
	2.4	4.4	16.4	43.6	33.2	
4. Improving teachers' knowledge on environmental issues	8	8	42	123	69	
	3.2	3.2	16.8	49.2	27.6	
5. Improving teachers' knowledge on teaching methods for EE	4	11	39	122	74	
	1.6	4.4	15.6	48.8	29.6	
6. Developing sources and materials for EE	2	2	29	127	90	
	.8	.8	11.6	50.8	36.0	
7. Providing financial sources for field trips	1	1	23	94	130	1
	.4	.4	9.2	37.6	52.0	.4
8. Support of the school administration for EE implementations	4	3	25	96	122	
	1.6	1.2	10.0	38.4	48.8	
9. Increasing the importance given to EE in schools	2	2	20	107	119	
	.8	.8	8.0	42.8	47.6	
10. Improving the physical structure (forestation, forming cultivation areas, laboratory, etc.) of schools	1	4	19	90	136	
	.4	1.6	7.6	36.0	54.4	
11. Enhancing the motivation and interest of teachers for EE	2	6	24	118	100	
	.8	2.4	9.6	47.2	40.0	
12. Enhancing the motivation and interest of students for EE	1	3	23	103	120	
	.4	1.2	9.2	41.2	48.0	

Table D.6 (continued)

13. Improving support of parents for EE	1	1	19	80	149
	.4	.4	7.6	32.0	59.6
14. Enhancing the cooperation with universities in the context of EE	3	1	10	107	129
	1.2	.4	4.0	42.8	51.6
15. Establishing student clubs on environment at schools	4	9	35	127	75
	1.6	3.6	14.0	50.8	30.0
16. Integration of EE to other lectures in the school program	1	5	24	119	101
	.4	2.0	9.6	47.6	40.4
17. Motivating students to participate in national/international projects on EE	1	4	25	117	103
	.4	1.6	10.0	46.8	41.2
18. Improving the activities about environmental issues in the science textbook	4	2	31	115	98
	1.6	.8	12.4	46.0	39.2
19. Generating a network for teachers to provide information exchange	3	5	27	123	92
	1.2	2.0	10.8	49.2	36.8

Table D.7. Missing environmental issues in elementary science program in the words of in-service science teachers

Items (Part J)	n	%
1. Environmental pollution (air, water, soil pollution)	118	47.2
2. Climate change and global warming	111	44.4
3. Sustainable development	151	60.4
4. Biological diversity	99	39.6
5. Endangered animals and plants	116	46.3
6. Deforestation	147	58.8
7. Erosion	101	40.4
8. Solutions for environmental problems	128	51.2
9. Use of sustainable sources	107	42.8
10. Renewable energy sources	90	36.0
11. Consumption patterns	154	61.6
12. Population growth	98	39.2
13. Transportation	81	32.4
14. Pesticides	128	51.2
15. Recycling	135	54.0
16. Activities for developing individual responsibilities about environmental problems	148	59.2
17. Case study about environmental problems	138	55.2
18. History of environmental problems	108	43.2
19. Approaches in Turkey to environmental problems	146	58.4

APPENDIX E. RESULTS OF PRE-SERVICE SCIENCE TEACHERS FOR EE SoAQ

Table E.1 General perceptions of pre-service science teachers

Items	N	%
Perception on EE		
A.1 EE is not necessary	1	.8
A.2 EE is necessary and should be provided by formal and non-formal education	144	95.0
A.3 EE is necessary but providing it at school is not necessarily	4	3.3
A.4 Undiceded	1	.8
Perception on ESD	**N**	**%**
B.1 ESD is not necessary	1	.8
B.2 ESD is necessary and should be provided by formal and non-formal education	130	83.3
B.3 ESD is necessary but providing it at school is not necessarily	12	10.0
B.4 Undiceded	7	5.8
General statements about EE	**N**	**%**
C.1 EE provided by formal education institutions is sufficient.	14	9.3
C.2 EE should be given only in science program	11	7.3
C.4 EE should be integrated to all courses in elementary education.	130	86.7
C.4 Theoretical and practical knowledge I gathered during the university education is adequate for teaching environmental issues	112	74,6
C.5 Compulsory EE lecture should be provided to pre-service teachers during their license education.	115	76.7
C.6 There are sufficient sources (book, article, journal, internet, video, etc.) about EE in Turkey	35	23.3
C.7 I can easily reach the sources about EE in Turkey	40	26.7

Table E.2. EE content of the elementary science program in the words of pre-service science teachers

		Frequency and Percentage (%)					
	Items (Part E)	Stongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1.	Environmental issues involved in the science program are sufficient for increasing environmental knowledge of students.	7 4.7	48 32.0	30 20.0	63 42.0	2 1.3	
2.	Environmental issues involved in the science program are sufficient for increasing environmental awareness of students.	6 4.0	50 33.3	27 18.0	65 43.3	2 1.3	
3.	Environmental issues involved in the science program are sufficient for enhancing the positive behaviors of students towards the environment.	8 5.3	42 28.0	36 24.0	60 40.0	4 2.7	
4.	Environmental issues involved in the science program are sufficient for students to understand that environmental problems are part of their life.	9 6.0	43 28.7	33 22.0	58 38.7	7 4.7	
5.	Environmental issues and activities involved in science program reflect daily environmental problems.	2 1.3	30 20.0	27 18.0	84 56.0	7 4.7	
6.	Environmental issues and activities involved in the science program involve the concept of sustainable development.	4 2.7	24 16.0	45 30.0	70 46.7	7 4.7	
7.	The science program sufficiently covers environmental issues and activities.	5 3.3	52 34.7	40 26.7	49 32.7	2 1.3	2 1.3

Table E.3. Pre-service science teachers' self-efficacy on EE applications

	Items (Part F)	Frequency and Percentage (%)					
		Stongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1.	I have adequate knowledge to teach the environmental issues involved in the science program.	1 .7	6 4.0	28 18.7	93 62.0	22 14.7	
2.	I have the necessary skills to teach the environmental issues involved in the science program.		10 6.7	16 10.7	95 63.3	29 19.3	
3.	I have difficulty in controlling the students while teaching environmental issues involved in the science program.	7 4.7	10 6.7	37 24.7	74 49.3	22 14.7	
4.	I can answer the questions of students about the environmental issues involved in the science program.	1 .7	6 4.0	15 10.0	108 72.0	19 12.7	1 .7
5.	I can teach the environmental issues involved in the science program as well as the other issues involved in the science program.		9 6.0	20 13.3	96 64.0	25 16.7	
6.	I can use various activities while teaching environmental issues involved in the science program.	1 .7	3 2.0	7 4.7	104 69.3	35 23.3	

Table E.4. Perception of pre-service science teachers on practices for teaching EE in the classroom

Items (Part G)	Frequency and Percentage (%)					
	Stongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Missing
1. The related activities in the science text book should be used while teaching environmental issues in the science program.	2 1.3	20 13.3	29 19.3	87 58.0	12 8.0	
2. The activities that teachers develop or adapt from other sources should be used while teaching the environmental issues in the science program.		7 4.7	6 4.0	101 67.3	36 24.0	
3. The environmental issues should be taught by linking them with other disciplines.	1 .7	3 2.0	11 7.3	84 56.0	51 34.0	
4. The environmental issues in the science program should be taught by linking them to daily life.	3 2.0	3 2.0	3 2.0	71 47.3	70 46.7	
5. Student-centered approach should be used while teaching the environmental issues in the science program.	4 2.7	2 1.3	6 4.0	81 54.0	56 37.3	1 .7

Table E.5. Perception of pre-service sience teachers on teaching methods and activities that should be used for EE

Items (Part H)	Frequency and Percentage (%)					
	Never	Seldom	Sometimes	Usually	Always	Missing
1. Lecturing	28	52	51	14		5
	18.7	34.7	34.0	9.3		3.3
2. Field trip		2	30	75	42	1
		1.3	20.0	50.0	28.0	.7
3. Role playing	1	15	51	62	19	2
	.7	10.0	34.0	41.3	12.7	1.3
4. Drama	2	12	51	67	15	3
	1.3	8.0	34.0	44.7	10.0	2.0
5. Discussion			22	79	48	1
			14.7	52.7	32.0	.7
6. Questioning	1	2	19	79	48	1
	.7	1.3	12.7	52.7	32.0	.7
7. Video		2	26	79	43	
		1.3	17.3	52.7	28.7	
8. Experiment	1	5	31	73	38	2
	.7	3.3	20.7	48.7	25.3	1.3
9. Problem-based learning		5	31	81	33	
		3.3	20.7	54.0	22.0	
10. Case study		9	49	75	14	3
		6.0	32.7	50.0	9.3	2.0
11. Computer based activity		9	55	64	21	1
		6.0	36.7	42.7	14.0	.7

Table E.5 (contined)

12. Presentation	8	27	52	50	10	3
	5.3	18.0	34.7	33.3	6.7	2.0
13. Doing research on a certain topic		14	41	68	27	
		9.3	27.3	45.3	18.0	
14. Individual or group project	1	7	43	65	33	1
	.7	4.7	28.7	43.3	22.0	.7

Table E.6. Perceptions of pre-service science teachers' for more effective EE

Items (Part I)	Frequency and Percentage (%)					
	there is not any need	there is no need	there is less need	there is need	there is strong need	Missing
1. Increasing the time spent for EE in elementary schools	2	2	21	61	64	
	1.3	1.3	14.0	40.7	42.7	
2. Transforming EE issues in science program to sustainable development issues	1	3	18	78	50	
	.7	2.0	12.0	52.0	33.3	
3. Organizing in-service training for EE	1	1	19	72	57	
	.7	.7	12.7	48.0	38.0	
4. Improving teachers' knowledge on environmental issues			8	64	78	
			5.3	42.7	52.0	
5. Improving teachers' knowledge on teaching methods for EE			9	61	80	
			6.0	40.7	53.3	
6. Developing sources and materials for EE		1	6	65	78	
		.7	4.0	43.3	52.0	
7. Providing financial sources for field trips			6	48	96	
			4.0	32.0	64.0	
8. Support of the school administration for EE implementations			4	53	93	
			2.7	35.3	62.0	
9. Increasing the importance given to EE in schools			7	48	95	
			4.7	32.0	63.3	
10. Improving the physical structure (forestation, forming cultivation areas, laboratory, etc.) of schools		1	7	50	92	
		.7	4.7	33.3	61.3	
11. Enhancing the motivation and interest of teachers for EE		1	10	62	77	
		.7	6.7	41.3	51.3	
12. Enhancing the motivation and interest of students for EE			7	61	81	1
			4.7	40.7	54.0	.7

Table E.6 (continued)

13. Improving support of parents for EE	2	7	58	83
	1.3	4.7	38.7	55.3
14. Enhancing the cooperation with universities in the context of EE	1	7	60	82
	.7	4.7	40.0	54.7
15. Establishing student clubs on environment at schools	1	9	85	54
	.7	6.0	57.3	36.0
16. Integration of EE to other lectures in the school program	1	12	63	74
	.7	8.0	42.0	49.3
17. Motivating students to participate in national/international projects on EE	1	18	68	63
	.7	12.0	45.3	42.0
18. Improving the activities about environmental issues in the science textbook		9	65	76
		6.0	43.3	50.7
19. Generating a network for teachers to provide information exchange	2	7	71	70
	1.3	4.7	47.3	46.7

Table E.7. Missing environmental issues in elementary science program in the words of pre-service science teachers

Items (Part J)	N	%
1. Environmental pollution (air, water, soil pollution)	37	24.7
2. Climate change and global warming	48	32.0
3. Sustainable development	106	70.7
4. Biological diversity	36	24.0
5. Endangered animals and plants	71	47.3
6. Deforestation	63	42.0
7. Erosion	29	19.3
8. Solutions for environmental problems	66	44.0
9. Use of sustainable sources	83	55.3
10. Renewable energy sources	80	53.3
11. Consumption patterns	82	54.7
12. Population growth	40	26.7
13. Transportation	48	32.0
14. Pesticides	64	42.7
15. Recycling	71	47.3
16. Activities for developing individual responsibilities about environmental problems	84	56.0
17. Case study about environmental problems	69	46.0
18. History of environmental problems	74	49.3
19. Approaches in Turkey to environmental problems	80	53.3

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MS	METU Elementary Science and Mathematics Education Master Program	2008
BS	METU Elementary Science Education	2005
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WORK EXPERIENCE

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2003- Present	Continuing Education Center (CEC), METU	Research Assistant-Education Coordinator
Feb. 2006 – Aug. 2006	Continuing Education Center (CEC), METU	Education Coordinator

FOREIGN LANGUAGES

Advanced English

PUBLICATIONS/PRESENTATIONS

1. Yıldırım, N. (2008). To detect the impact of designed environmental education lectures on environmental attitudes of primary school students (Master Thesis). METU.

2. Yıldırım, N. & Teksöz, G. (2007). Lecture Design for primary school students: Environmental Education. I. National Elementary Congress, Hacettepe University, Ankara

HOBBIES

Tennis, Scuba Diving, Wing Chun, Aikido, Cycling, Ski.

APPENDIX G. TURKISH SUMMARY

TÜRKİYE'DE ÇEVRE EĞİTİMİNİN MEVCUT DURUMU: ANKARA ÖRNEKLEMİ

Son zamanlarda çevresel problemlerdeki artış tüm dünyada açıkça gözlenir hale geldi. Kaynakların aşırı tüketimi insan hayatını tehdit etmeye başladı. Nüfus artışı, kentleşme, ormanların azalması, hava, su, toprak kirliliği gibi çevre problemleri sonucunda ortaya çıkan bu tehdit insanların doğal kaynakların sürdürülebilir olması için çözüm yolları aramalarını sağladı (WCED, 1987).

Çevre Eğitimi, bu tehditle başa çıkmanın en etkili yöntemlerinden biri olarak önerilmektedir. Geleceği garanti etmek ve gelecek kuşakların daha sağlıklı ve güvenli koşullarda yaşamalarını desteklemek için çevre eğitimi gereklidir; ancak bu sayede çevreye duyarlı bireyler yetiştirilebilir (UNESCO & UNEP, 1978; 1987). Çevre Eğitimi insanların çevre okuryazarlığını geliştirmeyi hedefler (Chu ve diğerleri, 2007) ve aynı zamanda öğrencilerin kendi davranış ve tutumlarının çevreye olan etkisini farketmelerini sağlar (NEETF & Roper, 2005). UNEP & UNESCO (1987) insanların çevreye verdiği zararın aynısının insan yaşamı üzerinde de etkili olacağını vurgulamaktadır. Bu sebeple, insanlar için daha sağlıklı ve güvenli bir çevre yaratabilmek hedefiyle çevre eğitimi konusu gündeme gelmiş ve çevre ile ilgili konular 21. yüzyılda önem kazanmaya başlamıştır (UNCED, 1992). Çevresel sorunları azaltmak için en önemli çözüm yollarından biri olan çevre eğitimi girişimleri aynı zamanda, gelecekte sürdürülebilir yaşama sahip olabilmemizi sağlayacak "sürdürülebilir kalkınma için çevre eğitimi" kavramını da içermeye başlamıştır (Tilburry, 1995). Kısacası, çevre eğitimi sürdürülebilir kalkınma için gereklidir (Smati, 2004; McKeown, 2002).

Çevre eğitiminin amacına ulaşılmasında ve öğrencilerin çevreye olan duyarlılıklarının arttırılmasında okulların rolü büyüktür (Stevenson, 2007) ve bu bağlamda eğitim sistemi önemli bir role sahiptir (Smyth, 2006). Buna ek olarak, öğrencilerin çevreye olan ilgisinin arttırılmasında öğretmenler temel yapıyı oluşturmaktadır (Teksöz ve diğerleri, 2010). Kısacası, çevre ile ilgili konular öğretmenler tarafından anlatılmazsa, çevresel sorumluluk sahibi bireyler yetiştirmek mümkün değildir (Plevyak ve diğerleri, 2001). Ancak, Türkiye'de bireylerin çevresel okur-yazarlığını arttırmayı hedefleyen çevre eğitimi gelişim sürecinin başındadır (Kahyaoğlu, 2010). İlkokullarda çevre eğitimi ayrı bir ders yerine fen dersi kapsamında anlatılmaktadır. İlkokul fen programı 2004 yılında geliştirilmiş ve 2005-2006 eğitim yılında öğrenci merkezli öğretim yöntemlerine daha çok önem veren yeni müfredat kullanılmaya başlanmıştır (Bıkmaz & Akben, 2007). Buna ek olarak, bu yeni müfredat ile çoğunlukla öğrencilerin bilgilerini geliştirmeye yönelik çevre ile ilgili konular anlatılmaya başlanmıştır (Erdoğan, ve diğerleri, 2009). Çevre eğitimi ile ilgili bu girişimlere rağmen, ilkokul öğrencileri ile yapılan çalışmalar çevreye yönelik bilgilerinin yeterli olmadığını ortaya koymuştur (Alp ve diğerleri, 2006, 2008; Darçın ve diğerleri, 2006). Ayrıca, Türkiye'nin taraf olduğu çevre ile ilgili sözleşmeler [Biyolojik Çeşitlilik Sözleşmesi (1992), Birleşmiş Milletler İklim Değişikliği Çerçeve Sözleşmesi (1992), Çölleşme ile Mücadele Sözleşmesi (1994)] ile Çevre ve Şehircilik Bakanlığı tarafından hazırlanan stratejiler, hedefler, eylemler ve ihtiyaçlar içeren raporlarda eğitim programlarının öğretmenlerin ve öğrencilerin çevresel bilgi ve farkındalığını arttırma açısından geliştirilmesi gerektiği ortaya konmuştur. Bununla birlikte, ilkokullarda yeni fen programı geliştirilmiş ve 2013-2014 eğitim yılı itibari ile 5. Sınıflardan başlayarak kademeli olarak uygulanmaya başlanmıştır (MoNE, 2013). Sınıf seviyesine göre programda bulunan çevre ile ilgili kazanımlar ve konu başlıkları Tablo G.1'de sunulmuştur.

Tablo G.1. İlkokul fen programında çevre eğitimi konuları ve kazanımları

Ünite	Konu	Kazanımlar
5. Sınıf		
5.5. Canlılar Dünyasını Gezelim ve Tanıyalım / Canlılar ve Hayat	***5.5.2. İnsan ve Çevre İlişkisi*** Önerilen Süre: 6 ders saati Konu/Kavramlar: İnsan-çevre etkileşimi (insanın çevreye etkisi)	5.5.2.1. İnsan faaliyetleri sonucunda oluşan çevre sorunlarını araştırır ve bu sorunların çözümüne ilişkin önerilerde bulunur. 5.5.2.2. Yakın çevresindeki bir çevre sorununun çözümüne ilişkin proje tasarlar ve sunar
5.7. Yer Kabuğunun Gizemi / Dünya ve Evren	***5.7.4. Hava, Toprak ve Su Kirliliği*** Önerilen Süre: 6 ders saati Konu/Kavramlar: hava kirliliği, toprak kirliliği, su kirliliği	5.7.4.1. Hava, toprak ve su kirliliğinin nedenlerini, yol açacağı olumsuz sonuçları ve alınabilecek önlemleri tartışır.
6. Sınıf		
6.6. Madde ve Isı / Madde ve Değişim	***6.6.1. Madde ve Isı*** Önerilen Süre: 8 ders saati Konu/Kavramlar: Isı iletkenliği, ısı yalıtkanlığı, ısı yalıtımı, ısı yalıtım malzemeleri	6.6.1.2. Binalarda ısı yalıtımının önemini, aile ve ülke ekonomisi ve kaynakların etkili kullanımı bakımından tartışır.
	6.6.2. Yakıtlar Önerilen Süre: 8 ders saati Konu/Kavramlar: Katı yakıtlar, sıvı yakıtlar, gaz yakıtlar	6.6.2.1. Yakıtları, katı, sıvı ve gaz yakıtlar olarak sınıflandırarak yaygın olarak kullanılan yakıtlara örnekler verir. Fosil yakıtların sınırlı olduğu ve bu nedenle yenilenemez enerji kaynakları olarak nitelendirildiği belirtilerek yenilenebilir enerji kaynaklarının önemi vurgulanır. 6.6.2.2. Farklı türdeki yakıtların ısı amaçlı kullanımının, insan ve çevre üzerine etkilerini araştırır ve sunar.

Tablo G.1 (devamı)

7. Sınıf		
7.3. Maddenin Yapısı ve Özellikleri / Madde ve Değişim	***7.3.5. Evsel Atıklar ve Geri Dönüşüm*** Önerilen Süre: 6 ders saati Konu/Kavramlar: Evsel katı atık maddeler, evsel sıvı atık maddeler, geri dönüşüm, yeniden kullanma	7.3.5.1. Evsel atıklarda geri dönüştürülebilen ve dönüştürülemeyen maddeleri ayırt eder. 7.3.5.2. Evsel katı ve sıvı atıkların geri dönüşümüne ilişkin proje tasarlar. 7.3.5.3. Geri dönüşümü, kaynakların etkili kullanımı açısından sorgular. 7.3.5.4. Yakın çevresinde atık kontrolü sorumluluğunu geliştirir. 7.3.5.5. Atık suların arıtımına yönelik model oluşturur ve sunar. 7.3.5.6. Geri dönüşüm tesislerinin ekonomiye katkısını tartışır. 7.3.5.7. Yeniden kullanılabilecek eşyalarını, ihtiyacı olanlara iletmeye yönelik proje geliştirir.
7.5. İnsan ve Çevre İlişkileri / Canlılar ve Hayat	***7.5.2. Biyo-çeşitlilik*** Önerilen Süre: 6 ders saati Konu/Kavramlar: Yerel ve küresel çevre sorunları, nesli tükenen canlılar, nesli tehlike altındaki türler, bilinçsiz avlanma, türlerin korunması	7.5.2.1. Biyo-çeşitliliğin doğal yaşam için önemini sorgular. 7.5.2.2. Biyo-çeşitliliği tehdit eden faktörleri, araştırma verilerine dayalı olarak tartışır ve çözüm önerileri üretir. 7.5.2.3. Ülkemizde ve Dünya'da nesli tükenen ya da tükenme tehlikesi ile karşı karşıya olan bitki ve hayvanları araştırır ve örnekler verir.
7.7. Güneş Sistemi ve Ötesi / Dünya ve Evren	***7.7.3. Uzay Araştırmaları*** Önerilen Süre: 4 ders saati Konu/Kavramlar: Uzay teknolojisi, uzay kirliliği	7.7.3.4. Uzay kirliliğinin sebeplerini ifade ederek bu kirliliğin yol açabileceği olası sonuçları tahmin eder.

Tablo G.1 (devamı)

8. Sınıf		
8.5. Canlılar ve Enerji İlişkileri / Canlılar ve Hayat	***8.5.2. Madde Döngüleri*** Önerilen Süre: 4 ders saati Konu/Kavramlar: Su döngüsü, oksijen döngüsü, azot döngüsü, karbon döngüsü	8.5.2.3. Ozon tabakasının seyrelme nedenlerini ve canlılar üzerindeki olası etkilerini araştırarak sorunun çözümü için öneriler üretir ve sunar.
	8.5.3. Sürdürülebilir Kalkınma Önerilen Süre: 4 ders saati Konu/Kavramlar: Sürdürülebilir yaşam, kaynakların tasarruflu kullanımı, geri dönüşüm	8.5.3.1. Kaynakların tasarruflu kullanımına yönelik proje tasarlar. 8.5.3.2. Katı atıkları geri dönüşüm için ayrıştırmanın önemini ve ülke ekonomisine katkısını, araştırma verilerini kullanarak tartışır ve bu konuda çözüm önerileri sunar.
	8.5.4. Biyo-teknoloji Önerilen Süre: 4 ders saati Konu/Kavramlar: Biyo-teknolojik çalışmalar, biyo-teknoloji uygulamalarının çevreye etkisi	8.5.4.1. Günümüzdeki biyo-teknoloji uygulamalarının olumlu ve olumsuz etkilerini, araştırma verilerini kullanarak tartışır.
8.8. Deprem ve Hava Olayları / Dünya ve Evren	***8.8.4. İklim*** Önerilen Süre: 4 ders saati Konu/Kavramlar: İklim, iklim bilim-iklim bilimci, küresel iklim değişiklikleri	8.8.4.3. Küresel iklim değişikliklerinin nedenlerini ve olası sonuçlarını araştırır ve sunar.

Öğretmen eğitimi programları ile ilgili olarak, eğitimin yetersiz olması müfredatın başarısız olmasına sebep olan temel konulardan biridir (UNESCO, 1997). Öğretmen adaylarının eğitiminin geliştirilmesi ve öğretmenlerin mesleki gelişimlerinin sağlanması çevre eğitiminde karşılaşılan en önemli sorunlardan biridir (Goldman ve diğerleri, 2006). Öğretmen eğitim programları kapsamında bulunan çevresel konuların eksikliği çevre eğitiminin bu programlarda mecburi kılınmamasından kaynaklandığı için, öğretmen adaylarına yönelik çevre eğitimi içeren programların incelenmesi ve öğretmen eğitimi programlarına çevre eğitiminin dahil edilmesi gerekli hale gelmiştir (Teksöz ve diğerleri, 2010). Ulusal ve uluslararası araştırmalar, çevreyle ilgili konularda pedogoji ve yöntem bilgilerini arttırmak ve gerekli becerileri kazandırmak için öğretmen eğitiminin önemini vurgulamaktadır (Ferreira ve diğerleri, 2006; Özdemir & Yapıcı, 2010; Stanisic & Maksic, 2014). Bu sebeple, çevre eğitimi son zamanlarda üniversitede verilen dersler arasında yer almaya başlamıştır (Dobrinski, 2008). Ancak, yapılan araştırmalar öğretmen adaylarını yetiştirmek için nitelikli ders sağlanmasının çevre eğitimi ile ilgili en önemli ihtiyaçlardan biri olduğunu göstermektedir (UNESCO & UNEP, 1988).

Çevre ile ilgili konular hakkında ihtiyaç analizi yapan çalışmalar en çok eksiklik duyulan konuları ortaya çıkarmak ve çevre eğitimi ile ilgili mevcut durumu algılamak için etkili bir araçtır (Ardoin & Sivek, 2010). Yapılan bu tarz çalışmalar sonucunda çevre eğitimi ile ilgili en önemli ihtiyaçlar ve bariyerler zaman, bütçe ve işbirliği yetersizliği, yetersiz çevre eğitimi programları, yetersiz öğretmen eğitimi programı, hizmet-içi eğitimler, alan gezisi imkanları ve müfredat kaynaklar olarak bulunmuştur (Meichtry, 2001; Monroe ve diğerleri, 2002; Meichtry ve Harrell, 2002; McDuff, 2002; Ardoin ve Sivek, 2010, Njeru, 2010; Yangın ve Filik İşçen, 2013).

Çevre eğitiminin mecvut durumu, ihtiyaçlar ve bariyerler ile ilgili bugüne kadar yapılan çalışmaların çoğunluğu sadece akademisyenler, öğretmenler, öğrenciler

veya öğretmen adayları gibi tek düzeyde katılımcı dahil edilerek yapılmıştır. Bu çalışmaların sonuçları mevcut durumu görmek için faydalı olsa da, farklı düzeylerdeki katılımcıların (öğrenci, öğretmen, öğretim üyesi) algılarının nasıl örtüştüğünü araştırmak gerekmektedir.

Bu çalışmada, çevre eğitiminin mevcut durumu, ihtiyaçlar ve var olan mücadeleleri daha iyi ortaya koyabilmek için kendini eğitime adamış üç farklı düzeydeki katılımcı ile araştırma yapılmıştır: öğretim üyeleri, öğretmen adayları, öğretmenler.

Çok düzeyli karma yöntem (multi -level mixed method design) kullanılan bu çalışmanın sonuçlarını farklı bi bakış açısı ile yorumlanmıştır: "As-Is & To-Be" model. "As-Is & To-Be" model genellikle iş süreci yönetiminde kullanılan bir araçtır. Bu modeler mevcut durumu yansıtan ve gelecekte geliştirilmesi için bilgi sunan süreç haritası ve akış şeması oluşturmak amacıyla kullanılmaktadır. Buna ek olarak, bu model mevcut durumun detaylı sunumu ve bu durumu geliştirmek için bilgi toplanması ve olanakların önemini vurgulamayı sağlayan disiplinlerarası bir yöntemdir. Bu doğrultuda, "To-Be" "As-Is" analizi sonucunda ortaya çıkan sorunları belirlemek için yeni bir yol bulma veya "As-Is" analizinde ortaya çıkan sonuçları dikkate alarak tamamen yeni bir dizayn oluşturmayı amaçlar.

Kısacası, bu tezde eğitim alanı için "As-Is & To-Be" yaklaşımı kullanılarak çevre eğitiminin durumu ve ihtiyaçları hakkında üç farklı düzeydeki katılımcılardan elde edilen veriler sunulmuştur. Genel olarak, çok düzeyli karma yöntem kullanılarak çevre eğitiminin durumu ve ihtiyaçlar hakkında bilgi edinilen bu çalışmada kullanılan yaklaşım "As-Is & To-Be" modelidir.

Bu çalışmanın amacı Türkiye'de ilkokul ve öğretmen eğitimi programlarında çevre eğitimi uygulamaları ve ihtiyaçları ile ilgili mevcut durumu öğretim üyeleri, öğretmenler ve öğretmen adayları deyişiyle ortaya koymaktır. Çalışmanın araştırma soruları aşağıdaki gibidir:

1. Öğretmenlerin deyişiyle Türkiye'de ilkokul fen programında çevre eğitimi mevcut durumu nasıldır?
    5.1 Türkiye'de ilkokul fen programında çevre eğitiminin durumu ile ilgili fen öğretmenlerinin görüşleri nelerdir?
    5.2 Çevre eğitimi ile ilgili uygulamalara yönelik fen öğretmenlerinin öz-yeterlilikleri nedir?
    5.3 Fen öğretmenlerinin sınıflarında çevre eğitimi anlatırken kullandıkları mevcut uygulamaları nelerdir?
    5.4 Türkiye'de ilkokullarda yer alan çevre eğitimi ihtiyaçları ile ilgili fen öğretmenlerinin görüşleri nelerdir?
2. Fen öğretmeni adaylarının deyişiyle Türkiye'de ilkokul fen programında çevre eğitimi mevcut durumu nasıldır?
    1.1 Türkiye'de ilkokul fen programında çevre eğitiminin durumu ile ilgili fen öğretmeni adaylarının görüşleri nelerdir?
    1.2 Çevre eğitimi ile ilgili uygulamalara yönelik fen öğretmeni adaylarının öz-yeterlilikleri nedir?
    1.3 Fen öğretmeni adaylarının sınıflarında çevre eğitimi anlatırken kullandıkları mevcut uygulamalar nelerdir?
    1.4 Türkiye'de ilkokullarda yer alan çevre eğitimi ihtiyaçları ile ilgili fen öğretmen adaylarının görüşleri nelerdir?

3. Öğretim üyelerinin deyişiyle Türkiye'de ilkokul fen programı ve öğretmen eğitimi programında çevre eğitimi mevcut durumu nasıldır?
    1.1 Türkiye'de ilkokul fen programında çevre eğitiminin durumu ile ilgili öğretim üyelerinin görüşleri nelerdir?
    1.2 Türkiye'de fen öğretmeni yetiştirme programında çevre eğitiminin durumu ile ilgili öğretim üyelerinin görüşleri nelerdir?
    1.3 Türkiye'de fen öğretmeni yetiştirme programında yer alan çevre eğitimi ihtiyaçları ile ilgili öğretim üyelerinin görüşleri nelerdir?

1.4 Türkiye'de fen öğretmeni yetiştirme programında yer alan çevre eğitiminin geliştirilmesi için öneriler hakkında öğretim üyelerinin görüşleri nelerdir?

4. Öğretmen adayları ve öğretmenlerin ilkokul çevre eğitimi uygulamaları ve ihtiyaçları ile ilgili algıları arasında anlamlı bir fark var mı?
5. Öğretim üyeleri, öğretmen adayları ve öğretmenler tarafından belirtildiği üzere fen eğitimi öğretmen programı, ilkokul programında yer alan çevre eğitimi ile ilgili ihtiyaçları nasıl karşılamaktadır?

YÖNTEM

Araştırma Yöntemi:

Türkiye'de ilkokul ve öğretmen eğitim programlarında çevre eğitimi uygulamaları ve ihtiyaçları ile ilgili mevcut durumu ortaya koymak için karma yöntem kullanılmıştır. Karma yöntem araştırmaları (Mixed method research) tek bir çalışma veya çok aşamalı çalışma içerisinde nicel ve nitel veri toplama, analiz etme ve bütünleştirme yöntemlerini kullanmayı içermektedir (Creswell, 2007). Buna uygun olarak, bu çalışmada kullanılan karma yöntem çok düzeyli karma yöntemdir. Çok düzeyli karma yöntem deseninde (Multi-level mixed method design), nitel veri bir düzeyde (öğretim üyeleri), nicel veri ise başka bir düzeyde (öğretmen adayları ve öğretmenler) toplanmaktadır ve böylelikle her iki çeşit yöntemle toplanan veriler analiz edilmekte ve sonuçlar çok düzeyli yorum yapmak için kullanılmaktadır (Tashakkori & Teddlie, 2003). Bu amaçla, veri toplamak için araştırmacı tarafından geliştirilen anket ve görüşme protokolü kullanılmıştır.

Örneklem:

Bu araştırmanın örneklemi, çalışmanın 3 düzeyli olma özelliğini yansıtacak şekilde Ankara'da bulunan 4 öğretim üyesi, 150 fen öğretmeni adayı ve 250 fen

öğretmeniden oluşmaktadır. Öğretim üyeleri (1 kadın, 3 erkek), Ankara'daki devlet üniversitelerinin ilköğretim fen bilgisi öğretmenliği bölümünde açılan "Çevre Bilimi" dersini verenler arasından seçilmiştir. Öğretmen adayları (133 kadın, 17 erkek) ilköğretim fen bilgisi öğretmenliği bölümünde okuyan "Çevre Bilimi" dersini alan öğrencilerden oluşmaktadır. Öğretmenler (167 kadın, 83 erkek) ise Ankada'da ulaşımı kolay ve şehir merkezine yakın bölgelerde (Altındağ, Çankaya, Gölbaşı, Etimesgut, Keçiören, Mamak, Sincan and Yenimahalle) bulunan devlet ilkokullarındaki fen öğretmenlerinden oluşmaktadır.

Veri Toplama Araçları:

Bu çalışmada araştırmacı tarafından geliştirilen iki veri toplama aracı kullanılmıştır. Bunlardan birincisi, çalışmanın nicel boyutu kapsamında ilkokullardaki çevre eğitimi uygulamaları ve ihtiyaçları ile ilgili mevcut durumu belirlemek amacıyla hazırlanan Çevre Eğitimi Gelişme Seviyesi Anketidir (EE SoAQ). İkinci veri toplama aracı ise çalışmanın nitel boyutu kapsamında hem ilkokul hem de üniversite eğitiminde yer alan çevre eğitimi uygulamaları ve ihtiyaçları ile ilgili mevcut durumu ortaya koymak için geliştirilen yarı yapılandırılmış görüşme protokolüdür (EE-U IP). Bu çalışmada araştırılan beş temel araştırma sorusu, very toplama araçları, katılımcılar ve ilgili data analizi Tablo G.2'de sunulmuştur.

Tablo G.2. Araştırma soruları, ilgili katılımcılar, very toplama aracı ve very analiz yöntemi

Araştırma soruları	Veri toplama aracı	Katılımcılar	Veri analiz yöntemi
1. Öğretmenlerin deyişiyle Türkiye'de ilkokul fen programında çevre eğitimi mevcut durumu nasıldır?	EE SoAQ	Öğretmenler	Tanımlayıcı Analiz (Frekanslar, ortalamalar) İçerik Analizi

Tablo G.2 (devamı)

2. Öğretmen adaylarının deyişiyle Türkiye'de ilkokul fen programında çevre eğitimi mevcut durumu nasıldır?	EE SoAQ	Öğretmen adayları	Tanımlayıcı Analiz (Frekanslar, ortalamalar) İçerik Analizi
3. Öğretim üyelerinin deyişiyle Türkiye'de ilkokul fen programı ve öğretmen eğitimi programında çevre eğitimi mevcut durumu nasıldır?	EE-U IP	Öğretim üyeleri	İçerik Analizi
4. Öğretmen adayları ve öğretmenlerin ilkokul çevre eğitimi uygulamaları ve ihtiyaçları ile ilgili algıları arasında anlamlı bir fark var mı?	EE SoAQ	Öğretmenler Öğretmen adayları	Nedensel karşılaştırma araştırması: MANOVA
5. Öğretim üyeleri, öğretmen adayları ve öğretmenler tarafından belirtildiği üzere fen eğitimi öğretmen programı, ilkokul programında yer alan çevre eğitimi ile ilgili ihtiyaçları nasıl karşılamaktadır?	EE SoAQ EE-U IP	Öğretmenler Öğretmen adayları Öğretim Üyeleri	Tanımlayıcı Analiz (Frekanslar, ortalamalar) İçerik Analizi

Çevre Eğitimi Gelişme Seviyesi Anketi (EE SoAQ): Ilkokullardaki çevre eğitimi uygulamaları ve ihtiyaçları ile ilgili mevcut durumu belirlemek amacıyla hazırlanan EE SoAQ öğretmen adayları ve öğretmenlere uygulanmıştır. EE SoAQ (Appendix B) 3 açık uçlu, 4 çoktan seçmeli, 51 likert tipi maddeden oluşmaktadır. Maddeler, öğretmen ve öğretmen adaylarının demografik bilgileri, ilkokullarda yer alan çevre eğitimi konularının durumu, öz-yeterlilikleri, öğretim teknikleri ve mecvut uygulamaları, çevre eğitimi ile ilgili ihtiyaçlar hakkında algılarını ölçmek amacıyla beş kategori altında toplanmıştır. Ancak, öğretmen adaylarının kullandıkları öğretim teknikleri ve mevcut uygulamalar olmadığından bu kategorideki maddeler

öğretmen adaylarının kullanılması gereken öğretim teknikleri ve uygulamalar hakkındaki görüşlerini ölçmek üzere adapte edilmiştir. Öğretmenler ve öğretmen adaylarına uygulanan anketin kategorileri ve örnek maddeleri Tablo G.3'te sunulmuştur.

Tablo G.3. Öğretmenler ve öğretmen adaylarına uygulanan EE SoAQ kategorileri ve örnek maddeler

Öğretmenlere uygulanan EE SoAQ kategorileri	**Öğretmen adaylarına uygulanan EE SoAQ kategorileri**	**Örnek maddeler**
Demografik bilgi (Yaş, cinsiyet, deneyim, çevre eğitime genel bakış açısı)	Demografik bilgi (Yaş, cinsiyet, çevre eğitime genel bakış açısı)	A. Aşağıda belirtilen çevre eğitimi ile ilgili düşüncelerden hangisi sizin görüşünüze uygundur? a. Çevre eğitimi gereksizdir b. Çevre eğitimi gereklidir, örgün ve yaygın eğitim kurumlarında verilmelidir. c. Çevre eğitimi gereklidir, ancak okullarda verilmesi şart değildir d. Kararsızım C. Aşağıda çevre eğitimi ile ilgili ifadeler bulunmaktadır. Bu ifadelerden hangilerine katıldığınızı kutucuklara işaret koyarak belirtiniz a. Örgün eğitim kurumlarında verilen çevre eğitimi yeterlidir. b. Çevre eğitimi sadece fen bilgisi dersi kapsamında verilmelidir. c. Çevre eğitimi tüm derslere entegre edilmelidir. d. Öğretmen adaylarına eğitimleri sırasında zorunlu çevre eğitimi dersi verilmelidir.

Tablo G.3 (devamı)

İlkokul fen programında çevre eğitiminin durumu hakkında görüşleri	İlkokul fen programında çevre eğitiminin durumu hakkında görüşleri	E.1. Programda bulunan çevre ile ilgili konular öğrencilerin çevreye yönelik bilgilerini arttırmak için yeterlidir.
		E.2. Programda bulunan çevre ile ilgili konular öğrencilerin çevresel farkındalığını arttırmak için yeterlidir.
		E.4. Programda bulunan çevre ile ilgili konular, öğrencilerin çevre sorunlarının kendi yaşamlarının bir parçası olduğunu anlamaları için yeterlidir.
		E.5. Programda bulunan çevre ile ilgili konular ve etkinlikler güncel çevre sorunlarını yansıtmaktadır.
Çevre eğitimi uygulamalarına yönelik öz-yeterlilik	Çevre eğitimi uygulamalarına yönelik öz-yeterlilik	F.1. Fen bilgisi dersinde yer alan çevre ile ilgili konuları, etkili bir şekilde öğretecek kadar iyi biliyorum.
		F.2. Fen bilgisi dersinde yer alan çevre ile ilgili konuları öğretmek için gerekli becerilere sahibim.
		F.5. Fen bilgisi dersinde yer alan çevre ile ilgili konuları programında bulunan diğer konular kadar iyi öğretebilirim.
Mevcut öğretmenlik uygulamaları	Öğretmenlik uygulamaları hakkındaki görüşleri	G.1. Fen bilgisi ders programında yer alan çevre ile ilgili konuları anlatırken ders kitabındaki etkinlikleri kullanıyorum.
		G.2. Fen bilgisi dersi programında yer alan çevre ile ilgili konuları anlatırken kendi oluşturduğum ya da diğer kaynaklardan bulduğum etkinlikleri kullanıyorum.
		G.4. Fen bilgisi dersi programında yer alan çevre ile ilgili konuları günlük hayatla ilişkilendirerek anlatıyorum.
		G.5. Fen bilgisi dersi programında yer alan çevre ile ilgili konuları anlatırken öğrenci-merkezli yaklaşımlar kullanıyorum.

Tablo G.3 (devamı)

Daha etkili çevre eğitimi sağlanabilmesi için çevre eğitimi ihtiyaçları hakkındaki görüşleri	Daha etkili çevre eğitimi sağlanabilmesi için çevre eğitimi ihtiyaçları hakkındaki görüşleri	I.1. Okullarda çevre eğitimi için ayrılan zamanın arttırılmasına I.2. Programda bulunan çevre eğitimi ile ilgili konuların sürdürülebilir kalkınma eğitimi içeriğine dönüştürülmesine I.5. Öğretmenlerin çevre eğitimi için kullanılabilecek öğretim teknikleri hakkında bilgilerinin arttırılmasına I.10. Çevre eğitimi için okulların fiziksel yapısının (bahçe ağaçlandırması, ekim dikim alanı oluşturma, laboratuvar vb.) geliştirilmesine I.12. Öğrencilerin çevre eğitimi konularına olan ilgi ve motivasyonunun arttırılmasına I.14. Çevre eğitimi ile ilgili konularda üniversitelerle işbirliğinin geliştirilmesine K. Size göre Türkiye'de çevre eğitimi ile ile ilgili en önemli 3 ihtiyaç nedir? Lütfen önem sırasına göre yazınız. L. Size göre Türkiye'de çevre eğitimi uygulamalarını engelleyici en önemli 3 bariyer nedir? Lütfen önem sırasına göre yazınız.

Anket sorularının geçerliliği için çevre eğitimi alanında uzman üç kişinin görüşleri alınmıştır. Ayrıca, anketin yapı geçerliği için iki tane pilot çalışma yapılmış ve faktör analizi uygulanmıştır. Faktör analizi sonucunda anketin son hali düzenlenmiştir. Anketin iç tutarlılığını belirlemek için Cronbach alpha değeri .895 olarak hesaplanmıştır ve Hair ve diğerleri (1998) tarafından belirtilen .70 değerinden yüksek olduğu için anketin güvenilir olduğu ortaya konmuştur.

Üniversitelerde Çevre Eğitimi Görüşme Protokolü (EE-U IP): Üniversiteler ve ilkokullarda çevre eğitiminin durumu ve ihtiyaçları ile ilgili öğretim üyelerinden toplanan veriler yarı yapılandırılmış görüşme protokolü ile yapılmıştır. Ilkokullarda çevre eğitimi, öğretmen yetiştirme programlarında çevre eğitimi, üniversite kampüsünde çevre eğitimi uygulamaları ile ilgili ihtiyaçlar, Türkiye'de çevre eğitimi ile ilgili ihtiyaçlar ve çevre eğitiminin geliştirilmesi için öneriler olmak üzere beş kategori altında toplanan görüşme soruları alt kategorileri ile birlikte Tablo G.4'te sunulmuştur.

Table G.4. Öğretim üyelerine ugulanan EE-U IP kategorileri, alt kategorileri ve örnek maddeler

Kategoriler	**Alt-kaetgoriler**	**Örnek maddeler**
İlkokullarda çevre eğitiminin durumu hakkında görüşler	Çevre ile ilgili konuların ilkokul fen programına dahil edilmesinin gerekliliği Öğretmenlik stratejileri Öğretmenlik uygulamaları	1. Çevre ile ilgili konuların ilkokul fen bilgisi dersi programında yer alması gerektiğini düşünüyor musunuz? Sebebini açıklar mısınız? c. Çevre eğitimi programda nasıl/ne düzeyde yer almalı? d. Çevre eğitimi tüm yöntemlerde faydalı olur mu? e. Çevre eğitimi nasıl dizayn edilirse daha faydalı olur? f. Çevre eğitiminin etkinliğini arttırmak için ne yapmak gerekir?
Öğretmen eğitim programlarında çevre eğitiminin durumu hakkında görüşler	Çevre Bilimi dersinin amacı Çevre Bilimi dersinin kazanımları Çevre Bilimi dersinin içeriği Çevre Bilimi dersi sırasında kullanılan öğretim teknikleri	3. Çevre Bilimi dersi ile ilgili sorular: a. Dersin temel amacı nedir? b. Dersin kazanımları nelerdir? c. Bu ders kapsamında yer alan konular nelerdir? d. Bu ders anlatılırken hangi öğretim teknikleri ve etkinlikleri kullanıyorsunuz?

Tablo G.4 (devamı)

	Üniversite tarafından sağlanan imkanlar	e. Hazırladığınız ders içeriğinde öğrencilerinize çevresel konuları nasıl öğretecekleri ile ilgili bölüm var mı? Bu kısım neleri içeriyor? f. Dersi anlatırken günlük yaşamla bağlantı kuruyor musunuz? Örneklerle açıklar mısınız? 4. Bu ders kapsamında yaptığınız alan gezisi, açık hava etkinlikleri, video gösterimi, vb. etkinlikler için Üniversite imkan sağlıyor mu?
Üniversite kampüsünde çevre eğitimi uygulamalarına yönelik ihtiyaçlar ile ilgili görüşler	-	5. Üniversite'de sağlanan çevre eğitimi ile ilgili ne gibi ihtiyaçlar/eksiklikler olduğunu düşünüyor sunuz?
Türkiye'deki çevre eğitimi ihtiyaçları ile ilgili görüşler	-	6. Size göre Türkiye'de çevre eğitimi ile ile ilgili en önemli 3 ihtiyaç nedir?
Çevre eğitimini geliştirmek için öneriler hakkında görüşler	Çevre eğitiminin geliştirilmesi için bireylere yönelik öneriler Çevre eğitiminin geliştirilmesi için yönetimlere yönelik öneriler Çevre eğitiminin geliştirilmesi için yerel yönetim, üniversiteler ve sivil toplum kururuluşları arasında işbirliğinin geliştirilmesine yönelik öneriler	7. Çevre eğitiminin geliştirilmesi için ne gibi adımlar atılmasi gerektiğini düşünüyorsunuz? a. Yerel Yönetim, Üniversite, STK, bireysel bazda neler yapılmalı? b. Bunlar arasında ortak çalışma geliştirilmeli mi? i. Nasıl çalışmalar yapılabilir?

Görüşme protokolü sonuçları, biri bu çalışmanın araştırmacısı, diğeri ise çevre eğitimine ilgilisi olan ve eğitim fakültesinde doktora yapan iki araştırmacı tarafından analiz edilmiş ve ortaya konulan kodlar karşılaştırılmıştır. Böylece, .94 olarak hesaplanan güvenilirlik değerinin Miles ve Humebrman (1994) tarafından belirtilen değerin (.80) üstünde olduğu ortaya konmuştur.

VERİ TOPLAMA VE ANALİZİ:

Veri Toplama

Bu çalışmanın verileri 2013-2014 eğitim yılında toplanmıştır. ODTÜ uygulamalı etik araştırma merkezi tarafından izin alındıktan sonra veri toplama araçlarının pilot çalışmaları yapılmıştır. Buna ek olarak, Milli Eğitim Bakanlığından anketin Ankara'daki 6 farklı bölgede yer alan 300 ilkokulda uygulanması için izin alınmıştır. Anketin ilkokullardaki fen öğretmenlerine uygulanması araştırmacının okulları ziyaret etmesi ile gerçekleşmiştir. Anketin öğretmen adaylarına uygulanması ise "Çevre Bilimi" dersi sonunda bu dersi alan fen öğretmen adayları ile yapılmıştır. Aynı zamanda, "Çevre Bilimi" dersini anlatan öğretim üyeleri ile görüşmeler yapılmıştır. Anketin uygulanması yaklaşık 20 dakika, görüşme protokolünün uygulanması ise yaklaşık 25 dakika sürmüştür ve tüm katılımcılar öncesinde çalışmanın amacı hakkında bilgilendirilmiştir.

Veri Analizi

Çalışmanın nicel kısmı ile ilgili verilerin analizi "Statistical Package for Social Sciences" (SPSS) istatistik program ile yapılmış ve veriler tanımlayıcı istatistik ve yorumsal istatistik olarak incelenmiştir.

Tanımlayıcı istatistik olarak ankette bulunan ilkokullarda çevre eğitimi, öz-yeterlilik, kullanılan öğretim teknikleri ve uygulamalar ve çevre eğitimi ihtiyaçları hakkında öğretmenler ve öğretmen adaylarının görüşleri bölümleri ile ilgili ortalama, standart sapma, frekans ve yüzdelik değerler hesaplanmıştıştır.

Yorumsal istatistik olarak öğretmenler ve öğretmen adaylarının çevre eğitiminin durumu ve ihtiyaçları ile ilgili algıları arasındaki farkı araştırmak için MANOVA uygulanmıştır. Buna ek olarak, katılımcıların demgrafik bilgileri ile algları arasında ilişkiye korelasyon ile bakılmıştır.

Çalışmanın nitel kısmı ile ilgili verilerin analizi için içerik analizi yapılmıştır. Ses kayıtları yazıldıktan sonra elde edilen veriler, biri bu çalışmanın araştırmacısı, diğeri ise okul öncesi bölümünde doktora öğrencisi olan ve çevre eğitimine ilgisi olan, iki araştırmacı tarafından kodlanmıştır ve karşılaştırma yapılarak güvenilirlik sağlanmıştır. İçerik analizi sonucunda ortaya çıkan kategoriler ve alt kategorilerin çoğunluğu daha önceden belirlenenlere benzerdir.

Bunlara ek olarak, nicel ve nitel verilerin sonuçarını birlikte yorumlayabilmek için ve öğretim üyeleri, öğretmen adayları ve öğretmenlerin çevre eğitimi durumu ve ihtiyaçları hakkında görüşleri arasındaki benzerlik ve farklılıkları ortaya koyabilmek için "As-Is & To-Be" modeli kullanılmıştır.

VARSAYIMLAR VE SINIRLILIKLAR:

Varsayımlar

1. Anket ve görüşme protokolünün uygulanması katılımcılar için eşit koşullarda yapılmıştır.
2. Katılımcılar veri toplama araçlarındaki soruları samimi ve tarafsız bir şekilde cevaplamıştır.
3. Aynı okul veya üniversitedeki katılımcılar sorular hakkında iletişime geçmemiştir.
4. Katılımcılar çalışmaya gönüllü olarak katılmışlardır.
5. Katılımcılar verdikleri cevapların gizli kalacağını bilmektedir.

Sınırlılıklar

1. Çalışmanın örneklemi 2013-2014 eğitim tılında görev yapan 250 fen öğretmeni, 150 fen öğretmen adayı ve 4öğretim üyesi ile sınırlıdır.
2. Çalışmanın sonuçları Türkiye, Ankara'dan seçilen örneklem ile sınırlıdır.
3. Çalışmanın geçerliliği kullanılan veri toplama araçlarının güvenirliliği ile sınırlıdır.
4. Çalışmanın geçerliliği katılımcıların sorulara verdikleri cevaplardaki dürüstlükleri ile sınırlıdır.
5. Bu çalışma rastgele örneklem kullanılmadan seçilen örneklemin seçilme yöntemi ile sınırlıdır.

BULGULAR:

Bu çalışmanın amacı Türkiye'de ilkokul ve üniversitelerde çevre eğitimi mevcut durumu ve ihtiyaçlarını öğretim üyeleri, öğretmen adayları ve öğretmenlerin deyişiyle ortaya koymaktır. Karma yöntem kullanılan bu çalışmada nicel yöntem kapsamında öğretmen ve öğretmen adaylarına EE SoAQ uygulanmış, nitel yöntem kapsamında ise öğretim üyelerine EE-U IP uygulanmıştır.

EE SoAQ sonuçlarının analizi, öğretmenlerin görüşlerinin ilkokullarda bulunan çevre eğitimi konularının öğrencilerin çevresel bilgi, farkındalık ve davranışlarını geliştirmek gibi birçok açıdan yetersiz olduğu eğiliminde olduklarını göstemektedir. Buna karşın, öğretmen adaylarının görüşleri ise ilkokullaraki çevre eğitimi programının birçok konuda yeterli olduğu eğilimindedir.

Hem öğretmenler hem de öğretmen adaylarının EE SoAQ de bulunan birçok madde konusunda öz-yeterliliklerinin yüksek olduğu saptanmıştır. Örneğin, çevre ile ilgili konuları anlatmak için yeterli bilgi ve beceriye sahip oldukları, çevre eğitimini anlatırken değişik etkinlikleri kullanabilecekleri ve öğrencilerin sorularını cevaplayabilecekleri belirtilmiştir.

Öğretmener tarafından çevre eğitimi için kullanılan uygulamalar ve etkinlikler öğrenci-merkezli öğretim metodları kullanımı, günlük yaşamla ve diğer disiplinlerle bağlantı kurmayı içermektedir. Buna ek olarak, öğretmenlerin en çok kullandıkları öğretim yöntemleri tartışma, belirli bir konuda araştırma yapma, soru sorma ve bireysel veya grup projeleri olarak belirtilmiştir. Öğretmen adayları da, çevre eğitimi sırasında kullanılması gereken uygulamalar ve etkinlikler konusunda öğretmenlerle benzer yanıtlar vermişlerdir. Çevre eğitimi için kullanılması gereken öğretim teknikleri öğretmen adayları tarafından problem temelli öğrenme, soru sorma, tartışma, video ve arazi gezileri olarak belirtilmiştir.

Çevre eğitimi ihtiyaçları ile ilgili, öğretmenler en çok üniversitelerle işbirliği yapılması, ailelerin desteği ve okul yönetiminin desteği konularında ihtiyaç olduğunu belirtmişlerdir. Öğretmen adayları ise okul yönetimi desteği, çevre eğitimi ile ilgili material ve kaynak ve alan gezisi için sağlanan finansal olanaklar konularında en çok ihtiyaç olduğunu söylemişlerdir.

Öğretmenlerin ve öğretmen adaylarının çevre eğitimi durumu ve ihtiyaçları hakkında görüşleri arasındaki farkı incelemek için MANOVA uygulanmıştır. Sonuç olarak çevre eğitimi ihtiyaçları hakkındaki görüşleri arasında anlamlı bir fark bulunmuştur. Ortalama değerlerine bakıldığında ise öğretmen adaylarının çevre eğitimi ihtiyaçları hakkında görüşlerinin öğretmenlere göre az bir farkla daha yüksek olduğu saptanmıştır.

Öğretim üyelerine uygulanan EE-U IP sonuçlarının analizi göstermektedir ki, çevre yaşamımızın bir parçası olduğu için, öğrencilerin yaşamımızın çevreye bağlı olduğunu anlamaları için ve yaşam tarzlarının küçük yaşlardan başlayarak çevreye duyarlı hale getirilmesi için ilkokul fen programına çevre ile ilgili konular dahil edilmelidir. Ilkokullarda çevre eğitimi anlatılıken öğretmenler, hem teorik hem de pratik uygulamalar kullanmalı, çocukların yaşamla bağlantı kurabilmesi için günlük yaşamdan örnekler aktarmalı ve öğrencileri çevreye duyarlı davranış geliştirmeleri konusunda desteklemelidir. Bunlara ek olarak, öğretmenin iyi bir

moderator olduğu öğrenci-merkezli öğretim teknikleri kullanılmalı, konu anlatımının yanı sıra, açık hava etkinlikleri, drama, deney gibi öğretim tekniklerine öncelik verilmelidir.

Öğretmen eğitimi programlarında çevre eğitimi ile ilgili öğretim üyelerine verdikleri zorunlu ders olan "Çevre Bilimi" dersinin amacı, kazanımları, anlatılan konular, kullanılan öğretim teknikleri sorulmuştur. Dersin temel amacı, öğretim üyeleri tarafından çevreye yönelik bilgi ve bilinci arttırmak olarak belirtilmiştir. Dersin kazanımları ise, temel olarak olumlu davranış geliştirme, çevreye yönelik bilgi, tutum ve bilincin artması olarak sıralanmıştır. Ders sırasında anlatılan konular, temel ekolojik kavramlar, çevre kirliliği, biyoçeşitlilik, çevre eğitimi, ekolojik ayak izi konularını içermektedir. Öğretim üyeleri, "Çevre Bilimi" dersi kapsamında çoğunlukla grup projeleri, konu anlatımı, soru sorma, sunum, görsel araçlar ve tartışma yöntemlerini kullandıklarını ve dersler sırasında günlük yaşamdan örnekler sunduklarını dile getirmişlerdir. Bunlara ek olarak, yılda en az bir defa atık su arıtma tesisi, içme suyu artıma tesisi, müze vb. arazi gezisi yaptıklarını belirtmişlerdir. Üniversitenin çevre eğitimi için sağladığı imkanlar sorulduğunda ise çoğunlukla arazi gezileri için üniversitenin ulaşım imkanı sağladığı söylenmiştir. Buna ek olarak bazı üniversitelerde kumanya sağlandığı da belirtilmiştir.

Üniversitelerde çevre eğitimi ihtiyaçları ile ilgili olarak kampüste geri dönüşüme dikkat edilmemesi, atıkların ayrı ayrı toplanmaması ve gereksiz enerji harcanmasının önemsenmemesi belirtilmiştir. Sınıflarda ders olmamasına ragmen ışıkların açık bırakılması, kaloriferler yanarken kapı ve pencerelerin açık bırakılması gibi davranışlar örnek olarak sunulmuştur. Bunlara ek olarak, üniversitelerde daha sağlıklı çevre eğitimi sağlanabilmesi için gelişmiş laboratuvarların kurulması, daha az kalabalık sınıflarda ders verilmesi gibi fiziksel olanakların geliştirilmesi, ayrı bir çevre eğitimi dersi konması, var olan "Çevre Bilimi" dersinin süresinin uzatılması, üniversitedeki diğer bölümlerde de çevre

eğitimi dersi verilmesi ve de çevre eğitiminin diğer derslere de entegre edilerek anlatılması konularında ihtiyaç olduğu bildirilmiştir.

Çevre eğitiminin geliştirimesi konusunda öğretim üyelerinin önerileri bireysel, yönetim ve üniversite, yerel yönetim ve sivil toplum kuruluşlarının ortak çalışması bazında listelenmiştir. Bireysel olarak, kişilerin atık yağ ve pil toplanması, atıkların geri dönüştürülmesi gibi çevreye yönelik sorumlu davranış geliştirmelerinin sağlanması ve bilgilerinin arttırılması; yönetim bazında, yönetimlerin önceliklerinin değişmesi, çevre bilincinin arttırılması ve ilgili alanları uzman kişilerin getirilmesi; ortak çalışma olarak da bireylerin çevresel bilgi, tutum, davranış, bilinç ve farkındalıklarının geliştirimesi için yerel yönetim, üniversite ve sivil toplum kuruluşlarının ortak çalışması ile eğitim ve seminer organize edilmesi, hizmet içi eğitim sağlanması ve çeşitli etkinlikler düzenlenmesi önerilmiştir. Bunlara ek olarak, fen bilgisi bölümünde yüksek lisans öğrenimine devam eden kişilerin çoğu aynı zamanda öğretmen olarak çalıştığı için, üniversitenin ihtiyaçlara yönelik yüksek lisans dersi açması ve böylece öğretmenlerin uygulamalar konusunda desteklenmesi önerilmiştir.

SONUÇ VE ÖNERİLER:

Bu çalışma üniversiteler, üniversitedeki eğitimciler, ilkokullar ve öğretmenler için birçok çıkarımda bulunmaktadır. Çalışmada yer alan öğretim üyeleri, öğretmen adayları ve öğretmenler tarafından belirtilen çevre eğitimi ile ilgili ihtiyaçlar ilkokullarda çevre eğitiminin birçok yönden geliştirilmesi gerektiğini ortaya koymaktadır.

Üniversite ile ortaklaşa çalışma yapılması, okul yönetimi ve ailelerin desteğinin arttırılması en önemli ihtiyaçların bazıları olarak belirtilmiştir. Bu sebeple, ilkokullarda çevre eğitiminin geliştirilmesi ve öğretmenlerin çevre bilgisinin arttırılması için üniversite ile ortak çalışılarak çevre eğitimi alanında uzman kişilerin desteği alınmalıdır. Ayrıca, ailelerin ve okul yönetiminin farkındalığı

arttırılarak çevre eğitimi için var olan engellerin (örn. açık hava etkinlikleri için ailelerin izin vermesi, arazi gezileri için olanak sağlanması, vb.) azaltılması sağlanmalıdır.

İlkokul ve üniversitede sağlanan çevre eğitiminin süresinin arttırılması, ayrı bir ders olarak verilmesi ve çevre eğitiminin diğer konularda da anlatılması hem öğretim üyeleri, hem öğretmen adayları hem de öğretmenler tarafından belirtilen ihtiyaçlar arasındadır. Bu yüzden ilkokulda ve üniversitede anlatılan çevre eğitimi daha geniş ve detaylı bir müfredat ve daha çok zaman sağlanarak geliştirilmelidir.

Çevre eğitimini geliştirmek için yerel yönetim, sivil toplum kuruluşları ve üniversiteler arasındaki işbirliğini geliştrimek ve böylelikle bireylerin çevresel farkındalıkları, bilinçleri ve bilgileri geliştirilmelidir. Buna ek olarak, yönetimlerin öncelikleri değiştirilmesi ve çevre eğitimi ilkokul ve üniversite programlarına yeteri kadar dahil edilmelidir. Kısacası, ilkokullarda ve öğretmen yetiştirme programlarında yer alan çevre eğitimi yukarıda belirtilen ihtiyaçlar doğrultusunda geliştirilmeli ve yenilenmelidir.

Bu çalışmada çok düzeyli karma yöntem (Multi-level mixed method design) kullanılması çevre eğitiminin durumu ile ilgili farklı düzeylerdeki katılımcıların görüşlerinin farklı olduğunu göstermektedir. Yani, çevre eğitiminin mevcut durumunun farklı bakış açılarına göre bakıldığında karmaşık olduğu saptanmış ve çok düzeyli karma yöntem kullanılarak daha fazla çalışma yapılması gerektiği vurgulanmıştır.

Bu çalışmada katılımcıların sonuçlarından elde edilen ilkokul ve öğretmen eğitim programramlarında çevre eğitiminin mevcut durumu ve ihtiyaçları ile ilgili görüşler farklı bir yaklaşım ola “As-Is & To-Be” modeli kullanılarak sunulmuştur. Bu modelin eğitim alanında kullanımı gelecekte yapılan çalışmalar için örnek teşkil etmektedir.

Bu çalışma ilköğretim fen bilgisi öğretmenliği bölümündeki öğretim üyeleri, fen öğretmen adayları ve fen öğretmenleri ile yapılmıştır. Bu katılımcılara ek olarak, okul yönetimi, ilkokul öğrencileri ve aileleri de çalışmaya dahil edilmeli ve onların algısı da araştırılmalıdır. Ayrıca, çevre eğitimi disiplinlerarası olduğu için, fen eğitimi dışındaki diğer alanlardan katılımcıları da dahil ederek daha fazla çalışma yapılmalı ve o alanlardaki çevre eğitimi mevcut durumunu ve ihtiyaçları da ortaya konmalıdır.

Bu çalışmada öğretmenler ve öğretmen adaylarının ilkokullarda çevre eğitiminin mevcut durumu ve ihtiyaçları hakkında görüşlerini almak için anket uygulanmıştır. Ankete ek olarak, görüşme protokolü ve ders gözlemi yolu ile nitel veri toplanarak görüşleri hakkında daha detaylı bilgi edinilebilir.

2013-2014 eğitim yılında 5. sınıflardan itibaren kademeli olarak yeni fen programı uygulanmaya başlamıştır. Bu çalışma, yeni programın uygulaması tüm sınıflarda tamamlandıktan sonra tekrar edilmelidir.

Çevre eğitiminin etkinliğini arttırmak için, çevre eğitimi ile ilgili ihtiyaçlar, bariyerler ve çözüm önerilerini araştırmak amacıyla karma yöntem kullanılarak daha çok çalışma yapılmalıdır.

TEZ FOTOKOPİSİ İZİN FORMU

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YAZARIN

Soyadı : Yıldırım
Adı : Nuray
Bölümü : İlköğretim

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